ICONQUHAS & ICONIST 2018

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Preface

Assalamu’alaikum Warahmatullahi Wabarakaatuh.

It is a privilege and great honour for me on behalf of the Organizing Committee to welcome all the experts and academicians to the 2nd International Conference on Qur'an and Hadith Studies. We are delighted to have you all with us to participate and share your knowledge and experiences in our conference. Thank you for coming and welcome to Bandung. Many of you have travelled long distance to be here. I hope this conference will give what you expect to.

We are also honoured to have prominent scholars with us today. We have Prof. Dr. Abdullah Saeed from the University of Melbourne, Australia an expert in contemporary Qur'anic Studies, and Prof. Dr. Mohamed Fauzan Noordin from International Islamic University Malaysia who expert on using Information Technology and media for the Study of Qur'an and Hadith. We also have Associate Prof. Dr. Nurazzah Abdul Rahman from University Teknologi MARA Malaysia also expert in Data retrieval of Hadith Studies. We also thank Dr. KH. Ahmad Luthfi Fathullah a lecturer from our university who usually facilitate the students in studying Hadith in his Pesantren. We, actually invite a prominent scholar from Leeds University, United Kingdom, Prof. Dr. Eric Atwell. Unfortunately, he could not be with us here today because his daughter has to go on surgery. However, he already recorded his speech for today and could interact with us through Skype (I hope the connection is running well). Prof. Atwell is an expert in Computational Linguistics and specifically in supervising many students deal with data mining of the Qur'an. Thus, all of the keynote speakers are esteemed specialists in contemporary Qur'an and Hadith Studies. So, prepare yourselves to be challenged, excited, and inspired!

International conference on Qur'an and Hadith Studies (ICONQUHAS) is an annual event committed to actively engage the scholars of Qur'an and Hadith studies to increase quality of research capacity for potential collaborative projects and networks.

In this occasion, allow me to thanks the Rector of UIN Sunan Gunung Djati Bandung Prof. Dr. H. Mahmud M.Si, Dean of the Faculty of Ushuluddin Prof. Dr. H. Rosihon Anwar, M.Ag, Director of LP2M (Institute for Research and Community Development) Dr. H. Munir, MA and Dr. Wahyudini Darmalaksana, M.Ag (Head of Research Center), for all the supports for this conference special thanks to all the committee members, colleagues and students for the endless work for making this happening.

Finally, I hope you will benefit from many thoughtful and enriching discussion. It is wonderful to see so many of you here. Happy discussing and enjoy you stay in Bandung.

Wassalaantu'alaykum Warahmatullahi Wabarakaathuh.

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Abstract. The Subh time specified in the prayer schedule has been considered as early as 20 to 30 minutes, whereas prayer must be done on time. This study aims to verify the phenomenon of dawn shadiq (astronomical twilight) as a mark of dawn time. The research was carried out by observation method using Sky Quality Meter technology and the results will be analyzed with the approach of ushul fiqh science, astronomy, and mathematics. The approach to the science of ushul fiqh is to analyze the normative aspects, the approach of astronomy is to analyze the phenomenon of dawn, and the approach of mathematics to analyze the results of dawn observations with Sky Quality Meter. The results of the study showed that at dawn Shadiq can be observed factually at a depression angle of 15 ° to 18 ° below the equivalent horizon of 60 to 72 minutes before sunrise. The magnitude of the depression angle is different from the determination of the Ministry of Religion of the Republic of Indonesia and Islamic Organizations that is equal to 20 ° below the horizon equivalent to 80 minutes before sunrise. The implication of the findings of this study is the shift of dawn time, imsak time and the start time of fasting 8 to 20 minutes from the time specified in the prayer time schedule.

Keywords: Dawn sky, Subh prayer time, SQM technology

1 Introduction

The critique on the early determination of Subh prayer time as being too early has been around since 2010 in an article published in Qiblati magazine titled “Salah Kaprah Waktu Subuh” (the misunderstanding of Subh prayer time) written by Syaikh Mamduh Farhan al-Buhairi [1]. This article sparks many questions in the society regarding the determination of Subh prayer time. Before, many Muslims in society already agreed that Subh prayer time as it was thought as completely finalized without any doubt and has been listed in the perpetual salat timetable as a guide for Muslim on when to perform their daily prayers.

Susiknan Azhari said that before Syaikh Mamduh Farhan al-Buhairi wrote about the phenomenon of dawn that is being used in Indonesia [2], Hanafi S. Djamari has written an article titled “Menelaah Kembali Awal Shalat Subuh” (examining the starting time of Subh prayer) and as published in the newspaper Republika in May 2, 1999. In his article, Hanafi urged to re-examine the concept of zenith distance of sun to determine Subh prayer time. According to him, the relevant zenith for Subh prayer time is when the solar elevation angle is around 18° [3]. However, many Muslims are still being unresponsive of the concept he presented at that time.
Many parties reacted to the concept presented in Qiblati magazine in 2010 about the correction of Subh prayer time. Indonesian government represented by the Director for Islamic Religious Affairs and Syariah Development of the Ministry of Religious Affairs, Rohadi Abdul Fatah stated that the Subh prayer time determined by the government, has been already verified so that the Muslim society didn’t have to be restless [4]. The determination of Subh prayer time refer to the calculation result by the Indonesian Hisab and Rukyat Body with the member consisting of the delegation of Islamic organization and experts in cosmography and astronomy so that their calculation is without a doubt a valid one. This view is also supported by one of the biggest Islamic organizations in Indonesia, Muhammadiyah. The vice secretary of Majelis Tarjih Muhammadiyah, Fatah Wibisono said that Subh prayer time is already correct which is when the solar elevation angle is in 20° below the horizon. Wibisono further asserted, “Muhammadiyah didn’t have any differences in determining Subh prayer time from what has been calculated by the Indonesian Hisab and Rukyat Body or the Indonesian government. So there is no need to revise the already calculated Subh prayer schedule.” His reaction reassured the Muslim communities and they viewed this as a finalized argument in the calculation of Subh prayer time [5].

However, the discourse about Subh prayer time reappeared again in 2017 in the national seminar, focusing on the subject of “Evaluasi Awal Waktu Shalat Subuh Menurut Sains dan Fikh” (the evaluation of Subh prayer time according to science and fiqh) initiated by the Islamic Science Research Network (ISRN), Universitas Muhammadiyah Prof Dr Hamka (UHAMKA) [6]. Tono Saksono stated that scientifically, it has been observed that it our Subh prayer time is indeed around 20-30 minutes too early. Saksono stated that,”The already agreed time of the dawn sky that refer to the solar elevation angle of 20° below the horizon or equal to 80 minutes before sunrise has been observed to be too early, as the observation shows that the dawn phenomenon as an indicator for Subh prayer time has only started when the solar elevation angle is around 11° to 15° below the horizon or equal to 44 to 69 minutes before the sunrise."

The head of the National Institute of Aeronautics and Space (LAPAN), Prof Dr Thomas Djamiluddin in the same seminar also said that it is already time to revised the usage of the standardized angle of 20° below the horizon, however, the observation needs to be done from a location where there is a minimal atmospheric disturbance to prevent the distortion of the result [7]. This finding was positively welcomed by the vice head of Lembaga Falakiyah Nahdlatul Ulama (LFNU), Sirril Wafa. According to Wafa (2017), NU is ready to welcome the change and to initiate research cooperation in astronomy between NU, Muhammadiyah, MUI, Lapan, and others.

The validity in determining Subh prayer time is related to many questions concerning fiqh such as when is the time to start the Subh prayer, the beginning and the end of imsak, and the time to start fasting. These questions can only be answered if the Subh prayer time has been determined. Based on that, there is a necessity to do a research about Subh prayer time that synergized how the Fajr Shadiq or the true dawn is defined in both the Islamic syar’i and scientific aspects. Furthermore, with the invention in the field of optics in the form of sky detector technology or Sky Quality Meter (SQM), the research can be optimized in order to gain the best solution in determining the Subh prayer time. This research was supported by the principles of fiqh that the rule can change according to the difference in time, place, and recent conditions.

2 The Dawn Sky Phenomenon As A Sign For Subh Prayer Time
Salat is one of the main act of worship (ibadah) in Islam. Thus, according to the principle of Ushûl, “al-ashlu fî al-’ibâdah al-buthlân hatta yaqûma al-dalîl ‘alâ al-’amr” that the initial tenet of ibadah is prohibited unless there is a proof that the ibadah is according to what had been taught by Allah and the Prophet [8]. As-Shatibi stated that ibadah is ta’abbudî or taken for granted and the practice of ibadah is a form of faith, obedience, and submission to the God [9]. Ibadah can only be done by closely following the set rule and steadying the heart to always remember about Him so that the person can feel His presence within. Thus, in practicing salat, be it related to the obligatory condition (syarat), the pillars (rukun), or the essential acts of salat need to be based on normative aspects that is written in the Quran verse or in the hadith of the Prophet Muhammad SAW.

One of the obligatory condition of salat in the fiqh literature is ascertaining the arrival of stated times for prayer [10]. The knowledge about the arrival time of prayer shows that salat needs to be performed within the correct appointed time. This is in accordance to Quran Surah An-Nisa verse 103, “Indeed, performing prayers is a duty on the believers at the appointed times”. The word mauqûta in this verse, according to Muhammad Quraish Shiha is an ever unchanging obligatory [11]. Muhammad Ali al-Sais and Muhammad Ali al-Shabuni said that the meaning behind mauqûta is an obligation that is tied with a specified time and it is forbidden to exceed that [12], [13]. This verse is a mujmal verse (containing word or statement whose meaning is not clear) and the explanation can be found in the hadith of the Prophet Muhammad SAW. Ibnu Katsir quoted the perspective of Ibnu Abbas and Ibnu Mas’ud said that to perform the worship prayer of salat there is a prescribed appointed time like performing the Hajj [14].

The arrival of stated time for Subh prayer started after the dawn and ended when the sun rises. The dawn is marked by the the disappearance or the dimming of the stars. Quran verse Surah At-Thûr verse 49 call the phenomenon as “idbâr al-nujûm” which ended as stated in Quran Surah Qaaf verse 39 which is at “thulû’ al-syams” or the rising of the sun. The explanation on the arrival of stated time for Subh prayer is described within a few hadith of the Prophet Muhammad SAW, some of them are: (1) Hadith narrated by Abdullah ibn Amar in Sahih Muslim (hadith 966), The time for Subh prayer is from the coming of dawn until before the sun rises; (2) Hadith narrated by Jabir ibn Abdullah in Sunan al-Nasa’i (hadith 510), the arrival time of Subh prayer is when the dawn has spread and the morning has come, Jibrl is coming and the star is at its brightest; (3) Hadith narrated by Ibn Abbas in Sunan al-Tirmidzi (hadith 138), the arrival time of Subh prayer is when the dawn has come and the food becomes forbidden for those who do fasting which is when the sun started to spread its light around. These three hadith asserted the importance of the coming of dawn as the sign for the arrival time of Subh prayer.

The entity that is known as dawn as the sign for the arrival time of Subh prayer refers to the second dawn or better known as fajr shadiq (true dawn), while the first dawn is known as fajr kadzib (false dawn) which resembles a wolf’s tail (kadzanbi al-sirhân). Different from fajr shadiq which is heavily related to many worship rituals, fajr kadzib doesn’t have any implications toward the Islamic worship ritual. The existence of two dawn has been asserted in the hadith, “From Ibn Abbas RA, he said: Rasulullah SAW has said: The dawn is of two types: As for the first, it doesn’t prevent eating nor does it permit prayer (Subh prayer). As for the other, it prohibits eating (for the fasting person) and allows the prayer”. This hadith is narrated by Ibn Khuzaimah and Hakim and passed down by both of them. And in Hakim from the hadith Jabir is also like that but he added about the dawn which prohibits eating that “spreads across and covers the horizon”, and the other dawn which doesn’t prohibit anything that it “is like the tail of a wolf (kadzanbi al-sirhân)".
Ibnu Hajar al-Asqalani the meaning behind the word mustathilan is elongated and lie horizontally, while al-sirhân al-dzanbi is the raising of the lights spreading in the horizon to the sky vertically so that it looks like a tail of a wolf [15]. Hasan explained more about the two types of dawn, stating that fajr shadiq is a white mark at the edge of the eastern sky spreads across and covers the horizon accompanying the end of the night [16]. That is the true dawn where a Muslim is prohibited to eat and drink but is allowed to perform Subh prayer. Meanwhile, fajr kadzib is a white mark in the eastern sky which spread vertically (upwards) like a tail of wolf. This dawn comes before the true dawn where the night is still around, thus, this is the lying dawn in which it doesn’t prevent eating or drink but prohibits the Subh prayer because it hasn’t entered the time. Therefore, fajr shadiq is related to the rules of syara’ such as the starting time to do fasting, Subh prayer, and the end of the time for Isha prayer while fajr kadzib is not related to the rules of syara’. The characteristics of these two types of dawn mentioned within the hadith of the Prophet is necessary to be observed factually both in the perspective of syar’i and science so that the prayer can be performed in the appointed time.

3 The Observation Of Dawn Using The Sky Quality Meter Technology

The determination of Subh prayer time started with the phenomenon of the dawn, which is the true dawn or fajr shadiq and not the lying dawn or fajr kadzib. Fajr shadiq is a white mark vertically resembling a wolf’s tail or in the astronomical literature is known as zodiacal light. As for fajr shadiq, it is a white mark that spread across horizontally accompanying the end of the night or in the astronomical literature is known as astronomical twilight.

In astronomy, the dawn sky phenomenon or morning twilight was divided into three which is astronomical twilight, nautical twilight, and civil twilight [17]. Astronomical twilight is defined as the end of the night when the lights from the stars started to dim because of the lights spreading from the sun. Usually defined by the curvature of the light, astronomical twilight comes when the sun is at around 18° below the horizon. Nautical twilight is a where the dawn becomes visible for the sailors, happening at around 12° below the horizon. Civil twilight is when the dawn is started to be reflected in everything around us which happens at around 6°. These three twilights can be seen in Figure 1.

![Figure 1. Definition of Twilight, credit: www.weather.gov](image)

The phenomenon of fajr shadiq or astronomical twilight marked by the burst of light in the eastern horizon is relative to the position of the sun. This phenomenon happened because of the
scattering of the sunlight by the particles in the atmosphere surrounding the earth. In Quran Surah Al-Baqarah verse 187, it was stated as “until the white thread of dawn becomes distinct to you from the black thread (of night)”. As for the exact solar elevation for this *fajr shadiq*, there are many differing opinions. According to the expert of cosmography in Indonesia such as KH.Zubair Umar al-Jailani and Abdur Rachim, the elevation was around -18° to -20° [18]. The Ministry for Religious Affairs used the elevation at -20° based on the reasoning that the sensitivity of the eye is higher during this time because of the transition from darkness to light. However, in the recent development regarding to the solar elevation, *fajr shadiq* happened at around 11° to 15° below the horizon [19]. When converted into minute, the difference can reach 20 to 30 minutes from the already established Subh prayer time.

Nowadays, the research into the dawn sky phenomenon as the sign of the arrival of the stated time for Subh prayer can be done with the help of Sky Quality Meter (SQM). SQM is a modern photometer device that can be used to detect the brightness of the night sky so it can be very practical to observe and detect the coming of *fajr shadiq*. Beside that, SQM is also used for several research such as selection of astronomical sites [20], Effects of cloud amount on the night sky brightness [21], survey of light pollution [22]–[25], research of moon crescent sighting [26], research of bird living near airport [27], to research of prayer time evaluation [6]. This research used the SQM model SQM-LU-DL (SQM Lens USB-Data Logger) to observe the dawn. The SQM-LU-DL can automatically record and read the data of the observation using USB connection with or without the help of a computer. The observation using this SQM resulted in the data of the night sky brightness in the scale of magnitudes per arc second square (MPSAS).

This observation of the dawn sky phenomenon is using SQM model SQM-LU-DL produced by Unihedron with the serial number AL0316VH and firmware version 4.6.56. During the observation, the light censor will capture and record the situation in the observation location which will be processed within the micro-controller. Although equipped with data logger, the observation was done with the help of a computer connected to the SQM-LU-DL by using USB cable. The data from the observation will then be read by using Unihedron Device Manager (UDM) version 1.0.0.157.

The observation was done in Depok and Yogyakarta with geographical data and the date of observation logged in the table 1.

**Table 1. Location and Date of Observation**

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kota Depok</td>
<td>-6.392968</td>
<td>106.761872</td>
<td>May 11 &amp; 13, 2018</td>
</tr>
<tr>
<td>Krakal Beach, Yogyakarta</td>
<td>-8.148838</td>
<td>110.595726</td>
<td>July 21, 2018</td>
</tr>
<tr>
<td>Panguk Hills, Yogyakarta</td>
<td>-7.959344</td>
<td>110.441156</td>
<td>July 22, 2018</td>
</tr>
</tbody>
</table>

The observation in several location mentioned in table 1 was done in varied time, between midnight until the sunrise. The direction of SQM was also varied to prevent the lighting effect from the moon. The resulting data from SQM was then compared to the solar position data from NOAA. The data from SQM is in the form of ASCII in the format of .txt file. To process this data further, it needs to be converted into the.xsl file format. Afterwards, using Ms Excel, the data can be shown as a graphical chart in Figure 2.
Figure 2. Night sky brightness observation data in Krakal beach, Yogyakarta, July, 21 2018

Figure 2 shows the nightsky brightness graphic in Pantai Krakal, Yogyakarta per 3 seconds. The Y axis shows the night sky brightness in the magnitudes per arc second square (MPSAS) unit while the X axis shows the Solar elevation angle. The higher the number of MPSAS, the darker the sky observed. Meanwhile, the lower the number of MPSAS, the brighter the sky observed. From the graphic we can see that there is a change in brightness in line with the rising of the sun. This means that the higher the sun, the brighter the sky. The dawn is where the sky is started to get brighter, so in order to determine the coming of dawn, the graphic needs to be observed to see where in the local time and the solar elevation when the chart started to see a continuous dip, representing of the coming of the dawn.

To determine the coming of the dawn represented by the turning point in the data or the graphic, the processing of the data was done using several methods, which is solver method, polynomial 5 degree method, and moving average method. The result of these methods was presented in the Table 2.

Table 2. The Result of Observation and Data Processing

<table>
<thead>
<tr>
<th>Location and Date of Observation</th>
<th>Solver</th>
<th>Pol 5</th>
<th>MA 3</th>
<th>MA 5</th>
<th>MA 7</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depok 05/11/2018</td>
<td>-</td>
<td>14.2</td>
<td>17.6</td>
<td>11.8</td>
<td>12.8</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>9°</td>
<td>3°</td>
<td>1°</td>
<td>4°</td>
<td>2°</td>
<td>13.96</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Depok 05/13/2018</td>
<td>-</td>
<td>14.8</td>
<td>16.8</td>
<td>11.2</td>
<td>13.1</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>7°</td>
<td>3°</td>
<td>1°</td>
<td>7°</td>
<td>5°</td>
<td>13.87</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yogyakarta 07/21/2018</td>
<td>-</td>
<td>18.3</td>
<td>18.0</td>
<td>15.0</td>
<td>15.9</td>
<td>15.9</td>
</tr>
<tr>
<td></td>
<td>5°</td>
<td>3°</td>
<td>8°</td>
<td>6°</td>
<td>6°</td>
<td>16.68</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yogyakarta 07/22/2018</td>
<td>-</td>
<td>17.8</td>
<td>17.3</td>
<td>14.1</td>
<td>15.0</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>1°</td>
<td>1°</td>
<td>6°</td>
<td>1°</td>
<td>5°</td>
<td>15.85</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total average</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.09</td>
</tr>
</tbody>
</table>
Based on the result of observation and data process in Table 2, it can be obtained that the coming of the dawn happened when the sun is at the elevation of -15.09°. Compared to the standard used nowadays in Indonesia which is -20°, there is a difference of 4.91° or, converted to minute, is around 19 minutes 38.4 seconds. This ±19 minutes difference will affect the schedule of Subh prayer that the Indonesian Muslim refer to nowadays. The coming of dawn in the elevation of -15.09° shows that the sky is already bright (isfâr). The Prophet SAW said, "Delay Fajr a litte (asîfirû bi al-fajr), for it is greater in reward" (Sunan Tirmidzi hadith 142). Wahbah Zuhaili interpret isfâr as starting the Subh prayer after the bright light has spread [28].

The usage of -20° solar elevation or equal to 80 minutes before sunrise as the calculation for Subh prayer time in Indonesia, according to Thomas Djamaluddin is quite possible [7]. In certain condition, there is a possibility that dawn came before the solar elevation at -18°, for example when the thickness of the atmosphere increased or when the air is more dense with dust-like particles so the sunlight was spread by the higher atmospheric layer. This caused the dawn sky phenomenon to be detected even when the solar elevation was less than -18° and the sky looks dark. Aisyah said, "The mu’minah women used to attend the Subh prayer with the Prophet and after finishing the prayer they would return to their home and nobody could recognize them because of darkness" (Sunan Ibnu Majah hadith 661). The table 3 shows the Subh prayer time in Jakarta in September 10, 2018 when the sun is at the elevation of -20° and -18°.

<table>
<thead>
<tr>
<th>HASIB</th>
<th>SOLAR ELEVATION</th>
<th>SUBH PRAYER TIME (UT+7)</th>
<th>SUBH PRAYER TIME USING ELEVATION OF -15.09°(UT+7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISLAMIC FINDER</td>
<td>-20°</td>
<td>04:32:00</td>
<td>04:51:38.4</td>
</tr>
<tr>
<td>ACCURATE TIME</td>
<td>-18°</td>
<td>04:39:00</td>
<td>04:58:38.4</td>
</tr>
<tr>
<td>KEMENAG</td>
<td>-20°</td>
<td>04:34:00</td>
<td>04:53:38.4</td>
</tr>
</tbody>
</table>

From Table 3 we can see that the usage of SQM technology in observing the dawn sky phenomenon can give a different result in determining the Subh prayer time significantly. The difference of around 19 minutes between the established standard schedule (elevation of -20°) with the result of the observation (elevation of -15.09°) has an implication of the shifting of Subh prayer, imsak time, and fasting time by 8 to 20 minutes.

4 Conclusion

The determination of the phenomenon of dawn shadiq in certain angles of sun depression means to facilitate the preparation of the timetable for the morning prayer, justified in the realm of ushul fiqh. According to "qaidah fiqh" that the law can change if there is a change of the place, time and current state. The dawn which is intended as a mark is dawn shadiq or true dawn or astronomical twilight in the form of white light that spreads on the eastern horizon. The appearance of the dawn of the Shadiq set at the angle of depression of 20° below the
horizon equivalent to 80 minutes before sunrise and is used as a guideline in compiling the timetable for the morning prayer in Indonesia so far. At the present, using Sky Quality Meter photometer technology, it is found that the phenomenon of dawn on the angle of depression of 20° below the horizon has not been detected and seen factually. The phenomenon of dawn shadiq can only be detected with Sky Quality Meter at a depression angle of 15° to 18° below the horizon equivalent to 60 to 72 minutes before sunrise. This finding shows that the dawn time determined so far is 8 to 20 minutes faster, whereas prayer must be done on time. This research finding also has implications to the shift of dawn time, imsak time, and the time to start fasting 8 to 20 minutes from the time specified in the prayer time schedule.

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References


Measurement of Social Technology Use in Islamic University Institutions in Indonesia (A Case Study)

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Abstract. The advantage of utilizing social technology can help solve problems, improve the quality and quantity of communication with colleagues and students among universities, to save operational costs of the institution. However, negative impacts or risks that arise for organizations or individuals may happen if the use of this application is not managed properly and correctly. Universitas Islam Negeri Syarif Hidayatullah Jakarta (UIN Syahid) is one of the leading Islamic-based state higher education institutions in Indonesia. Measurement of technology use at UIN Syahid aimed to increase the distribution and ability of the academic community to obtain useful information. A survey has been conducted to collect data and analyzed them using descriptive statistics. While the measurement and hypothesis testing were conducted using partial least squares structural equation modeling (PLS-SEM). The survey results indicated that the average social technology users at UIN Syahid were used to using this application with about 6-10 years of experience and they routinely used this application to do work and professional development. The survey also showed that the majority of these application users intensely accessed this technology 5-7 times per week. The study results stated that the five variables, i.e. collaboration, communication, a frequency of access, knowledge & resources sharing, and usefulness had a positive effect and significant correlation to the use of social technology. To improve the institutional performance, the management is expected to increase the socialization of the use of social technology applications, particularly for the new user group of this application.

Keywords: diffusion of innovation; partial least square; PLS-SEM; structural equation modeling; social technology.

1 Introduction

The application of social technology has become increasingly popular in recent years in various circles with different backgrounds/social groups. A study about social technology use in business-oriented and higher education institutions has been increased since 2008-2011 [1]. The simple reason why social technology is currently so popular both in business and in higher education institutions is that this application can be adopted free and can be easily used by various levels of social groups regardless of their educational background in the social system. This phenomenon has fundamentally changed the way of communication within individuals, social groups and organizational and institutional settings.

The use of social technology applications both individually and in groups around the world aims to engage in social activities such as interaction, collaboration, communication and sharing of knowledge resources [1].
The use of social technology applications both individually and institutionally faces two important issues, namely:

(i) users of this application will get various benefits
(ii) Adopters have not received the value of the benefits of social technology, and it can even bring risks that have a negative impact both individually and institutionally.

A study on the use of social technology has been done in different cross-country and cross-cultural contexts [1]. However, a study on social technology use in developing countries especially in higher education sectors is still rare. Competition among social technology users at the organizational level especially in the higher education sector is expected to continue to increase [1]. The adoption of social technology is generally used to assist institutions in increasing the competitiveness of each organization. The model used to measure the use of social technology in this study was derived from the theoretical framework and concepts of ref. [2] about the diffusion of innovation.

Most social technology users including higher education system in Indonesia do not focus on the potential of this use for the purpose of learning and teaching. The Islamic Higher Education Institution in Indonesia is part of the national higher education system in Indonesia. The total number of Islamic higher education (both public and private) reaches almost 15 percent of the total of national universities [3]. UIN Syahid as one of the leading Islamic-based state higher education institutions in Indonesia faces problems on how to measure the use of social technology to improve institutional competitiveness and variables used for measuring the adoption of social technology applications. Therefore, this study is as a pilot study for measuring social technology in universities by proposing a social technology use structure model involving several latent variables to obtain significance values.

2 Related Work

Higher education institutions as service-oriented organizations get benefits by adopting this social technology application. Social technologies (social tools) have been used by millions of people in the world for the purpose of communicating/collaborating, providing better customer services, opening new horizons, creating new awareness of the importance of good relationships with customers, building good relationships professionally, increasing marketing efforts, and recruiting new employees [4], [5]. Other studies on the same topic for the higher education sector in Romania showed that most students believed that sharing resources, collaborating through social networks online and communicating with instructors was very important [6]. This study concluded that communication had a significant influence on the potential use of social technology sites to carry out educational and teaching activities. In addition, there is a performance improvement for individuals or employees who use social technology to support their activities in an organizational context. Employees who use social technology can be integrated into their daily work resulting in effective communication between organizations and consumers. This study involves respondents across countries and cultures; therefore, other studies from various perspectives are indispensable.
Higher education institutions must consider the positive and negative aspects of social technology applications to avoid certain risks. The negative aspect mostly discussed by scientists is the lack of a control mechanism for message content, time and frequency. The following is a model structure of social technology use at Islamic higher education institutions in Indonesia.

The model concept of social technology use can be seen in Fig. 1. In the model structure, five variables will influence social technology use. The five variables were adopted from a previous study, Technology Acceptance Model (TAM) [6], [7]. In recent years, the use of social technology applications has increased significantly around the world.

A qualitative study has been conducted by researchers to explore teacher service behavior, normative, and trust control referring to the desire to use web 2.0 technology in the classroom [8]. The study results showed that the majority, 51% of them, committed to web 2.0 technology as the main instructional tool because it could increase student involvement. Teachers realized that even though they were comfortable technology users, they needed guidance on how to apply their use effectively in class. By using a web-based questionnaire and interviewing students from four universities, ref. [9] found a large difference in students' perceptions of technology use between private spaces and learning spaces. While more than 70% of students report having a social networking account, they also indicate that they rarely use social media for educational purposes. Three of the five themes appeared in the interview can explain the reasons for "divide".

To date, several studies have investigated, such as some Islamic universities conducted a similar measurement of social technology usage. The investigations showed that students have a significant awareness of benefits, weakness, and role of social media/technology usage. Due to the intensity of social media usage cause dependency behavior [10—12].

3 Research Method

This study was conducted by applying quantitative methods in the form of survey strategies. Survey research provides quantitative or numerical descriptions of trends, attitudes, or opinions of a population by studying the population sample. This includes cross-sectional and longitudinal studies using questionnaires or structural interviews in data collection, aiming to generalize from sample to population [13], [14].

To ensure the chosen research model with the current phenomenon, this study proposes the overall reference of the research model used in this study, as illustrated in Fig. 2 and refer to a model of ref. [15].
The population of this study was in the environment of UIN Syahid as a representation of Islamic Higher Education Institution. Population samples were addressed to all users of social technology applications used at the university such as lecturers, students, and other faculty members such as non-lecturer staffs. The simple random sampling method was used in this study means that all samples in the population were equally likely to have the opportunity to be selected as respondents. An important benefit of simple random sampling is that it allows researchers to use statistical methods to analyze sample results. To get samples and data collection, several strategies had been implemented. Data were gathered through online and offline survey method. The online questionnaire was conducted by sending it via cell phone number or e-mail address to prospective respondents including a website link consisting of an explanation of the research, purpose, and contact number if there was a question to be asked.

Data were analyzed using descriptive statistics, such as percentages and frequencies to present the main characteristics of the sample and mean, and standard deviation. In this study, measurement methodology and hypothesis testing were assessed using partial least-square structural equation modeling (PLS-SEM). SEM is a modeling technique that can handle a large number of endogenous and exogenous variables and latent variables.

4 Results

Online questionnaires were distributed to three hundred potential respondents at Syarif Hidayatullah State Islamic University covering students, staff, and lecturers. However, those
willing to fill it were 214 of them or only 71% of the expected target. Questionnaires were distributed in the form of hardcopy (offline) or soft copy (online through email or WhatsApp). In this study, students and lecturers dominated the majority of respondents. There were also some respondents as important personnel in the department, such as a head of department and secretary.

Descriptive analysis was conducted on the components/items of all hypothesis variables. The results of descriptive variable analysis correlated with the dependent variable of social technology adoption that had been discussed before and other variables such as ease of use, usefulness, social influence, and facilitating conditions.

4.1 Social Technology Adoption

The concept of social technology adoption is measured by three items, namely: financial benefits, the effectiveness of communication and increasing individual performance. Table 1 shows the distribution of the three components in the parameters of mean, standard deviation, and minimum and maximum.

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>STE1 - financial benefit</td>
<td>2</td>
<td>5</td>
<td>3.89</td>
<td>0.856</td>
</tr>
<tr>
<td>STE2 - effectiveness of communication</td>
<td>1</td>
<td>5</td>
<td>4.14</td>
<td>0.739</td>
</tr>
<tr>
<td>STE3 - increasing the individual performance</td>
<td>2</td>
<td>5</td>
<td>3.89</td>
<td>0.849</td>
</tr>
</tbody>
</table>

Table 1 shows the effectiveness of communication with the highest mean score (mean = 4.14, SD = 0.739). This highest rating may be attributed to personal placement related to effectiveness of communication, using social technology makes communication among peers more effective. This reflects financial benefit items with high mean (mean = 3.89, SD = 0.859). This finding is also similar to the item of increasing individual performance which has a high mean score (mean = 3.89, SD = 0.849). The mean of these items is between 3.89 and 4.14. Most responses are a central tendency as standard deviation values that are closer to the mean.

4.2 Usefulness

This section discusses the usefulness (independent variables). There are four items as described in Table 2 to measure usefulness concepts.

<table>
<thead>
<tr>
<th>Items</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE1 – help work more effectively</td>
<td>1</td>
<td>5</td>
<td>4.29</td>
<td>0.678</td>
</tr>
<tr>
<td>USE2 - easy to do academic work</td>
<td>1</td>
<td>5</td>
<td>4.18</td>
<td>0.698</td>
</tr>
<tr>
<td>USE3 – save time</td>
<td>1</td>
<td>5</td>
<td>4.41</td>
<td>0.718</td>
</tr>
</tbody>
</table>
Table 2 shows that the USE4 item has the highest mean score (mean = 4.42, SD = 0.678). This item has a score higher than the average mean score. While the lowest mean score is on USE2 item (mean = 4.18, SD = 0.698). This evidence indicates that higher education leaders must pay attention to providing training on how social technology can be used to support the work activities of respondents.

4.3 Communication

Communication variables can be measured from three items, as shown in Table 3.

Table 3. Description Statistics of Communication

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 - communication with lecturers/peers</td>
<td>1</td>
<td>5</td>
<td>4.42</td>
<td>0.672</td>
</tr>
<tr>
<td>COM2 – sharing of academic information</td>
<td>1</td>
<td>5</td>
<td>4.33</td>
<td>0.662</td>
</tr>
<tr>
<td>COM3 - communication with colleagues in training</td>
<td>1</td>
<td>5</td>
<td>4.10</td>
<td>0.724</td>
</tr>
</tbody>
</table>

Table 3 indicates that COM1 item has the highest score (mean = 4.42, SD = 0.672). While the lowest score is COM3 item (mean = 4.10, SD = 0.724). This evidence shows that the communication built with colleagues with social technology is still not fully utilized.

4.4 Collaboration

Collaboration variables can be measured from three items as shown in Table 4. Table 4 indicates that the COL1 item has the highest score (mean = 4.17 and SD = 0.650). While the lowest score is COL3 item (mean = 4.02 and SD = 0.712).

Table 4. Descriptive Statistics of Collaboration

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL1 - collaboration in educational activities</td>
<td>1</td>
<td>5</td>
<td>4.17</td>
<td>0.650</td>
</tr>
<tr>
<td>COL2 - collaboration with colleagues about new ideas</td>
<td>1</td>
<td>5</td>
<td>4.18</td>
<td>0.692</td>
</tr>
<tr>
<td>COL3 - collaboration with colleagues in project development</td>
<td>1</td>
<td>5</td>
<td>4.02</td>
<td>0.712</td>
</tr>
</tbody>
</table>
4.5 Knowledge and Resource Sharing

Knowledge variables and resource sharing can be measured from two items as shown in Table 5.

**Table 5. Descriptive Statistics of Knowledge and Resource Sharing**

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRS1 - share documents</td>
<td>1</td>
<td>5</td>
<td>4.22</td>
<td>0.779</td>
</tr>
<tr>
<td>KRS2 - share videos or pictures</td>
<td>1</td>
<td>5</td>
<td>4.24</td>
<td>0.721</td>
</tr>
<tr>
<td>Average mean</td>
<td></td>
<td></td>
<td>4.23</td>
<td></td>
</tr>
</tbody>
</table>

Based on the descriptive analysis presented in Table 5, KRS2 item achieves the highest score (mean = 4.23 and SD = 0.721) and KRS1 item has a lower score (mean = 4.22 and SD = 0.779). This evidence indicates that both items are similar and have not reached their maximum use of academic activities on campus for the respondents.

4.6 Frequency of Access

The frequency of the access variable can be measured from two items as shown in Table 6.

**Table 6. Descriptive Statistics Frequency of Access**

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOA1 - often access increases the effectiveness of academic activities</td>
<td>1</td>
<td>5</td>
<td>3.75</td>
<td>0.882</td>
</tr>
<tr>
<td>FOA2 - often access increases academic achievement</td>
<td>1</td>
<td>5</td>
<td>3.44</td>
<td>0.946</td>
</tr>
<tr>
<td>Average mean</td>
<td></td>
<td></td>
<td>3.6</td>
<td></td>
</tr>
</tbody>
</table>

Referring to the results of Table 6, the FOA1 item has the highest score (mean = 3.75 and SD = 0.882). While FOA2 item has a lower score (mean = 3.44 and SD = 0.946). This evidence indicates that the two items still cannot be ascertained about the impact on respondents.

4.7 Social Technology Use

The frequency of the access variable can be measured from three items as shown in Table 7. It shows the STU2 item has the highest score (mean = 4.19 and SD = 0.720) and the lowest is STU3 item (mean = 3.94 and SD = 0.829).

**Table 7. Descriptive Statistics of Social Technology Use**
<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>STU1 - financial benefits (saving communication costs)</td>
<td>1</td>
<td>5</td>
<td>3.96</td>
<td>0.801</td>
</tr>
<tr>
<td>STU2 - more effective communication with colleagues / lecturers</td>
<td>1</td>
<td>5</td>
<td>4.19</td>
<td>0.720</td>
</tr>
<tr>
<td>STU3 – increased personal performance</td>
<td>1</td>
<td>5</td>
<td>3.94</td>
<td>0.829</td>
</tr>
<tr>
<td>Average mean</td>
<td></td>
<td></td>
<td>4.03</td>
<td></td>
</tr>
</tbody>
</table>

This research model as shown in Fig. 3 is tested using Structural Equation Modeling (SEM), a statistical technique able to analyze the correlation pattern between latent variables and indicators, between latent variables themselves, and direct measurement errors. While the analysis tool used is the Smart-PLS version 2.0 application. The method of analysis conducted includes descriptive statistics and inferential statistics (outer and inner model tests).

![Figure 3. A proposed research model of social technology use](image)

As seen in Fig. 4, the outer model measurement (measurement model evaluation) focuses on the reliability of indicators that can be assessed through absolute standards of loading factor, where the ideal value of a loading factor must be equal to or higher than 0.7 and significant at the level 0.05. Figure 4 shows that the results of calculations with the Smart-PLS 2.0 algorithm proves that all the 17 indicators used in this survey are all reliable.
5 Conclusions and Discussion

The study results showed that the social technology application became a popular application and accepted in all levels such as students, lecturers, administrative staffs/officials, groups of officials ranging from the level of the study program, dean office, rector office and bureau units at UIN Syahid. For groups based on age, it was revealed that young people (29 years and under) were the majority of users in this study. This is in line with the characteristics of the population of civitas academia members of the university where the student group is the majority. The average social technology user at the university is used to using this application with about 6-10 years experience. The evidence also indicates that social technology users routinely use this application to do work and professional development. As expected and predicted, the most popular social technology application among users are Facebook, Youtube and other applications like WhatsApp.

The study results also stated that the five variables, collaboration, communication, frequency of access, knowledge & resources sharing, and usefulness, have a positive effect and significant correlation to the use of social technology. To improve institutional performance, the management is expected to increase socialization and use of social technology applications, particularly for groups of newcomers who use this application. In reality, the management conducts socialization in the form of policies and adds new media in sharing information among civitas academia. The management will be more helpful if the application users are given training on how to use productive and efficient social technology to support teaching and learning activities for students, lecturers, staff and other groups. Utilization of social technology applications is maximized, especially sharing academic information.

In a study, there must be shortcomings or limitations, starting from approach method, sampling method used or from the other side such as the extent to which the contribution of the variables used in this research model is able to explain 52.4%. The remaining, 47.6%, is not accommodated in this research model, so something needs to be done to identify further
research. Research with a quantitative method approach is vulnerable to the issue of generalization. Because of the limitations of existing samples, this study cannot be used to generalize globally. This study focuses on the population of social technology users among Higher Education institutions, particular in UIN Syahid. The number of questionnaire respondents affected the results of the study. With more respondents involved, the positive influence of variables will be clearly measured.

As mentioned in the related work, ref. [10] showed the response levels of Saudi and Jordanian students on Social Network Sites (SNSs) advantages and disadvantages using a questionnaire. Moreover, the results showed that Arabian students who use social networking websites are every 30 minutes rather than opening university or learning websites. Ref. [11] and [12] investigated the social technology for learning by questionnaire and statistical analysis. The analysis is done by obtaining frequency and percentage of Likert scale (strongly agreed until strongly disagreed). Compare with the current study, the author investigates a research model (inner and outer model) and measures the model variable to get a significant level of each indicator. This study not only results in measuring the use of social technology but recommend university which indicator that need improvement. Future research can involve many higher education institutions and can be applied in developing countries. Other influencing variables can be investigated and explored further.

Acknowledgement. The authors gratefully acknowledge the Center for Research and Community Services UIN Syahid for supporting financial and providing the guidance; and contributions made by several co-workers and colleagues in Department of Information System, M. Qomarul Huda, Ph.D., and Meinarini Catur Utami, MT. This paper in conjunction with The 1st International Conference on Islam, Science and Technology (ICONIST 2018) in Malang, East Java.

References


Study in Silico Alkaloid Compounds Tapak Dara Plant (*Catharanthus roseus* (L) G. Don) on Antiapoptosis Receptor B-Cell Lymphoma-2 Regulator (Bcl-2) as Anti-Cancer Chronic Lymphocytic Leukemia (CLL)

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**Abstract.** Tapak Dara plant (*Catharanthus roseus* (L) G. Don) has five potential alkaloid compounds as anticancer compounds. This study aims to determine the potential of alkaloid as an anticancer Chronic Lymphocytic Leukemia (CLL) with B-Cell lymphoma-2 receptor (Bcl-2). The method of this research is in silico. The compounds used are, vinblastine, vincristine, vindensine, vinflunine, and vinorelbine as well as chlorambucil (leukeran), prednisone, and venetoclax control compounds. The receptor used is B-Cell lymphoma-2 (Bcl-2) with a 2O2F PDB code. The docking process is done with PyRx software. The affinity binding value of vinblastine (-7.2 kcal/mol), vincristine (-3.2 kcal/mol), vindensine (-3.6 kcal/mol), vinflunine (-7.2 kcal/mol), vinorelbine (-7.1 kcal/mol), chlorambucil (-6.0 kcal/mol), prednisone (-8.0 kcal/mol), and venetoclax (-9.2 kcal/mol). The amino acid residues that have similarities with the control compound are on vinflunine (Glu133, Asp108, Phe109, Phe147); vinorelbine (Asp108, Gly142, Phe150, Phe109); and vinblastine (Ser133). The five vinca alkaloids are predicted to be effective as anticancer Chronic Lymphocytic Leukemia (CLL), namely vinflunine, vinorelbine, and vinblastine.

**Keywords:** *Catharanthus roseus* (L) G. Don; Bcl-2; Alkaloid; Chronic Lymphocytic Leukemia; Apoptosis, Docking

1 Introduction

Tapak dara (*Catharanthus roseus* (L) G. Don) is one plant that is widely distributed in the tropics including the family Apocynaceae. The spread of this plant is very broad in Indonesia so it has various regional names. The virgin can grow in the lowlands to the highlands with an altitude of 800 meters above sea level [1]. Tapak dara (*Catharanthus roseus* (L) G. Don) is a type of plant used by the community as a traditional medicine.

Various studies that have been carried out have found that the *Catharanthus roseus* (L) G. Don contain active chemicals that can be used as raw materials for medicines. This plant is identified as containing 130 bioactive ingredients [1]. Some contents of active compounds are catharantine, vinblastine, vincristine, vindoline, and catharoseumine [1]. Vinblastine and vincristine have been known to be used as cancer drugs extracted from the leaves of *Catharanthus roseus* (L) G. Don [2]. *Catharanthus roseus* (L) G. Don contains vinblastine, vincristine, leurosine, catharanthine, and lochanerine alkaloids which are efficacious as
anticancer [3]. According to Yusransyah, Pratiwi, & Khaerunnisa (2016), Catharantus roseus (L) G. Don have alkaloid compounds namely vincristine, vinorelbine, vinflunine, vinblastine, and vindensine [4].

Chronic Lymphocytic Leukemia (CLL) is the result obtained (not present at birth) from mutations (changes) of DNA (genetic material) from the spinal cord cells that develop into lymphocytes [5]. Leukemia has various types, including Chronic Lymphocytic Leukemia (CLL), Acute Lymphoblastic Leukemia (ALL), Chronic Myeloid Leukemia (CML), and Acute Myeloid Leukemia (AML) [6]. Leukemia is a cancer of white blood cells and starts in the spinal cord and blood, then this cancer will spread throughout the body including the brain [7]. Chronic Lymphocytic Leukemia (CLL) is a type of leukemia that originates from lymphocytes called B-cells [8]. CLL as a blood cancer, can spread throughout the body including lymph nodes, spinal cord, and other organs [9]. CLL is characterized by proliferation and accumulation of CD5-positive cells in the blood, spinal cord, and lymph nodes [10]. It has been reported, in CLL the capacity to produce clonal B cells is obtained in Hematopoietic Stem Cells (HSC) [11]. CLL can be initiated by loss or increase in chromosomal material, such as deletions 13q, deletion 11q, and trisomy 12 followed by mutations and more aggressive leukemia [12].

Bcl-2 is a B-cell lymphoma/leukemia-2 and a second protein from various proteins found in lymphoma [13]. As the name implies, this gene was discovered due to its involvement in B-cell malignancy, where chromosomal translocation occurs which then activates most of the genes in non-Hodgkin's B cell follicular lymphoma [13]. Protein B-cell lymphoma-2 (Bcl-2) is a regulator of the apoptosis process [14]. Bcl-2 is coded by the BCL2 gene derived from follicular lymphoma as a translocation protein on chromosomes number 14 and 18 [15]. This protein is located in the mitochondria, smooth endoplasmic reticulum and perinuclear membrane of blood cells [15]. Bcl-2 expression has been reported in hematologic malignancy [16].

Apoptosis is one of the main mechanisms of cell death in cancer therapy [17]. Apoptosis is often associated with programmed cell death [18]. Apoptosis involves the role of mitochondria, mitochondrial organelles have two groups of Bcl-2 proteins [19]. Unlike most oncogenes as proliferation promoters, Bcl-2 has the function of preventing cell death [20]. The B-Cell lymphoma-2 (Bcl-2) gene is first known in follicular B-cell lymphoma as the gene that regulates the chain of immunoglobulin bonds in the transliter breakpoints [21]. Bcl-2 protein was found to inhibit cell death. Genesis tumors can be caused not only by unlimited cell proliferation, but also by apoptotic disorders [22].

2 Methods

2.1 Preparation of Protein Macromolecule

Bcl-2 anti-apoptosis is a protein that plays a role in cell apoptosis. Apoptosis is one of the keys to cancer treatment. Bcl-2 gene expression is known in hematologic malignance, one of them is Chronic Lymphocytic Leukemia, which is one type of leukemia that attacks blood cells. Drug compounds that are often used in the treatment of Chronic Lymphocytic Leukemia (CLL) are venetoclax, prednisone, and chlorambucil (leukeran). The initial step is to prepare the target protein and ligand to be used. A two-dimensional protein structure can be downloaded from bank data proteins with the site http://www.rscb.org/. The selected
antiapoptotic Bcl-2 receptor identity is 2O2F. Macromolecules are sterilized using the PyMol application.

2.2 Ligan Preparation

The ligand used can be downloaded from PubChem with the site http://PubChem.ncbi.nlm.nih.gov with the .sdf format. Ligan is converted to .pdb format using the Discovery Studio 2016 Client application. The ligands used were five alkaloid compounds from the Tapak Dara plant (*Catharanthus roseus* (L) G. Don) namely vinblastine, vincristine, vindensine, vinflunine, and vinorelbine. While control compounds are drug compounds that have been proven to be a drug for Chronic Lymphocytic Leukemia (CLL) diseases, namely venetoclax, prednisone, and chlorambucil (leukeran).

2.3 Analysis and Visualization of Docking Results

The results of bond energy scores on the five alkaloid ligands by docking method using PyRx application are vinblastine (-7.2 kcal/mol), vincristine (-3.2 kcal/mol), vindensine (-3.6 kcal/mol), vinflunine (-7.2 kcal/mol), vinorelbine (-7.1 kcal/mol). And comparative ligands are chlorambucil (-6.0 kcal/mol), prednisone (-8.0 kcal/mol), and venetoclax (-9.2 kcal/mol).

3 Result

Testing ligand test of alkaloid compounds and comparative ligands on Bcl-2 antiapoptotic receptors was carried out using PyRx application. The position of Alkaloid Ligands-Comparison Ligand (Venetoclax) can be seen in Figures 1, 2, 3, 4, and 5.

![Figure 1. Vinblastine-Venetoclax](image)
Figure 2. Vincristine-Venetoclax

Figure 3. Vindensine-Venetoclax

Figure 4. Vinflunine-Venetoclax
The position of Alkaloid Ligands-Comparison Ligand (Prednisone) can be seen in Figures 6, 7, 8, 9, and 10.
The position of Alkaloid Ligands-Comparison Ligand (Chlorambucil) can be seen in Figures 11, 12, 13, 14, and 15.
Figure 11. Vinblastine-Chlorambucil

Figure 12. Vincristine-Chlorambucil

Figure 13. Vindensine-Chlorambucil
From the results of visualization of the binding sites of alkaloid ligands with comparative ligands it is known that vinblastine has the same inherent side as the comparative ligand venetoclax, vinflunine and vindensine have the same inherent side as the comparative ligand chlorambucil. Based on the interaction of Bel-2 antiapoptotic amino acid residues, Table 1 shows residual amino acids.

Table 1. Residual Amino Acids
4 Discussion

Most patients who experience CLL experience high sensitivity to treatment [23]. Treatment given to CLL sufferers such as chemotherapy or other treatments can cause complications in CLL patients or even make the cancer worse [12], [24]. The thing that causes CLL to get worse is because of the interaction between CLL cells and other cell types, such as stromal cells, T cells and nurse-like cells in the lymph node [6]. One solution offered to handle CLL sensitivity is to use herbal plants. Based on the results of research, herbs have few side effects than commercially made chemical drugs [25]–[27]. Based on this, researchers conducted an analysis of the content of the *Catharanthus roseus* (L) G. Don plant which can be used as an alternative to the CLL drug.

Based on the results of data analysis there are 2 compounds that have many similarities amino acid residues so that it can be used as a BCL-2 activator that functions in cell apoptosis. The two compounds contained in *Catharanthus roseus* (L) G. Don are Vinflunine and Vinorelbine. There have been previous studies on the plant *Catharanthus roseus* (L) G. Don has examined the effects of these plants on apoptosis of cancer cells [28]. This research was conducted by Yusransyah et al., (2016) conducted to test the efficacy of breast cancer [4]. The results of his study showed no effect on vetiver plants against breast cancer apoptosis. In Malaysia the *Catharanthus roseus* (L) G. Don is believed to be used as a traditional cancer drug [29].

There are 3 different mechanisms for apoptosis-experienced cells, namely: (1) apoptosis originating from signals in cells (via mitochondrial pathways), (2) apoptosis due to the stimulation of death activators that bind to cell surface receptors namely TNF, and (3) Neurons and other cells have different paths unlike the previous 2 paths (without caspase) [18]. However, each cell has a different mechanism in apoptosis [30].

5 Conclusion

Based on data analysis and discussion, *Catharanthus roseus* (L) G. Don plant is most likely to be used as a natural substitute for CLL drugs. The active compound in *Catharanthus roseus* (L) G. Don which can be used as anti-cancer is Vinflunine and Vinorelbine. This research is still in the stage of estimating the effects of a compound through computational...
estimates, further research is recommended to do testing in the laboratory whether the active compound contained in *Catharanthus roseus* (L) G. Don can actually be used as a CLL drug.

**Acknowledgements.** This paper in conjunction with the 9th International Conference On Green Technology (ICGT) 2018.

**References**


Metabolomic Analysis of *Dendrophthoe pentandra* (L.) Miq. Leaves via UPLC-QToF-MS Coupled with Multivariate Data Analysis using PCA

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**Abstract.** Mango mistletoe (*Dendrophthoe pentandra*) is a semi-parasitic plant on a host that is potential as a medicinal plant. Thus, it is necessary to conduct metabolite profiling to determine the compounds contained in mango mistletoe leaves. This research aims to find out the difference of metabolite profile of mango mistletoe leaves obtained from Kediri, East Java; Pekalongan, Central Java; Batun Baru Mountain, Lampung and Tanjung, Selor Hilir in North Kalimantan. Extraction method with ultrasonic aid using 96% ethanol solvent with the ratio of 1:10 [b/v] was used to obtain condensed extract of mango mistletoe leaves. The four extracts from different regions were analyzed using UPLC-QToF-MS/MS, mobile phase of mixture of water/formic acid of 99.9/0.1 [v/v] and acetonitrile/formic acid of 99.9 / 0.1 [v/v] with a gradient elution system and a C18 stationary phase. The results of the analysis were then followed up by a chemometric analysis using PCA employing Minitab 17 software. There are differences in the metabolite among the four regions of extract acquisition. The grouping is based on similar metabolite which occurred in Kediri, East Java and Tanjung Selor Hilir, North Kalimantan. Allegedly, methylidioctylamine; scortechinone F; 3-Cyclohexyl-N-(Ethoxycarbonyl)-L-Alanyl-N-[(4S, 5E, 7R)-7-carbamoyl-9-methyl-5-decen-4-yl]-lysianamide; and Phosphoribide A were biomarker compounds based on the geographic origin.

**Keywords:** Metabolomics; Dendrophthoe pentandra (L) Miq.; UPLC-QTOF-MS/MS; PCA (Pricipal Component Analysis)

1** Introduction

The use of traditional medicine (herbal medicine) has been done since a long time ago. It even continues to be used and grows rapidly until now. 8% of Africans use some types of traditional medicine to treat illness. In 2008, markets around the world sell traditional medicine products that reach 60 billion US $ [1][2][3]. Plant is one of raw materials sources of traditional medicine. Mango mistletoe is a semi-parasitic plant used to treat cough, diabetes, cancer, hypertension, and diuretics [4][5]. It can also stop the ringworm infection in children [6], and it is potential to be developed into immunomodulator [7]. Mango mistletoe leaves contain flavonol glycosides, quercitrine (quercetin-3-O-rhamnoside) that have antioxidant activity [8].
A plant that will be used as raw materials of medicinal plants should be standardized by controlling the quality of the metabolome. Metabolome is the total metabolites contained in plants. The composition is influenced by several factors including salinity, light, climate, temperature, weather, humidity, drought and nutrient [9]. Quality control of medicinal plants can be done through a metabolic analysis technique called metabolite profiling. This technique analyzes all analytes detected in the used samples and metabolites identification that is expressed differently in samples that have a clear classification [10]. Metabolite profiling uses a combination of several analytical techniques such as Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), or Capillary Electrophoresis-Mass Spectrometry (CE-MS). The techniques can provide detailed chromatographic profiles from the sample and both absolute and relative measurement numbers from the detected compounds [11]. Metabolomic is widely applied in many scientific disciplines, such as diagnostics of human diseases, biomarker discovery, nutrition, food safety, plant science and microbiology [12]. It is comparatively more precise and gives more informative data about the small metabolic molecules synthesized by the organism [13].

Ultra-Performance Liquid Chromatography-Mass Spectrometry (UPLC-MS) is the development of LC-MS techniques which can be utilized to analyze metabolite profiling. The technique of chromatography is able to present reliable, powerful results of chromatogram, high resolution, accurate measurement of mass and structural information as well as to detect a large number of metabolites in a sample of plants [13]. UPLC that is applied with MS is developed to be a powerful instrument to simultaneously identify and quantify chemical compounds contained in the raw materials of traditional medicines [14]. The component of UPLC-MS analysis results is analyzed using PCA of the chemometric analysis which can show the sample classification and characteristic of the compounds [15].

This research describes the metabolomic analysis in mango mistletoe using UPLC-QToF-MS with a PCA multivariate analysis to determine metabolite profiles and discriminate samples in accordance with the difference of growing locations.

2 Experimental Section

2.1 Materials

Fresh and clean mango mistletoe was obtained from some areas, namely Kediri, East Java (225 masl); Pekalongan, Central Java (8 masl); Tanjung Selor Hilir, North Kalimantan (6 masl) and Gunung Batin Baru, Lampung (30 masl). It was dried in an oven with a temperature of 50°C for 5-7 days before turning it into powder. The powder was separated according to the location of samples. The mango mistletoe that was processed to be samples had been identified as *Dendrophthoe pentandra* by Indonesian Institute of Sciences (LIPI).

2.2 Instrumentation

The instruments used were rotary evaporator (IKA, Ohio, USA), ultrasonic cleaner (Sonica Soltec, Milano, Italy), and Ultra Performance Liquid Chromatography-Quadrupole Time of Flight-Mass Spectrometry (UPLC-QToF-MS) (Waters, Massachusetts, USA).

2.3 Procedure

Extraction of Plant Material
50 grams of mango mistletoe powder was extracted using 500 ml of ethanol 96% by the aid (Merck, Darmstadt, Germany) by using ultrasonic waves for 20 minutes. The gained extract was filtered using filter papers, and was subsequently condensed using a rotary evaporator until it turned into solid extracts. Afterward, the solid extract was stored in a temperature of -4 °C before having next treatment.

**Ultra Performance Liquid Chromatography-Quadrupole Time of Flight-Mass Spectrometry (UPLC-QToF-MS) Analysis**

The analysis of UPLC-QToF-MS employed UPLC-MS systems with QToF as the analysator and positive ESI as the ionization source with the Acquity C18 column 1,8 µm; 2,1 × 150 mm. The applied Eluent was mixture between (A) Water (HPLC grade)/formic acid (Merck, Darmstadt, Germany) 99,9/0,1 [v/v]; (B) Acetonitril (Merck, Darmstadt, Germany)/formic acid 99,9/0,1 [v/v] and the system of gradient elution. The comparison is presented in table 1.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>% Eluent A</th>
<th>% Eluent B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,00</td>
<td>95,0</td>
<td>5,0</td>
</tr>
<tr>
<td>2,00</td>
<td>75,0</td>
<td>25,0</td>
</tr>
<tr>
<td>3,00</td>
<td>75,0</td>
<td>25,0</td>
</tr>
<tr>
<td>14,00</td>
<td>0,0</td>
<td>100,0</td>
</tr>
<tr>
<td>15,00</td>
<td>0,0</td>
<td>100,0</td>
</tr>
<tr>
<td>19,00</td>
<td>95,0</td>
<td>5,0</td>
</tr>
<tr>
<td>23,00</td>
<td>95,0</td>
<td>5,0</td>
</tr>
</tbody>
</table>

The source temperature was 100°C and the desolvation temperature was 350°C. A 10 mg extract sample was solved in 10 ml volumetric flask with absolute methanol then, 5 µL volumes were injected into UPLC-MS system. From chromatogram data, the area was in percentage. The chromatogram was processed using Masslynx version 4.1 software (Waters, Massachusetts, USA). The component identification was based on the ratio of measured m/z in Masslynx and chemdraw version 12.0 (CambridgeSoft, Cambridge, USA).

**Statistical Analysis**

The identification data of extract component were classified based on the sample origin place and the percentages of its area were analyzed using Principal Component Analysis (PCA) to get loading plot and score plot. PCA was performed using Minitab 17 (Minitab Inc, Pensylvania, USA).

**3 Results and Discussion**

**3.1 UPLC-MS profiling of Dendrophthoe pentandra leaves metabolome**

UPLC-MS is a method to analyze metabolite profile with a high resolution, speed and sensitivity. It is also widely used for pharmaceutical analysis, such as long-chain fatty acid,
underivatized amino acid and opiate in various matrixes [16]. The employed UPLC-MS uses an MS detector with ion source ESI (+) and MS analyser of Q-ToF.

The sample chromatogram was obtained by injecting sample into injection port which led to chromatography column and it created a component separation of injected extract. The research employed C18 or octadecyl silica as the column stationary phase, formic acid and water mixture 99.9/0.1 [v/v] as the eluent and acetonitrile/formic acid 99.9/0.1 [v/v] with a gradient elution system, the ratio of both solvents was always changing [17]. Octadecyl silica was a stationary phase commonly used since it was able to separate low, medium and high polarity compounds [18]. The mixture of water/formic acid and acetonitrile/formic acid helped the separation process in the column efficiently and eluted the analyte in less than 10-15 minutes [15] [19]. The use of this kind of UPLC-MS system produced chromatogram with polar compound at first and its polarity was gradually decreased [15]. After that, the sample of elution product went to MS detector.

In the MS system, the liquid sample was turned into drops through needle and was positively charged, since ESI that was used as ion source was the positive ones. Then, the ion was separated by Q-ToF analyzer. The product of the separation process was identified by the detector and presented as a chromatogram which was processed using the application of Masslynx 4.1 to present m/z spectrum of each chromatogram peak [20]. Figure 1 below is the chromatogram of Dendrophthoe pentandra from each location where the sample obtained.

Each chromatogram peak indicated one compound. The application of Masslynx 4.1 was used to process the chromatogram to find out the m/z spectrum. Therefore, the molecule formula of the interpretation product compound could be predicted. Then, chemspider website helped the researcher to find out the compound name of the prediction. When typing down the molecule formula, the total molecule should be taken away by one molecule. It was due to the fact that the ion source of positive ESI would add the H charge on the compound, so it was needed to subtract the total m/z with the real mass of H atom that was 1.0078. After finding out the name of the compound and structure, the measured and calculated m/z were compared by drawing the compound structure using Chemdraw Ultra 12.0 [21]. If the difference was ≤ 0.0005 then the peak was belong to the predicted compound [22]. The result of chromatogram data interpretation was presented in the following Table 2. The data showed that 76 compounds were from Tanjung Selor Hilir, North Borneo; 17 compounds were from Kediri, East Java; 61 compounds were from Gunung Batin Baru, Lampung; and 56 compounds were from Pekalongan, Central Java.

Principal Component Analysis

The PCA multivariate data analysis is one of chemometric analyses commonly used for multicomponent analysis [20]. It analyzes the data from chromatogram in the form of compound name and m/z value using Minitab 17 software. The data for PCA analysis consisted of compound names found in area presented in percentage from four sampling places. The results were Score Plot and Loading Plot presented in Figure 2 and Figure 3. The score plot indicated the similarity among samples. Similar samples went to a same group or a close point. Plot loading described the relation among variables – the origin and the new ones [23]. It was used to analyze the contribution of each metabolite on PC (Principal Component), so the furthest component from the group significantly contributed on the difference among groups. The result of PCA analysis on the Dendrophthoe pentandra leaves extract showed 89.6% total variants (PC1 = 59.8% dan PC2 = 29.8%). Figure 2 shows the pattern of sample grouping. The sample from Kediri, East Java (K) was in the same group with the sample from Tanjung Selor Hilir, North Borneo (TSH). On the other hand, the samples from Gunung Batin...
Baru, Lampung (GBB) and Pekalongan, Jawa Tengah (P) were not grouped. It indicated that the type of metabolite from K and TSH were similar compared to that of GBB and P.

**Figure 1.** UPLC-MS Chromatogram of *Dendrophthoe pentandra* leaves extract. A) Chromatogram of *Dendrophthoe pentandra* leaves extract from Kediri, East Java. B) Chromatogram of *Dendrophthoe pentandra* leaves extract from Tanjung Selor Hilir, North Borneo. C) Chromatogram of *Dendrophthoe pentandra* leaves extract from Gunung Batin Baru, Lampung. D) Chromatogram of *Dendrophthoe pentandra* leaves extract from Pekalongan, Central Java
Figure 2. Scoring plot which showed the metabolic grouping from Kediri, East Java and Tanjung Selor Hilir, Kalimantan Utara.

Figure 3. Plot loading which showed the findings of several identifying compounds.

The grouping according to metabolic resemblance could be influenced by plants environment or other abiotic factors like weather, climate or rainfall [24]. TSH and K were estimated to have similar abiotic factors. Rainfall and average temperature of these areas were relatively similar; K’s rainfall was 2.043 mm and the average temperature was 24.4°C. Meanwhile, TSH’s rainfall was 2.738 mm and the average temperature was 26.8°C. Although the temperatures of both areas were different, those areas were in the same main climate: type A climate. According to Koeppen, A climate is tropical forest with extreme weather along the year [25]. Moreover, K and TSH have the dominant soil type similarity that is alluvial soil type. The previous sub chapter explained that this type of soil has good fertility level. With several similarities of abiotic factors from those areas, it could be inferred that those areas’ metabolic were almost the same.

Figure 3, plot loading shows the hypothesis of biomarker compound from the extracts of mango mistletoe leaves which were collected from several areas. In the plot loading, there were four metabolics, they were methyldioctylamine; scortechinone F; 3-Cyclohexyl-N-(ethoxycarbonyl)-L-alanyl-N-[(4S,5E,7R) – 7 – carbamoyl-9-methyl-5-decen-4-yl]-L-
lysinamide; and Pheophorbide A which were estimated to be able to be used as identifying compound for grouping basics for mango mistletoe leaves according to their geographical origin. Those four compounds were dominant or major compounds from their areas. Methyldioctylamine compound was from Tanjung Selor Hilir with area percentage of 11.448%; 3-Cyclohexyl-N-(ethoxycarbonyl)-L-alanyl-N-[(4S,5E,7R)-7-carbamoyl-9-methyl-5-decen-4-yl]-L-lysinamide compound were from Pekalongan (21.11%) and Tanjung Selor Hilir (2.54%); Pheophorbide A compound was from Pekalongan (23.96%); 1-(4,6-dimethylpyrimidin-2-yl)-3-(4-methyl-3-nitrophenyl) guanidine compound was from Gunung Batin Baru (13.57%), Pekalongan (5.20%), and Tanjung Selor Hilir (10.14%); and Scortechinone F compounds were from Gunung Batin Baru (21.76%) and Tanjung Selor Hilir (0.82%). The spectras of those compounds were shown in figure 4. One of those identifying compound had scortechinone F compound. Scortechinone F compound was from the group of xanthones compound. It had been found in Garcinia scortechinii plant [26]. There was not much information about this compound. Recently, there are several kinds of Scortechinone compound; they are Scortechinone U, Scortechinone J, Scortechinone F, Scortechinone E, Scortechinone H, Scortechinone I [27].
Figure 4. The spectra of biomarker compounds. A) methyldecylamine; B) Scortechinone F; C) Pheophorbide A; D) 3-Cyclohexyl-N-(ethoxycarbonyl)-L-alanyl-N-[(4S,5E,7R)-7-carbamoyl-9-methyl-5-decen-4-yl]-L-lysamamide

4 Conclusion
There are some differences of metabolic profile of mango mistletoe leaves extract obtained from Kediri, East Java; Pekalongan, Central Java; Gunung Batin Baru, Lampung; and Tanjung Selor Hilir, North Kalimantan. The marker compounds obtained were methyldioctylamine compound from Tanjung Selor Hilir, North Kalimantan; 3-Cyclohexyl-N-(ethoxycarbonyl)-L-alanyl-N-\{(4S,5E,7R)-7-carbamoyl-9-ethyl-5-decen-4-yl\}-L-lysinamide compound was from Pekalongan, Central Java and Tanjung Selor Hilir, North Kalimantan; Pheophorbide A compound was from Pekalongan, Central Java; 1-(4,6-dimethylpyrimidin-2-yl)-3-(4-methyl-3-nitrophenyl)guanidine compound was from Gunung Batin Baru (Lampung), Pekalongan (Central Java), and Tanjung Selor Hilir (North Kalimantan); while Scortechinone F compound was from Gunung Batin Baru (Lampung) and Tanjung Selor Hilir (North Kalimantan).

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References

The Qur'anic Classification Uses Algorithm C4.5

Mohamad Irfan, Wisnu Uriawan, Nur Lukman, Opik Taupik Kurahman, Wahyudin Darmalaksana

Abstract. According to the place he descended, the surah can be divided into Makkiyah and Madaniyah groups. This division is based on the place and time that is predicted to decrease the surah or certain verses, where the surah that descended before the Prophet S.A.W migrated to Madinah classified as surah makkiyah while the surahs that descended after it belongs to Madaniyah surah. Surah that descended on Mecca in general suras with a small number of verses, contains the principles of faith and morality, the call is addressed to humans. While the surahs that descend on Medina, in general, have a large number of verses, containing the rules that govern one's relationship with God, or someone with another (shari'ah) and other discussions. The division by phase before and after the hijrah is considered more appropriate because there is a surah Madaniyah which descended on Mecca. the surah that was sent down in Mecca was 86 suras, and 28 suras were revealed in Medina. This grouping is done by determining the classification of data and using an algorithm. Algorithm C4.5 is one induction decision tree to conduct the classification process, the results of testing the accuracy of applications made using C4.5 algorithm is 95.6%. From this result, it is known that the C4.5 algorithm is quite well used in the classification process for the classification of suras in the Qur'an.

Keywords: Classification; Makkiyah; Madaniyah; Algorithm C4.5

1 Introduction

The Qur'an consists of 114 surahs, each of which consists of several verses. The number of verses in the Qur'an reaches 6236 verses. The Qur'an is divided into 30 sections called juz. In studying the science of the Qur'an, must know about the classification or groupings contained in the Qur'an[1]–[3]. The importance of classification serves for further study of the clause. As we know the classification of suras in the Qur'an is divided into 2 namely surah Makkiyah and Madaniyah. the Makkiyah surah which he revealed in Mecca and the surah Madaniyah was revealed in Medina[4]–[8].

Based on the short length of the verse, the suras in the Qur'an are grouped into four groups: As Sab'luththiwaal (very long surah of 130-290 verses), Al-mi'uun (long suras of 100-129 verses), Al-matsaani (surah long enough from 51-99 verses), and Al-mufashshol (surah not long from 1-50 verses). The grouping of surah based on the short length of the verse aims to facilitate the study and study of the Qur'an[9]–[12]. Based on that, the function of Classification of surah automatically made it easier to determine the surah based on the number of verses in the Qur'an[8]. [13], [14]. The determination uses Algorithm C4.5 for
grouping and forming a decision tree. The decision tree is usually expressed in tabular form with attributes and records[1], [15], [16].

This paper is organized into four sections. First, the introduction section that explains the background, problems, and objectives of the study. Second, the research methods section that describes the methods used for Algorithm C4.5. Third, finding and discussions. The last section is the conclusion.

2 Research Methods

2.1 Classification

Classification is a process for finding models or functions that explain and distinguish concepts or data classes in order to estimate the class of an object whose label is unknown. This can be said as a classification that maps an item into one of several defined classes[17], [18].

2.2 Algorithm C4.5

Algorithm C4.5 is an algorithm used to form decision tree. A decision tree is a very powerful and well known method of classification and prediction[19]–[22]. The decision tree method transforms a very large fact into a decision tree that presents the rules[1], [15], [19], [23], [16]. In general, the C4.5 algorithm for building decision trees is as follows:

1. Select the attribute as root.
2. Create a branch for each value.
3. For the case in the branch.
4. Repeat the process for each branch until all in the case have the same class.

Selecting the attribute as the root of a tree is to determine the highest gain value of the attributes. The formula for calculating the gain value of equation 1 as follows:

$$Gain (A) = Entropi (S) - \sum_{i=1}^{k} \frac{|S_i|}{|S|} \times Entropi (S_i)$$

Descriptions:
- \(S\) : the set of cases
- \(A\) : attribute
- \(n\) : number of attribute partition \(A\)
- \(|S_i|\) : the number of cases on the \(i\)-th partition
- \(|S|\) : the number of cases in \(S\)

To calculate the value of entropy can be seen in equation 2 as follows:
2.3 Decision Tree

The first part of this decision tree is the root point, whereas each branch of the decision tree is a division based on test results, and the end point (leaf) is the resulting class division.

The decision tree has 3 types of nodes, namely:
1. The root node, where the dot has branches that enter and has more than one branch, sometimes has no branch at all. This node is usually an attribute that has the greatest influence on a particular class.
2. Internal node, which has only 1 incoming branch, and has more than 1 out branch.
3. A leaf node, or end node where only 1 branch entered and has no branch at all and marked that the node is a class label.

![Decision Tree Diagram](image)

**Figure 1. Tree of Decision**

3 Finding and Discussions

3.1 Determining Attribute Details on Each Attribute

The following is a description of the C4.5 algorithm steps to solve the example of determining where the descendants are dropped and the number of verses based on the surah.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verses</td>
<td>Short</td>
<td>1-50 Verses</td>
</tr>
<tr>
<td>Verses</td>
<td>Quite Long</td>
<td>51-99 Verses</td>
</tr>
</tbody>
</table>

*Table 1. Surah Sample Data Format*
3.2 Creating a New Case

A new case is the first step to solve a problem, by including inputs and criteria. In the final column contains an estimate of the results to be obtained later, the decision Yes (Madaniyah) and No (Makkiyah).

<table>
<thead>
<tr>
<th>No</th>
<th>Verses</th>
<th>Juz</th>
<th>Discussion</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very long</td>
<td>Beginning</td>
<td>Law</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Very long</td>
<td>Beginning</td>
<td>Tawheed</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Long</td>
<td>Midle</td>
<td>Tawheed</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Quite Long</td>
<td>Midle</td>
<td>Prophet</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Quite Long</td>
<td>Midle</td>
<td>Tawheed</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>Short</td>
<td>Last</td>
<td>Prophet</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Short</td>
<td>Last</td>
<td>Relationship</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>Very long</td>
<td>Beginning</td>
<td>Law</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>Long</td>
<td>Midle</td>
<td>Prophet</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Long</td>
<td>Beginning</td>
<td>Relationship</td>
<td>Yes</td>
</tr>
</tbody>
</table>

3.3 Node Table Creation

Determine the greatest value of each class and make a root in every decision, by counting the number of cases. Then calculate and find the Entropy value of each attribute and the Gain value for each class. So that can be found the largest value and become the root tree.

<table>
<thead>
<tr>
<th>Node</th>
<th>Set of Cases (S)</th>
<th>Yes (Medina) (S1)</th>
<th>No (Mecca) (S2)</th>
<th>Entropy</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total</td>
<td>10</td>
<td>6</td>
<td>4</td>
<td>0.156</td>
</tr>
<tr>
<td></td>
<td>Verses</td>
<td></td>
<td></td>
<td>0.3060</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Short</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Quite Long</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0.150</td>
</tr>
<tr>
<td></td>
<td>Long</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0.234</td>
</tr>
<tr>
<td></td>
<td>Very long</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0.166</td>
</tr>
<tr>
<td></td>
<td>Juz</td>
<td></td>
<td></td>
<td>0.0812</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beginning</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0.187</td>
</tr>
<tr>
<td></td>
<td>Midle</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Last</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td></td>
<td></td>
<td>0.1560</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Law</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Relationship</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tawheed</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0.234</td>
</tr>
<tr>
<td></td>
<td>Prophet</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0.234</td>
</tr>
</tbody>
</table>
3.4 Calculating Entropy and Gain Value

1. Calculates the value of Entropy
   The following is to calculate the total entropy value
   \[
   \text{Entropy (Total)} = -(-6/10 \times \log_2 (6/10)) + (-4/10 \times \log_2 )
   \]
   \[
   = -(-0.108) + (-0.048) 
   = 0.156
   \]

2. Calculate Gain value
   The following calculates the Gain value of the verses:
   \[
   (\text{total,verses}) = 0.156 - (\text{0.108} + 0.048 + 0.03 + 0.0702 + 0.0498)
   = 0.3060
   \]

3. Make a Decision Tree

   Decision trees are created by looking at the highest Gain value results and possible
decision results to support an accurate decision result.
The decision tree with the highest Gain value is a Verses with a total gain value of 0.3060.

\[\text{Figure 2. A decision tree with the highest Gain value}\]
3.5 Result Classification

The following is the result of Surah Al-Quran classification using Algorithm C4.5

Table 4. New Case Table

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Surah</th>
<th>Number of Verses</th>
<th>Place</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Fatiyah</td>
<td>7</td>
<td>Makkiyah</td>
<td>Al-Mufashshol</td>
<td></td>
</tr>
<tr>
<td>Al-Baqarah</td>
<td>286</td>
<td>Madaniyah</td>
<td>As Sab'uuthfiwaal</td>
<td></td>
</tr>
<tr>
<td>Al-Imran</td>
<td>200</td>
<td>Madaniyah</td>
<td>As Sab'uuthfiwaal</td>
<td></td>
</tr>
<tr>
<td>An-Nisa</td>
<td>176</td>
<td>Madaniyah</td>
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<td>6</td>
<td>madaniyah</td>
<td>al-mufashshol</td>
<td></td>
</tr>
</tbody>
</table>
The table above is the data that can be obtained from the results of classification of the surah data according to the System. Based on the number of verses, of the 114 data above shows that the results of inappropriate decisions according to the calculation of the system amounted to 5 surahs. With two comparisons of these results, we can determine how accurate this application is in determining the classification for the surah classifications, using the following formula:

\[
\text{Accuracy} = \frac{(\text{mount of data} - \text{the truth from different data})}{\text{mount of data}} \times 100\%
\]

\[
= \frac{(114 - 5) \times 100\%}{114}
\]

\[
= 95.6\%
\]

By obtaining this number, the system of grouping surah in Al-Qur'an by using Algorithm C4.5 considered quite helpful and can facilitate determine decision by using a decision tree, so from the decision obtained the result of grouping to categorize surah in Al-Qur'an based number of verses, places of inauguration and surah.

4 Conclusion

The conclusion from the above discussion is:
1. The built system is able to categorize surah based on descended places (Makkiyah and Madaniyah), and its surah group. The system is capable of displaying the digital Qur'an and providing detailed information on each of its surahs.
2. The results of testing the accuracy of this application of 114 data surah by using Algorithm C4.5 is 95.6%, from this result that the C4.5 algorithm able to help users in grouping the suras in the Qur'an.

Suggestions related to the development of the system that has been created that is, adding new features, translating Arabic into Latin, and other content such as the suras themes and groupings of verses Muhkam and Mutasyabih in Al-Qur'an.

References


Business Process Analysis For Marketing Honey Bee Products

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Abstract. Bees are God’s creatures that produce honey. Honey has natural properties for health. Allah also commands us to be able to use honey as a medicine. Bee cultivation has been done and honey has been produced. It takes facilities to market these products so that people can quickly feel the benefits. Information Technology (IT) and the Internet today are very possible to spread knowledge and empower this product to the public quickly. Improving the IT field is something that is very necessary. This paper discusses the benefits of honey bees in the Qur'an along with the use of ICT to market products from honey bees and also about how to analyze the business process of selling honey bee products through e-commerce by modeling business processes using BPMN. The research method consists of collecting data by studying literature, interviews and observations to the location of honey bee cultivations. The data obtained is analyzed and provides the results of a Business Process Modelling for honey bee products marketing through e-commerce technology.

Keywords: honey bee, marketing, e-commerce, business process analysis, BPA, business process modelling notation, BPMN

1 Introduction

Bees are God's creatures that produce honey. Many properties are produced by honey and God commands us to be able to use honey as a medicine, as the word of God in the Qur'an: "And your Lord revealed to the bees:” Make nests in the hills, in wood trees, and in places made by human.” [QS. An-Nahl: 68] "Then eat from each (kind) of fruit and take the path of your Lord that has been facilitated (for you). From the belly of the bee comes a drink in various colors, in which there is a cure for humans. Verily in this is a sign of the greatness of God for those who think." [Surat an-Nahl: 69]

There are also some traditions which explain the benefits of honey, including:

1) The Prophet Muhammad also affirmed the efficacy of honey in the hadith narrated by Bukhari: "Honey is a cure for all kinds of sickness and the Qur'an is a cure for all tangles of mind."
"From Abu Hurairah, he said: The Messenger of Allah said:” Whoever licks honey three times a morning every month, then he will not be subjected to great trials."

Honey is a natural product produced by stinging bees and stingless bees. Both types of bees produce honey with specific phenolic and flavonoid content which is very beneficial for human health [1].

It is an important thing to introduce a product or brand to a lot of people or buyers, therefore, marketing is something that must be really considered if you want to run an enterprise or business. Another important thing that must be remembered is that marketing is a constantly changing thing, so it is imperative to keep innovating [2].

This study only used a sample of bee cultivation site, namely the Rumah Kompos UIN Jakarta. In this place, the product produced from Trigona SP bee is propolis honey and bee pollen. In fact, there have not been many places to grow and also sell products from Trigona SP bee by the people in Indonesia. Honey produced is forest honey or sting honey as much as 75%, and honey from stingless bee 25% [2]. For this reason, strategy concepts are needed that can expand the sales area of the Trigona SP bee, so that more consumers will know, and have an interest in using the results of this Trigona SP bee. In accordance with the advances in information and communication technology, the utilization of information technology is more effective because it can be accessed by suppliers, sellers and consumers easily.

This is a case study of a cultivation in the Compost House of Syarif Hidayatullah State Islamic University. This cultivation really needs fast marketing tools for products. There are still many stingless bee cultivations, such as in Yogyakarta, Sulawesi, Pandeglang, Banten and other regions in Indonesia. Therefore this paper discusses how to analyze a business process to market the honey bee products through e-commerce and make business process modeling with Business Process Modelling Notation (BPMN).

2 Literature review

The bee that is currently booming is cultivated is Trigona Stingless Bee. The bee is a stingless bee that is not dangerous and can be cultivated anywhere, both in large gardens and in the land around the house. Trigona cultivation allows for those who do not have large land. Trigona is the largest genus of bees without sting. Trigona is in the Neotropic region and also throughout the Indo-Australian region. There are about 150 species that belong to this genus, which distinguishes mainly from the hind legs. The Trigona Stingless Bee classification is as follows:

- Kingdom: Animalia
- Phylum: Arthropoda
- Class: Insecta
- Order: Hymenoptera
- Superfamily: Apoidea
- Family: Apidae
- Subfamily: Apinae
- Tribe: Meliponini
Genus: *Trigona*

Jurine, 1807

Stingless bees besides producing honey and propolis also have other benefits, namely as a pollinator. Stingless bees can become pollinators better than honeybee pollinators. *Trigona* stingless Bee can grow and develop around the house (yard, on house terraces, under the roofs of houses protected from rain. *Trigona* bee cultivation is much easier compared to *Avis Mallivera* (stinging bees) because it must be done with a system of *angon* (migratory beekeeping), that is bees grazed in a mobile manner following the flower season of plants [3].

The ministry of Forestry said that the Indonesian farmer’s honey production only reached 5,000 tons a year, far from the world’s needs of 15,000 tons per year [4]. With a total population of around 250 million people and the assumption of honey per capita consumption in Indonesia of 30 grams/year we need at least 7,500 tons of honey per year to meet domestic honey needs. This deficiency of Indonesia must be imported every year more than 50% of national honey consumption needs.

The results of Berem’s research [5] state that the need for an institutional analysis function and a sustainable long-term development framework to support the successful implementation of honey marketing. From the results of the regression analysis, it was found that the increase in the price of honey showed an increase in honey needs 8,417 times each year in Ethiopia [6]. Honey producers in Serbia show that the average production costs are the same. From the results of the study it was found that there was a direct marketing system, to increase the added value of direct contact with consumers. The strategy is carried out by reducing costs without seeing the number of logs held [7]. The marketing strategy for honey and other products is by increasing cooperation, cooperative investment, and increasing public awareness about cooperation [8].

Marketing (Marketing) is the process of preparing integrated communication that aims to provide information about goods or services in relation to satisfying human needs and desires [9].

Marketing mix is a set of marketing tools used by companies to achieve marketing objectives in the target market. E. Jerome McCarthy named the marketing tools "the four Ps of Marketing". The intended 4P is Product, Price, Promotion, and Place [9]. McCarthy grouped the marketing mix activities into four groups known as 4P namely product, price, place and promotion. The 4P variable can be explained as follows [10].

E-commerce is a dynamic set of technologies, applications and business processes that connect certain companies, consumers and communities through electronics transactions and trade in goods, services and information which is done electronically. E-commerce / Electronic Commerce (e-business) is an activity business that is run (e.g. business transactions) electronically through a network (usually internet) and computer or buying and selling of goods or services (or transferring money) through digital communication channels [11].

By using e-commerce companies can obtain several benefits which include [11]:

1) Customer service and corporate image become good,
2) Find new business partners,
3) The process becomes simple and time can be compressed,
4) Increase productivity and access to information quickly,
5) Paper usage can be avoided,
6) Transportation costs are reduced and flexibility increases.
7) Can serve 24-hour transactions at each location
8) Provide many choices to customers
9) Providing products that are not expensive and shipping is faster.

These are the two options for electronic trading (electronic commerce or eCommerce): Business-to-Consumer (B2C) and business-to-business (B2B). Business-to-consumer, is a process for selling products directly to consumers. B2B, which stands for business-to-business, is a process for selling products or services to other businesses. [12].

Vergidis et al. [13] state that however, business process analysis is a term used with a rather broad meaning including a range of different tactics such as simulation and diagnosis, verification, and performance analysis of business processes. Business process analysis aims at investigating properties of business processes that are neither obvious nor trivial [14].

Business process modeling plays a major role in the perception and understanding of business processes. In most of the cases, a business process is as expressive and as communicative as is the technique that has been used to model it. Therefore, the elements and the capabilities of a business process model play a significant role in describing and understanding a business process [13].

BPMN (Business Process Modeling Notation) is a relatively new methodology, but now it is widely accepted as a standard model to describe the business processes of an organization. BPMN does not only consist of model diagrams but also comes with a series of tools to reduce the process to become the language of business execution [15].

3 Research Method

This research method begin with literature study. In this step, researchers collected literatures, papers, and books from prior studies that discuss about Bee, especially for the Stingless Bee. Besides that, there are also topics and materials about information and communication technology including marketing with e-commerce. The next step is interviews, researchers asked some questions to the interviewees about the process of Stingless Bee cultivation and the honey production. The last step is observation. Observation is carried out the direct observations of the trigona bee cultivation process at the Compost House of UIN Jakarta. The results obtained are bee trigona culture can produce honey propolis and bee pollen.

After all the data needs are completed, researchers analyzing the data. Data analysis is a very important part in solving research problems, while answering hypotheses and achieving research objectives. The data that has been obtained is then processed by using an analytical tool, Microsoft Office. Data processing consists of data tabulation and data classification used. Tabulation is the compilation of data into table form. The results of the research data were analyzed using data tabulation and concluded descriptively. Data tabulation is the compilation of data into table form. The purpose of tabulation is so that data can be easily compiled, summed up and simplifies data arrangement to be presented and analyzed. The tabulation process can be done by the tally method, using a card, or using a computer [13]. While descriptive analysis is a method used to describe or analyze a research result but is not used to make broader conclusions [14].
4 Result

Bees are special creatures, created by God Almighty that provide benefits and enjoyments to humans, so that the activity of bee cultivation is a beneficial activity for human life. This is related to the implementation of bee trigona cultivation at the composting house of UIN Jakarta. In the cultivation activity in the compost house consists of several stages of the process such as making the stup, placing the colony log containing bees, maintenance, harvesting and postharvest.

The stages include the following: a) Stups are made of wooden planks measuring approximately 20 X 15 X 10 cm. The use of this stup is to produce honey, propolis and bee pollen, making it easier to harvest. In addition, the benefits of making a stup that can avoid the dangers of pests such as ants, spiders, lizards and others. b) The placement of the colony logs is done neatly so that it is easier to control and clean the environment of the heterotrigona bee cultivation. The distance between the colony logs is around 1.5 - 2 meters per colony log. c) Maintenance is carried out by controlling each log, planting flowering plants in each area of the bee cultivation environment, cleaning the area of cultivation so that it is not attacked by pests. d) Harvesting can be done every 3 months or 4 months using syringes or honey suction devices. The results of the benefits of bee trigona production which produce honey, propolis and bee pollen provide business opportunities for cultivation. The productivity of bee trigona products at Kompos UIN House is the amount of honey, propolis and bee pollen produced in one year.
Fig. 2. Result of Tabulation of Trigona Beekeeping Production. Results Per Year

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Result</th>
<th>Unit</th>
<th>Total Production per Bottle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honey</td>
<td>15068 mL</td>
<td>250 mL</td>
<td>60</td>
</tr>
<tr>
<td>Propolis</td>
<td>27189 grams</td>
<td>250 grams</td>
<td>109</td>
</tr>
<tr>
<td>Bee Pollen</td>
<td>6956 grams</td>
<td>250 grams</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>197</strong></td>
</tr>
</tbody>
</table>

Details of honey bee trigona products amounted to 15,068 mL or 60 bottles of 250 mL with selling price in the domestic market averaging Rp. 150,000, - and generate revenue of Rp. 9,000,000, - propolis products amounted to 27,189 grams or 109 bottles of 250 grams per bottle and the selling price in the domestic market is averaged Rp. 250,000, - and generate revenue of Rp. 27,250,000, - while the product amounted bee pollen to 6,956 grams or 28 bottles of 250 grams with a selling price of Rp. 100,000, - and generate revenue of Rp. 2,800,000.

The largest amount of production produced by Bee Trigona at the Composite House of UIN Jakarta is the production of propolis compared to the production of honey and bee pollen. This is due to the lack of flower feed which produces nectar and pollen in the cultivation area. While foreign market participants benefit from the production of Bee trigona which produces honey and propolis, it provides business opportunities at this time, the wholesale market price of honey and propolis is around AU $ 50 per kg in Asia, the stingless beekeeping for pollination is only beginning to take root in Asia South, India and in Southeast Asia including Malaysia and the Philippines [15].

The marketing concept of Trigona SP bee products based on the 4P Marketing Mix study offered is as follows:

1) Product

As previously explained, the Trigona SP Bee cultivation process carried out at the Compost House of UIN Jakarta consists of several stages, starting with the making of the stup, placing the colony log containing bees, maintenance, harvesting and postharvest. The cultivation process produces products namely honey, propolis and bee pollen.

2) Price

Prices are priced for each product produced by Trigona SP Bee based on the average selling price in the domestic market, for honey with a size of 250 mL / bottle for Rp 150,000, propolis with a size of 250 grams / bottle for Rp 250,000, and for bee 250 gram / bottle pollen is worth Rp 100,000. Within a period of one year, the Compost House of UIN Jakarta produced 60 bottles of honey, 109 bottles of propolis and 28 bottles of bee pollen so that the total revenue generated from the sale was Rp. 39,050,000.
3) **Place**
   A place to market the products of Trigona SP Bee through e-commerce. This e-commerce system has a function as a platform for buying and selling online. The functions contained in this system include the function of product description, product prices, number of products available, selection of payment and shipping transactions. The actors involved in this system are: 1) the administrator of the system who manage the user of the e-commerce system, 2) sales division, 3) distribution division, 4) manager or executive or the leader of the Compost House of UIN Jakarta and 5) Customer. Customer can also be a consumer, the one who consumes the goods. The benefits of implementing an e-commerce system to market products include the broader range of product marketing areas and costumer can do transactions quickly and easily.

4) **Promotion**
   Marketing for Trigona SP Bee products can also be done through advertisements both on television, radio, and print media, for example advertising in newspapers, posting banners and distributing brochures in public places, and in the present way through social media such as Facebook, Twitter, Instagram, and others. Do not forget to include e-commerce web addresses so that consumers can easily find information about products and increase opportunities to make purchases.

   The online sales process through e-commerce is modeled using Business Process Modeling Notation (BPMN). In this process, there are 4 actors involved, namely customers, sales division, distribution division, and executive. Customers are placed separately on one pool and the e-commerce system is placed in the pool lane with three functions, namely, the sales division, distribution division, and executive.

![BPMN diagram of the E-Commerce Online sales process for Honey Bee Product](image)

**Fig.3. BPMN diagram of the E-Commerce Online sales process for Honey Bee Product**

Figure 3 illustrates the sales process that starts from the customer who logs in and sees the product being sold, selects the product and then decides whether to buy the product or not. If a customer wants to buy a product, the process continues to the next stage, but if the customer does not buy, the customer can log out immediately.
the next process after the customer decides to buy the product is that the customer enters the order, and the sales division will verify and validate the product ordered. If it is verified and validated, customers can make payments for their orders and the process continues. If the order made is not verified and validated, the sales division will provide a failed transaction notification.

After receiving payment from the customer, the sales division will record the order. Records of this order were then seen by the distribution division, and the distribution division made distribution routes and also made delivery of orders. Next, the sales division will make invoices and sales reports, this sales report which will later be seen by the executive. in addition, the executive will also see reports on the delivery orders made by the distribution division.

5 Conclusion

Marketing concepts using information and communication technology can be applied to market products produced by Trigona SP Bee. This study generate the Business to consumer (B2C) Honey Bee e-commerce concept using the 4P Marketing Mix approach. Due to the sample limitations used in this study which only amounted to one sample, namely bee cultivation at the Compost House UIN Jakarta, the number of products that can be marketed using this marketing concept is not much.

The analysis of the business process of selling honey bee products is modeled with Business Process Modelling Notation (BPMN). BPMN can be used to model the sales process on e-commerce system of honey bee products in a simple and comprehensive manner. For the case study used in this paper, there are 4 actors involved in the e-commerce system, namely customers, sales division, distribution division, and executive. For further research it may be able to involve more actors and a more detailed process and it is expected to be able to use more and varied samples so that the application of this concept can be maximized.

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References


Short-term *Momordica charantia* L. Fruit Concentrated Infusions Therapy on Alloxan-Induced *Rattus norvegicus* Kidney Glomerulus Cells Histology

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**Abstract.** The aim of this research is to know the effect of short-term bitter melon (*Momordica Charantia* L.) fruit concentrated infusions therapy on the histology of alloxan-induced rat kidney glomerulus. Renal glomerular histology was observed using Hematoxylin-Eosin (HE) test. A therapeutic dose of bitter melon fruit concentrated therapy used was 0.15 mL/200 g BW; 0.30 mL/200 g BW; 0.45 mL/200 g BW; 0.60 mL/200 g BW; 0.80 mL/200 g BW and 1 mL/200 g BW. The results showed that the bitter melon fruit concentrated infusions therapy on alloxan-induced DM rats was able to decrease the Blood Glucose Levels (BGL) of the treated rats in varying degrees. The therapy also successfully repairs the damage kidney glomerulus cells of all rats treated with an average bowman's space improvement of 110% of healthy rat's kidney glomerulus cells. It appears that the mechanism of the bitter melon active substance in reducing the BGL occurs through a different path to its mechanism in repairing damaged glomerulus cells.

**Keywords:** diabetes mellitus; extract; bitter melon; momordica; hematoxylin; eosin; HE; therapy; blood glucose levels; natural product; alloxan; kidney

1 **Introduction**

Diabetes Mellitus (DM) is a chronic disease characterized by high blood glucose levels (BGL) condition (hyperglycemia) due to improperly regulating glucose homeostasis. Chronic hyperglycemia leads to over-production of excessive free radicals, which can lead to the generation of oxidative stress. Free radicals can damage the cell membrane, if it continues it will lead to damage the cell membrane system and cell death [1].

Kidneys are the second organs susceptible to the effects of chemicals since these organs receive 25-30% of the blood circulation to be cleaned. So that as filtration organs the likelihood of pathological changes is very high [2]. DM disease can trigger the occurrence of diabetic nephropathy [3], namely complications that occur in fine blood vessels. Damage to the blood vessels leads to glomerular damage that serves as a blood filter in the kidneys. High levels of glucose in the blood will make the kidneys structure change [4]. Some short-term and long-term therapy has been investigated to treat this nephropathy and successfully for both term [5]–[8].
Bitter melon (*Momordica charantia* L.) fruit water extract contains some classes of carbohydrate compounds, proteins, amino acids, sterols, flavonoids, phlobatannins, terpenoids, glycosides, and saponins [9]. *Momordica charantia* contains some specific compounds such as albuminoid, charantin, hydroxytryptamine, dyes, vitamins A, B, and C [10]. Some of these compounds have an antioxidant role that can against free radicals.

In this study, the method used to extract bitter melon fruit is an infusion. Infusion is one of the extraction methods using a solvent such as water, oil or alcohol, by allowing the material to remain suspended in the solvent over time at a temperature of 90 °C without evaporation. This method is very effective to apply to the community because it can only use water as a solvent while still able to maintain its active ingredients.

This study will investigate the ability of bitter melon fruit infusions to repair the glomerular damage of diabetes mellitus suffering rats (DM rat). Rat induced hyperglycemia treated by the alloxan diabetogenic agent. This study aims to determine the effect of concentrated infusions therapy of bitter melon fruit on histologic features of renal glomerulus of DM rat.

### 2 Materials and Methods

#### 2.1 Material

The material used is the local bitter melon fruit readily harvested, male Wistar strain white rat (*Rattus norvegicus*) 2-3 months weighing ± 200 g, Alloxan (*Alloxan Monohydrate*), 0.9% NaCl, 10% Neutral Buffer Formalin solution, plastics, 70%, 80%, 90% alcohol, absolute alcohol, paraffin, and xylol.

#### 2.2 Preparation of Bitter Melon Fruit Concentrated Infusions

The method of making infusions follows the standard of the Directorate General of POM RI [11], but the simplicia powder is increased to 30 g from the Pharmacopeia standard of 10 g, to produce concentrated infusions. Concentrated infusions therapy is given daily for 14 days as a fresh solution. The dried bitter melon simplicial powder of 30 g was dissolved in 160 mL of water and then put in an infusion pot. The infusion pot is heated in a water bath for 15 minutes since the temperature reaches 90°C while stirring occasionally. Filtering is done using a white cotton cloth in a still hot solution. The infusions are made fresh every day when it will be given as therapy.

#### 2.3 Experimental Animal Preparation

The experimental animals to be adapted for ± 3 weeks to a uniform pattern of animal life. Feeding and drinking are done daily in ad libitum. The trial was divided into 8 treatment groups with 4 mice for each treatment group:

- KN: Normal control group without treatment
- KP: Positive DM control group
- KT1: DM group treated with infusions dose 0.15 mL / 200 g BW.
- KT2: DM group treated with infusions dose 0.30 mL / 200 g BW.
- KT3: DM group treated with infusions dose 0.45 mL / 200 g BW.
- KT4: DM group treated with infusions dose 0.60 mL / 200 g BW.
- KT5: DM group treated with infusions dose 0.80 mL / 200 g BW.
- KT6: DM group treated with infusions dose 1 mL / 200 g BW.
2.4 Diabetes Mellitus Rat Preparation

Diabetes Mellitus rat prepared by injecting alloxan in its intraperitoneal region on fasted condition. Alloxan solution prepared by homogeneously dilute of 896 mg alloxan p.a. in 0.9% NaCl solution until the solution volume was 28 mL. The alloxan solution dose used was 32 mg/200 g BW [12],[13]. Blood Glucose Levels (BGL) measurements were performed using a DR Glucometer through rat tail ends little cutting. The rat will be determined as positive for DM if BGL is above 200 mg/dL.

2.5 Kidney Organ Harvesting

The rats were dissected after putting to death by neck dislocation. The kidneys are removed and rinsed in water, then immersed in 10% Formalin Neutral Buffer solution in a sealed container for further analysis.

2.6 Preparation of Kidney Organs

The kidney organs were graded dehydrated using an alcohol of concentrations of 70%, 80%, 90%, absolute alcohols I, II every 2 hours respectively. Then cleared off by xylol and molded using paraffin so they were cast in paraffin blocks and then stored in a refrigerator. The paraffin blocks are then sliced as thick as 5-6 μm using a microtome. The slice results were floated in warm water at 60 °C to stretch for the tissue not to fold. The preparations were then lifted and placed in an object glass for Hematoxylin and Eosin (HE) staining [14],[15].

2.7 Hematoxylin-Eosin (HE) Stain for Renal Histologic Test

Preparation was observed under an electron microscope with a magnification of 40x. The observed part is the Bowman’s space of glomerulus. Bowman’s space improvement is calculated using the percentage formula:

\[
BS \text{ Percent of improvement} = \left( \frac{(b)}{(a)} \right) \times 100\%
\]

where

\[a = (\text{Average KP}) - (\text{Average KN})\]
\[b = (\text{Average KP}) - (\text{Average KT})\]

3 Result and Discussions

This study uses an in vivo test. The rats are conditioned for hyperglycemic by alloxan induction. Alloxan is a substance that works to increase blood glucose levels so that the rats suffer from Diabetes Mellitus (DM). The alloxan induction was done 2 times because in the first induction there were still some rats that its BGL have not reached 200 mg/dL so it has not determined as DM-positive. BGL measurements were performed on day-0 i.e. before alloxan induced and the day after alloxan induction. Day-1 is the day when all the rats have been tested as positive for DM. When all the rats were positive DM then given bitter melon fruit concentrated infusions therapy for 14 days. On the 15th day, the rats were dissected and the kidney organ was taken to be observed.
Before any treatment, all rats were in the same condition it had healthy rat's blood glucose levels below 200 mg/dL. The BGL condition of all rats after alloxan induction was DM-positive with a BGL value of above 400 mg/dL. After bitter melon fruit concentrated infusions therapy for 14 days were given, the rat's BGLs decreased substantially. The greatest decrease in BGL occurred in rat with bitter melon fruit concentrated infusions therapy at a dose of 0.3 mL. While the DM-positive rats without therapy, until day-15 have a steadily increasing BGL until reach an average value of 450 mg/dL.

Figure 2 shows that the glomerulus of DM rat (KP) has been damaged. The glomerulus undergoes considerable damage and decreases in the number of cells, resulting in a broadening of the Bowman's space to reach 5866.232 μm² (see Table 1). The Glomerular cell damage rate in diabetic rats was twice that of healthy rat (KN). The presence of samples with mild or moderate necrosis in the normal control (KN) and treatment control (KT) group in Figure 1 was normal due to the aging process and cell death that physiologically occurs in all normal cells. Every cell in a body will always experience aging, which ends with cell death and is replaced by new cells through the regeneration process [16], [17]. In addition, the influence of psychological condition affected by the surrounding environment and different hypersensitivity reactions in each rat can also affect the aging process.
Table 1 shows that there is a difference between health rat (KN), diabetic rat (KP), and treated rats (KT) Bowman’s space. The average of Bowman’s space in health rat was 2947.215 μm². KP shows the average of the Bowman’s space has widened to 5866.232 μm². KT1, KT2, KT3, KT4, KT5, and KT6 have a wide narrowing of the Bowman’s space back. The narrowing Bowman’s space indicates a repairing health glomerulus cells. The six therapeutic doses did not show significant differences in glomerular cell repairing degree. The average ability of bitter melon fruit concentrated infusions therapy in improving the rat Bowman’s space was 110% of the health one. The BGL data after the rats were treated by bitter melon fruit concentrated infusions shows a tendency that it is not in line with the improvement degree of glomerular cells. The improvement of glomerular cells in treating rats occurs to almost perfectly with an average value of 110% at all therapeutic doses. Glomerular cell returns to a healthy state with a value of the Bowman’s space approaching the mean value of a healthy one. While the value of rat BGLs after therapy in different doses showed varying degrees of decreasing values. This indicates that the repairing mechanism of glomerular cells occurs through a different path to the mechanism of decreasing blood glucose levels.

Table 1. Bowman’s Space Average Of All Rat Kidneys

<table>
<thead>
<tr>
<th>Group</th>
<th>Bowman’s Space (μm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KN (health)</td>
<td>2947.215</td>
</tr>
<tr>
<td>KP (DM-positive)</td>
<td>5866.232</td>
</tr>
<tr>
<td>KT1</td>
<td>2642.015</td>
</tr>
<tr>
<td>KT2</td>
<td>2368.635</td>
</tr>
<tr>
<td>KT3</td>
<td>2540.445</td>
</tr>
<tr>
<td>KT4</td>
<td>2269.607</td>
</tr>
</tbody>
</table>
Chronic hyperglycemia conditions encourage free radical production excessively. The formation of excess free radicals in diabetes triggers a decrease in antioxidant content and tissue damage. Antioxidants serve as the body's defense against free radicals that induce oxidative stress and reactive oxygen compounds in plasma and cells so that cell damage does not occur. Some active ingredients in concentrated infusions of bitter melon fruit are antioxidants, namely vitamin C (ascorbic acid) and flavonoids. Vitamin C (L-Ascorbic Acid) is a natural compound that is a powerful antioxidant and free radical binder but not enzymatic [18], [19]. Vitamin C will work extracellularly, which is to reduce the superoxide radical produced in the process of glucose autoxidation and nitric oxide synthesis. When superoxide radicals are excessive, there will be a reaction with nitric oxide producing a cytotoxic peroxynitrite radical. Inhibition of the formation of peroxynitrite radicals will maintain the vasodilation function of blood vessels played by nitric oxide. In endothelial cells, ascorbic acid affects the nitric oxide synthase enzyme so that superoxide radicals as byproducts of nitric oxide formation can be suppressed and antioxidants and free radicals will be balanced [21]. Due to the balance of antioxidants and free radicals will effect on repair glomerulus. Bitter melon fruit infusions also contain flavonoids. Polyphenol compounds, especially flavonoids, are thought to play a role in the inhibition of lipid peroxidation because they have the ability to capture free radicals as a free radical scavenger. Flavonoids donate an H atom of hydroxyl phenolic groups when reacting with free radicals. As an antioxidant, flavonoid compounds will react with free radicals resulting in stable products and reduced cellular damage [22].

4 Conclusion

The concentrated infusions therapy of bitter melon fruit on alloxan-induced DM rats was able to decrease the Blood Glucose Levels (BGL) of the treated rats in varying degrees. The therapy also successfully repairs the damage kidney glomerulus cells almost perfectly. It appears that the mechanism of the bitter melon active substance in reducing the BGL occurs through a different path to its mechanism in repairing damaged glomerulus cells.

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References

Study the Qur'anic Tafseer in the Age of Social Media (Study Learning Qur’anic Tafseer with Indonesian on Facebook)

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Abstract. Social media became a new trend in the delivery of Islamic messages including conveying the Qur'anic interpretation. Various applications are used to provide content learning tafseer from twitter, Facebook, Instagram, line, WhatsApp group, youtube to telegram. All of these applications are a new way of conveying messages and da'wah of Islamic teachings. This study describes the use of Facebook as a medium of learning interpretation qur'an. In this study, author using Marshal McLuhan theory that puts the media as a new device that becomes biased from technological development. So, the conclusion as to how this new trend will affect the interpretation of the Qur'an and this phenomenon will produce new interpreters whose interpretive credibility is questionable. Then, the research earn picture of the 5 groups learning tafseer qur'an in social media only 2 groups that explain the Qur'an in accordance with the terms interpretation of qur'an.

Keywords: Hadith; Nisfu Sha’ban night; rituals; Muslims; mosques; online medias

1 Introduction

Technological developments also affect the development of learning media and the study of interpretation of the Koran. In the past, people should go to majlis taklim or halaqah recitation held by mosques or other Muslim communities to refresh the Kyai or Ustad teach the interpretation of the Qur'an, but along with technological advances, the Qur’anic interpretation scholar who came to him via a smartphone. (Nadirsyah Hosen, 2017: v) This phenomenon occurs as the number of people using social media, because its existence has brought many benefits to those who use it, the media easily get religious advice and no exceptional exegesis (Ahmad Fathan.2016:38), even learning like this no longer collect a lot of people, but anywhere can be done which is important smartphone connected to the Internet network. In this age of social media, various applications are used to provide learning content for interpretation from twitter, Facebook, Instagram, line, WhatsApp group, Youtube to Telegram. All of these applications are a new way of conveying the messages and propaganda of Islamic teachings (Nadirsyah Hosen, v), even Maged M. Eljazzar in his research entitled "Towards A Time Based Video Search Engine for Al Quran Interpretation" mentions that in the days of technology this is a lot of applications that make it easy for people to access the interpretation of the Qur'an through the internet and the public can access all the interpreters that exist in the world including Arabic interpreters (Maged M. Eljazzar et.al.) However, the
presence of applications that provide content learning interpretation positive and negative effects. The positive effect is that people do not have to study out of the house, offices and others and the negative effect is the birth of an impromptu ustad who actually does not master the science of the interpretation of the Qur'an so that social media used them for political purposes, spreading the study of Islam that is not friendly, understanding al-Qur'an textually just is not contextual.

Among the many social media used for qur’anic interpretation is Facebook, it has a lot of communicative users though still less with twitter users, but Facebook offers a broad enough context to convey religious messages such as learning tafseer and even his writings are not limited to a few words , all admin just who want uploading writing on the Facebook page. Most of the tafseer learning on Facebook is usually formed by creating a group or like an ad, anyone who follows it automatically entered in the Facebook group.

This study attempts to explain and see how the development of interpretation in social media and whether the interpretation made by the interpreters is in accordance with the rules of interpretation applicable in the study science of al-qur'an, but this research does not researching all the existing interpretations in social media only focus on learning tafseer that felled on Facebook.

2 Methodology

This research is a literature research that tries to study the study of Qur'anic interpretation that developed in social media by taking the object of research phenomenon of development of tafseer in Facebook. Therefore, there are two types of author data sources required in this study namely the primary sources of the group on Facebook that provides content learning al-Qur'an interpretation while the secondary source is another library material that supports this research.

In this study, the authors will conduct a study of the phenomenon of learning the Qur'anic interpretation on Facebook by using Marshal McLuhan theory that puts the media as a new device that becomes biased from the development of technology. So, the conclusion is desired how this new trend is so influential on the interpretation of the Qur'an and this phenomenon will result in new interpreters whose interpretive credibility is questionable.

As for facilitate the process of this research, the authors will perform and collect some content groups on Facebook that provides learning content such as al-Qur'an tafseer, al-Qur'an commentary and similar, Then after collected, the authors will analyze and explain whether interpretation using the method and patterned skew interpretation what ?, after that the new authors conclude whether the interpretation is really as an interpretation that has been in line with the desired experts Quran commentary is a reference to humans rather than make anxiety toward people who read it.

3 Literature Review

There are several studies that have done research on the interpretation of qur'an and social media among others: first is the work of M. Eljazzar ddk entitled "Towards A Time Based Video Search Engine for Al Quran Interpretation" This research describes the use of the word for searching the Quran interpretation on google and the applications that develop along with
the advancement of technology. This study resulted in the conclusion that it is necessary to
add content to perfect the change from manual to manual search through applications or
google often with technological developments

Second Works Nafisatuzzaro 'which is a thesis as a conditional completing the master
program of Islamic studies with the title "Tafseer Al-Qur'an Audivisual in Cybermedia: Study
of Tafseer Al-Qur'an on Youtube and Its Implications Against the development of science
studies of the Qur'an" the conclusion that first, the media of tafseer from time to time always
evolved. Secondly, with the use of You Tobe as a new medium certainly mediates the Qur'anic
interpretation, it has subsequently brought about certain impacts mainly related to the way of
consumption and the production of a commentary in a more effective way because it is not
tied to the time and place to obtain it. In addition, the existence of this media also leaves a
social impact of dependence and addiction of the audience to the media YouTobe in obtaining
Tafseer. Later, this social media contributes to the development of the study of interpretation as
well as the general study of the Qur'an.

The third work Eko Sumadi titled "Da'wah and Social Media" which resulted in the
conclusion that da'wah is a duty for every Muslim and must be done in ways of policy, not
confrontational, non-discriminatory and provocative. Then social media is considered
effective as a means of preaching. However, preaching with social media must pay attention to
social media and ethical norms, so that it can bring in expediency instead of causing problems.

Fourth is the writing by Pardiyanto entitled "Affirming da'wah through New Media" this
paper gives an illustration that Muslims should be able to master and take advantage of the
greatest development of information technology. Secondly, with the development of
globalization and information today the internet media provides various applications that can
be used as a place to deliver the message of da'wah. so we need to compete to master
information technology and seek knowledge as much as possible, therefore the mastery of
information technology is absolutely necessary by Muslims, because it is one of the most
effective way to convey the message of da'wah. Because by mastering internet technology will
be able to realize the right strategy and right so that the values of Islam (message da'wah) can
be received well by fellow Muslims and other people who want to know about Islamic values.
Thirdly, with the various development of information technology in the era of all the internet
as it is today, it's time to confirm the dakwah bil-internet done by the da'wah (da'i). This is
because information technology has opened the eyes of the world to a new world, new
interactions, and an infinite worldwide network. It is well known that the development of
technology called the Internet, has changed the pattern of community interaction. In other
words, the precise method is the acceptance of da'wah and means of propagation is the cause
of the spread of da'wah. Therefore, with technological developments significant enough in the
last few decades, it is feasible to be a means of propaganda

4 Theoretical Review

4.1 Interpretation of Qur’an

The Qur'anic commentators define the interpretation of the Qur'an as follows: According
to Al-Zarkazi, interpretation is the science of knowing the content of the Book of Allah
revealed to Prophet Muhammad SAW, to explain the eating, the wisdom, the law contained in
al -Qur'an. Meanwhile, according to Abu Hayyan, tafseer is a way of understanding the text
related to the guidance and law both related to the text and context and eating contained in the
verses of the Qur'an in contextual and textual. Of the two definitions of the commentary experts of the Qur'an that the interpretation of the Qur'an is a way that can help understand the meaning of the Qur'an.

Al-Qur'an interpreters understand the Qur'an certainly use the tools and methods to understand it, there are several methods used by the expert of interpretation of the Qur'an, among others: using the source of the interpreter that is with history and ijtihad, the method of interpretation of the Quran the use of the method according to the system of mushaf al-Qur'an Usmani (tahlili), comparative (muqaran), global (imali) and thematic, while the style of interpretation of the Qur'an varies according to its scholarship, there are Islamic law, theology, philosophy, knowledge of nature, language, mysticism and others.

There are several criteria of a person worthy to be an expert on the interpretation of al-qur'an, Muslim scholars have formulated on the requirements to become an expert interpretation of the Qur'an, among others: his belief in strong Islam, not following the lust, understand usul fiqih science, hadith, knowing the basics of Islam, knowing the Arabic language and its supporting science, has the right purpose. While the ethics of the candidate expert interpretation of the Qur'an must be sincere and ethical good and right.

4.2 Facebook

Facebook is a social media used by the people of the world including Indonesia, the interest of the community using the media because Facebook combined two devices namely Friendster and MIRC, so people can communicate between countries through chat and video calls. In addition, Facebook has advantages that can be used for anything like disseminating good information related to business, da'wah, expressed opinion to vent his personal problems. Facebook also provides forum for selling, discussing to study the science of both general and religious.

History records Facebook is widely used by young people to exchange thoughts both in their education and communication media. Broadly speaking Facebook has many useful roles for the community, among them is Facebook for education (school), Facebook for da'wah, Facebook for business, Facebook for campaign, Facebook for humanity (charity) and Facebook for tourism industry.

Laila Nadiatul Falah noted there are three that is first, as a medium of information dissemination, by posting in Facebook account then all Facebook members can access that information. Second, where the discussion is Facebook users can create a group to discuss both the problems of the nation, religion and others. Third, a place of friendship between users whether it is a new old friend who was found or add a network of new friends that can be accessed around the world. (Laila, 2014: 394)

4.3 The Learning Phenomenon of Qur'anic Tafseer on Facebook

The author will explain about the phenomenon of learning interpretation of the Qur'an on Facebook, this learning then made reference by some Muslim communities, especially in Indonesia, but sometimes the readers do not read the details of the flow and model of learning tafseer conducted by some Muslims through Facebook. Most of the Qur'anic commentary studies are packaged in groups. This paper tries to see the group presents the study of Qur'anic commentary. There are several groups that provide learning content of interpretation of Qur'an, among others:

1. Majlis Tafsir al-Qur'an
Majlis Tafsir al-Qur’an is a group that contains the learning of the Qur’anic interpretations, because the purpose of the group is to explain some parts of the Qur'anic verses such as Surah al-Alaq and verses related to the theme of patience, resignation, good morals and others. This group was attended by eleven thousand Facebook users, however, there are a number of verses of the Qur'an which were interpreted to be incompatible with the purpose of making the group as an example in interpreting verses about infidels.

QS. Al-Bayyinah [98]: 6 “Lo! Those who disbelieve are the experts of the Book and those who are idolaters (will enter) to Hell. They abide therein. They are the worst creatures. "So in the context of the Presidential Election, do not choose leaders who are pro-infidels.

From some of the content examined the author has explained one or two examples of his interpretation, but what the author found is that there are several contests that are considered in accordance with the purpose of the Qur'an as guidance for humans and deviating from the rules of interpretation. The explanation can be seen in the following table:

<table>
<thead>
<tr>
<th>Follower Study</th>
<th>not in accordance with the rules of interpretation of the Qur'an</th>
</tr>
</thead>
<tbody>
<tr>
<td>6798</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

2. Tafsir al-Qur’an Karim

One example of post interpretation is post interpretation of surah al-baqarah verses 1-5 which is interpreted as follows:

1. Alif laam miim [1]. 2. The Book [2] (The Qur'an) is of no doubt to him [3]; guidance for those who fear Allah [4], 3. (ie) those who believe [5] to the Unseen [6], establish the Salat [7], and spend some of the Provision [8] which We bestow upon them. 4. And those who believe in the book that has been sent to you [9] and the books that have been revealed before you [10], and they are convinced of the existence of the Hereafter [11].

[1] are letters of the alphabet that lie at the beginning of some of the Qur'anic letters such as: Alif laam miim, Alif laam raa, Alif laam miim shaad and so on. Among the commentators there are those who submit their understanding to God because it is considered including the verses mutasyabihat, and some are interpreted. the groups who interpret it are the ones who see it as the name of the letter, and some argue that the letters of the alphabet are useless to attract the attention of the listeners to pay attention to the Qur'an, or to imply that the Qur'an is derived from Allah in Arabic composed of letters - alphabet letter. if they do not believe that the Quran is derived from Allah and only made Muhammad sallallaahu 'alaihi wa sallam solely, then try to make them a kind of Al Quran. Shaykh As Sa'diy argues that the more survivors are silent not looking for his intentions, which certainly Allah Ta‘ala does not drop off without any wisdom behind it only we do not know. You know a'lam. Imam Al Qurthubi said, "The commentators are at odds with the letters in the early letters Amir Asy Sya’biy, Sufyan Ats Tsauriy and the scholar of hadith say," He is the mystery of Allah in the Qur'an, and God has a secret in every book, it includes verses mutasyabihat that only God knows it, he should not be discussed, but we believe it and read it as comind it.
Allah Ta'ala named the Qur'an with the Book means "written", as a sign that the Qur'an is commanded to be written. [3] That is no doubt that he is from Allah Ta'ala, so it is not true still doubt him because obviously the proof. [4] Those who ward off benefit from it, make it a useful guide and science and make them able to do good deeds. They get two guides; hidayah irsyad (knowledge /direction) and hidayah taufiq (can charity). The Qur'an though the guidance for all men, but only the righteous who want to take it as a guide and carry out its contents. Piety is to take care of God's punishment by following His commandments; and keep away from his restrictions; not enough to mean with fear. The word huda (guidance) in the above verse is common, namely that the Qur'an is a clue to all the maslahat in the world and the hereafter, it is the guidance of man in the matter of ushul (the principal like belief) and furu' (branch), explaining the right and explain to them the path that can bring benefits in this world and the hereafter.

Faith means firm belief accompanied by submission and submission of the soul or confession in the heart which produces submission in verbal (with iqrar) and on the limbs. The sign of faith is doing what the faith requires. [6] The unseen is the one who cannot be caught by the senses. Believing in the unseen is, to believe existence of yangjud that cannot be caught by senses, because there are propositions that show existence, such as: existence of God, angels, hereafter and so on. Why believe in the unseen? The answer is that believing in something witnessed or perceived by the five senses cannot distinguish between Muslims and unbelievers. Therefore, the believers believe in all that Allah's Messenger and His Apostle preaches, whether they witness it or not, whether they understand it or not and whether it is reached by their intellect or not. Abdullah ibn Mas'ud radhiyallahu 'anhu said, "There is no faith believed by the believer more than his belief in the unseen", then Ibn Mas'ud read the verse "Alladziina yu'minuuna bil ghaib". [7] Namely in addition to believing in the unseen, they prove by establishing the prayer. Prayer by Arabic: prayer, according to syara'is a familiar worship, which begins with takbir and ends with a salam. Prayer is a proof of dedication and humility to Allah Subhaanahu wa Ta'aala. Establishing prayer is to accomplish it with.

from some of the content examined the author has explained one or two examples of his interpretation, but what the author found is that there are several contests that are considered in accordance with the purpose of the Qur'an as guidance for humans and deviating from the rules of interpretation. Explanation can be seen in the following table:

<table>
<thead>
<tr>
<th>Follower</th>
<th>the content under study</th>
<th>not in accordance with the rules of interpretation of the Qur'an</th>
</tr>
</thead>
<tbody>
<tr>
<td>6640</td>
<td>35</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Taman al-Qur'an Karim

The content of this group is followed by 5678 Facebook users and its post contains about reading and the virtue of reading al-Qur'an. In addition, the content calls for the folk reading of the Qur'an by reflecting on the content of the verses of the Qur'an and never having any threatening and hateful postings against others.

From some of the content examined the author has explained one or two examples of his interpretation, but what the author found is that there are several contests that are considered in
accordance with the purpose of the Qur'an as guidance for humans and deviating from the rules of interpretation. Explanation can be seen in the following table:

**Table 3. Taman Al-Qur’an Karim Characteristics**

<table>
<thead>
<tr>
<th>Follower under study</th>
<th>not in accordance with the rules of interpretation of the Qur’an</th>
</tr>
</thead>
<tbody>
<tr>
<td>4567</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

4. Terjemahan dan Tafsir al-Qur’an

The group’s content contains about the interpretation and translation of the Qur'an and is followed by about 3000 Facebook users. Every day the admin post thematic Qur'anic interpretation and verses randomly not in accordance with the systematics of the Qur'an. But some verses of the Qur'an that ever posted are the verses about the not allowed women to be leaders, non-Muslims should not be a leader according to al-Maidah verse 51 even post many that contain provocative. Then, the interpretation that is displayed literally is not contextual.

From some of the content examined the author has explained one or two examples of his interpretation, but what the author found is that there are several contests that are considered in accordance with the purpose of the Qur’an as guidance for humans and deviating from the rules of interpretation. explanation can be seen in the following table:

**Table 4. Terjemahan Dan Tafsir Al-Qur’an Characteristics**

<table>
<thead>
<tr>
<th>Follower under study</th>
<th>not in accordance with the rules of interpretation of the Qur’an</th>
</tr>
</thead>
<tbody>
<tr>
<td>5604</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

5 Conclusion

From some of the above discussion the authors conclude that, there are some group content that displays the interpretation is not in accordance with the purpose of descending al-Qur’an as a guide for humans from the sample that the author took there three groups on Facebook interpretation of the Qur'an is provocative and displaying un-Islamic faces and these groups serve as reference for some internet and Facebook users. Sometimes those who use are preachers and extensionists of Islam. Therefore, before referring to the Facebook content, then we need to learn and be careful.

References
Influence of Sintering Temperature on Structural and Morphology of La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$

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Abstract. Perovskite manganite of La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$ (LBNMO) has been investigated in this report. The LBNMO synthesized by sol-gel method. We examined several temperature treatments for 24 hours to study their effect on structure and microstructure. We use X-ray diffractometer (XRD), X-ray fluorescence (XRF) and Scanning Electron Microscope (SEM) to confirm each instrument result on the influence of the structure and morphology of LBNMO. Interestingly, we found that as sintering temperature increased, the structure did not change. Moreover, there was no significant affect of its lattice parameter. By means of XRF, we found the LBNMO keep on the stoichiometry composition. Then, according to SEM investigation, it showed greater grain as temperature increase. Therefore, sintering on variance temperature at certain time plays an important rule on structure and microstructure of the LBNMO.

Keywords: Perovskite manganite; Sintering Temperature; structure and microstructure;

1 Introduction

Perovskite manganite formula of RE$_1$-xAEXMnO$_3$ which RE is a rare-earth metal (RE = La, Nd, Pr) and AE is a divalent alkaline-earth such as (AE = Ba, Sr, Ca) has increased the interest of many researchers to investigate any alternative magnetic materials [1-5]. Due to, partial substitution of RE with divalent alkaline-earth ion from formula makes the valence of Mn$^{3+}$ and Mn$^{4+}$ mixture on the Mn-site, which is important influences the interaction ferromagnetic double exchange (DE) couplings by changing the Mn$^{3+}$–O– Mn$^{4+}$ bond angle and Mn–O bond length [6]. The double exchange phenomenon attracts a lot of attention because it has strange electrical and magnetic properties, especially the property of colossal magnetoresistance (CMR) and magnetocaloric effect (MCE) [5-7].

There have been many perovskite manganite materials investigated. One of them La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$ (LBNMO) is a potential material for CMR and MCE applications, because it has Curie temperature achieved to near room temperature (TC = 293 K), as reported by Unlu et al [7]. They synthesized the LBNMO by sol-gel method. Because at Curie temperature the perovskite manganite materials usually exhibit the CMR and MCE around their ferromagnetic (FM) - paramagnetic (PM) phase transition temperature (TC) [7]. The La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$ has attracted our attention to explore more of this material by
similar route. We examine the effect of sintering temperature on structural, morphologies and of the LBNMO more. The reason is because the preparation and sintering conditions also determine the nature of the grain surface area, influencing the role in electricity transportation, magnetotransport, and magnetic. The advantages synthesized with sol-gel are two which are good homogenous and low processing temperatures [6].

2 Experiments

The sol-gel method prepares the LBNMO sample. The raw materials are La₂O₃ (Aldrich, 99.5%) and Nd₂O₃ (Aldrich, 99.5%) was dissolved by nitrate acid and aquabidest to get nitrate solution form. Stoichiometric calculations obtained from nitrate precursor reagents Ba(NO₃)₂ (Merck, 99%) and Mn(NO₃)·4H₂O (Merck, 98.5%) were dissolved in aquabidest. All precursors were mixed to the beaker glass and added citric acid C₆H₈O₇·H₂O (Merck 99.5%). The solution obtained is to heat the heat plate under a constant stirrer at 80°C so that the water disappears and a thick gel is obtained. The gel is dried at 120 °C for one night and then calcined at 600 °C for 6 hours. Finally, the powder is sintered with temperature differences at 700 °C, 800 °C and 900 °C for 24 hours.

The existence of this phase structure is indicated by of X-ray diffraction (XRD) at room temperature with Cu Kα radiation (λ = 1.5406 Å). The chemical composition measured by) X-ray fluorescence (XRF). Scanning electron microscopy (SEM) was carried out to investigate the size of morphological and particles of powder samples at room temperature.
Figure 1. Rietveld analysis of XRD pattern for La_{0.7}Ba_{0.25}Nd_{0.05}MnO_{3}

3 Result and Discussions

Each sample has a parameter structure that is enhanced by the rietveld refinement analysis. The rietveld refinement showed a good agreement between the calculated and observed position of diffraction pattern. Rietveld refinement plot analysis of XRD pattern result depicted in Figure 1 reveal materials has single phase. The values studied with those calculated must have good suitability based on the criteria Goodness of Fit (GoF) and Reliability factors (R_p and R_wp) shown in Table 1. The XRD patterns each sample with different sintering temperature has the same pattern is confirmed on the cubic structure owned by the part pm-3m room. It is the same as reported by Ünlü et al. in the parental compound La_{0.7}Ba_{0.25}Nd_{0.05}MnO_{3} has a cubic structure [7]. There was no significant change of its lattice parameter observed at different sintering temperature summarized in Table 1.

The average crystallite sizes of each sample were calculated from the XRD peak width by using the Scherrer’s equation:

\[
D_{SC} = \frac{0.9 \lambda}{\beta_{2\theta} \cos \theta}
\]

where \(D_{SC}\) is average crystallite size, \(\lambda\) is Cu-K\(\alpha\) (1.5406 Å), \(\beta_{2\theta}\) is full-width at half maximum (FWHM) of the Bragg peaks [2]. The average crystallite size of samples sintering at 700 °C, 800 °C and 900 °C are found to be 17.99, 23.19, and 29.12 nm, respectively (Table 1).

The results calculated for the average crystallite sizes have increased, with increasing sintering temperatures and in the nanocrystalline range. In fact, the size of the crystallite is calculated comparable to that obtained from SEM. From figure 2 shows the change in the highest intensity of reflection (011), an increase in the intensity value and FWHM. Below is the result of an increase in particle size and sintering temperature [3].
Figure 2. The variation in intensity and $2\theta$ of the most intense (011) peak with sintering temperature

Figure 3 shows the LBNMO sample morphology sintered at 700, 800 and 900°C for SEM images. There is a uniform particle size distribution for the sample and if the sintering temperature increases, the particle size will also increase, this is revealed by SEM observations. Refers to many studies reported on the influence of sintering temperatures. The size of the particles or grains becomes larger as the temperature of sintering increases [1-6].

Table 1. Rietveld analysis structural parameter from observed XRD pattern of LBNMO at sintering temperature 700 °C, 800 °C and 900 °C.
The element composition sample measured by X-Ray Fluorescence (XRF) to confirm what elements are contained in La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$. The XRF spectra can be seen in Figure 3, sintered at different temperature produce the same spectrum without any sign of impurities. The concentration of the contained elements can be seen in table 2. The concentration of measurement results close from the stoichiometry calculation. The differences in measurement results with stoichiometry calculations because XRF is a semi-quantitative analysis.
Figure 3. SEM image from La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$
4 Conclusion

In conclusion, the influence of sintering temperature on structure and morphology was investigated. The La$_{0.7}$Ba$_{0.25}$Nd$_{0.05}$MnO$_3$ material has been successfully synthesized by using sol-gel method. The result of Rietveld refinement analysis showed that all samples are cubic structure with space group Pm-3m. There was no significant change of its lattice parameter observed at different sintering temperature. The average crystallite size for XRD data with Scherrer’s equation and particle size increase with increase sintering temperature.

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References
“Effect of sintering temperature and grain size on the electrical transport properties of La$_{0.67}$Sr$_{0.33}$MnO$_3$ manganite,” Chemical Physics Letters, vol. 640, pp. 77–81, Nov. 2015.


[7] C. G. Ünlü, Y. E. Tanış, M. B. Kaynar, T. Şimşek, and Ş. Özcan, “Magnetocaloric effect in La$_{0.7}$Nd$_x$Ba$_{0.3}$MnO$_3$ (x = 0, 0.05, 0.1) perovskite manganites,” Journal of Alloys and Compounds, vol. 704, pp. 58–63, May 2017.
The Evaluation Model of Student Decision in Using Islamic Banking: Theory of Planned Behavior Approach

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Abstract. Research on consumer behavior has been focused more on service advertisements and so on. This study evaluates the customer decision model i using the TPB approach. The expected results from this study are first, making a decision model for the selection of Islamic banks among students by using the development of planned behavioral theory. Second is to find out whether Islamic bank selection behavior for activities is carried out with careful consideration or just following others, third is to find out the profile of potential customers of Islamic banks among University of Esa Unggul students. Using primary data by distributing questionnaires to respondents by using purposive sampling method. Data analysis using causality method using Structural Equation Modeling (SEM) and qualitative analysis is done by cross tab and mapping of respondents' answers to find out how the characteristics of potential customers of Islamic banks among students. The expected findings from the results of this study were the first evaluation of the decision model of the selection of Islamic banks among students at Esa Unggul University, the second factor which had the greatest influence in the decision on the selection of Islamic banks among students at Esa Unggul University Jakarta, the third to find out the profile potential customers of Islamic banks among Esa Unggul University students in Jakarta.

Keywords: Theory of Planned Behavior, Structural Equations Modelling, Sharia Banking, Student

1 Introduction

Indonesia is the largest Muslim population in the world, based on data from the Central Bureau of Statistics, the number of Indonesian Muslim population in 2012 was 207 176 162 people, equivalent to 87.18% of the total population of Indonesia. Regarding macroeconomics, Indonesia is a country with high economic growth. The average economic growth in Indonesia is 6.2%, in 2012 with a per capita income of $ 3,563. Indonesia is predicted to become one of the world leaders in 2020 with per capita income predicted to be more than $ 7,000.

A large number of Muslim population in Indonesia is not comparable with the development of the Sharia Economy in Indonesia. Based on Bank Indonesia's data in 2012 the capitalization of sharia banking assets in the new Indonesia 227.711 billion rupiahs while at the same time the capitalization value of conventional commercial banks is 4,716,845 billion rupiahs. Total public funds in Syar'iah Bank in Indonesia amounted to 3,411,188 billion
rupiahs in September 2013 while at the same time third-party funds in banks conventional general 3,520,890 billion rupiahs. The total funds collected by Shariah banking in Indonesia as of September 2013 is equivalent to 6.57% of the total funds that can be used in conventional public banking. The same thing also happened in Malaysia, based on the research by Ahmad and Sudin (2004) the number of funds from third parties for shari'ah banking was RM 31 million ringgit while for conventional banking at the same time the number of funds from third parties was RM 381 million ringgit. The amount of funds is from third parties in the syari'ah bank, only 10% of the total banking funds as a whole.

Some research on the factors that influence Muslims in choosing sharia banking results is contradictory. In general, the research focuses on personal behavior (internal) of the respondents about the decision to choose a Shariah bank. Research conducted by Elfachmi (2012) shows that religiosity background influences the degree of customer satisfaction and loyalty. Research conducted by Muhlis (2011) which divides the sample into three groups. The first group is the sample that saves at the Syari'ah bank solely for religious reasons. The second group is a sample that saves at Bank Syariah for reasons of religion and profits and the third is a bank customer from the non-Muslim group. The results show that the religiosity factor only affects the savings behavior for first group customers. This shows that some of the people claim to act rationally in saving, not seeing regarding religion but also on the profit side.

Research conducted by previous research shows that attitudes, subjective norms, perceived control, religiosity, income, education and age influence the intention to save at the Shariah bank. This study supports the results of previous research concerning customer selection criteria shows that the religious factor (Shariah Attribute Complaint attribute) is the first rank while the profitability factor is the second rank.

2 Literature Review

Behaviorists exist as a reaction to introspectionism which analyzes human behavior based on subjective reports that appear, as well as reactions to psychoanalysis theories that discuss the invisible subconscious. Behaviorism wants to analyze human behavior that appears and can be measured, described and predicted. According to Peter and Olson, translated by Diah Tantri Dwiandini said that behavior refers to consumers' physical actions that can be directly observed and measured by other parties.

Theory of Planned Behavior was developed by Ajzen in 1985; this theory is a development of the Theory of Reasoned Action, the model of the planned Behavioral Theory can be described as shown in Figure 1.
Human behavior is influenced by interest, while three factors influence this interest, the first is attitude towards behavior, the second is subjective norms adopted by individuals and the third is perceived behavior control which explains how individuals it can control its behavior.

Attitude towards behavior is a thorough evaluation of a person in behaving (Jogiyanto, 2007). Attitudes toward behavior are based on a belief in behavior that connects the interest to behave according to the expected results. Behavioral belief is a subjective probability of an individual that the behavior carried out will produce results as expected. Although each has many behavioral beliefs, few are easily accessed and explained at certain times. It is assumed that beliefs behave in combination with subjective values that are believed to affect attitudes toward behavior. The results of evaluation of the results of behavior by individuals contribute to determining attitudes in the proportion of subjective individual probabilities to give results as expected.

Belief can indicate an action or behavior, even though information about something that is believed to be unlimited is limited, but only some information is believed that can make certain attitudes and behavior. Attitude toward a behavior is the degree of positive or negative value of a behavior outcome. According to the expectation value model, attitudes toward behavior are determined by a combination of behavioral beliefs that are linked to various possible outcomes and other attributes, especially the magnitude of the confidence level provided and the weight of the results of the evaluation of the expected results.

The components of the planned behavioral theory are as follows:

### 2.1 Attitude toward Behavior

Attitude is an individual's internal component that is related to an object. Attitudes have an important role because they can determine what actions or behaviors an individual does without being influenced by factors outside the individual. Fishbein and Azjen define attitudes as the number of affections or feelings to accept or reject a particular object or behavior. Factors that influence behavior are:

1. Lifestyle
2. Knowledge
3. Price
4. Personal Experience
5. Mass Media

### 2.2 Subjective Norm

Subjective norms are a person's perception of the beliefs of others that affect interest in doing or not doing the behavior being considered (Jogiyanto, 2007). Normative beliefs about perceived behavior refer to how important the reference group is like a spouse, family or friends. Research conducted on doctors, supervisors or worker helpers will show different results. It is assumed that normative beliefs will be combined with the motivation of individuals to follow different references that will form the individual's subjective norms. In particular, the motivation to adhere to the reference group contributes directly to subjective norms. The influence of the reference group is equal to the subjective probability that the person referred will think about doing a certain behavior.
Subjective norms are social pressures felt by individuals to be involved or not involved in behavior. This subjective norm is external to the individual. This norm is the second determinant of intentions that relate directly to individuals or groups that become a reference in behaving. The subjective norm factor that is considered to influence interest in behaving is:
1. Family
2. Reference Group
3. Friend

The study conducted by Shah Alam and Sayuti (2011) stated that subjective norms have a positive effect on the intention to buy halal products. The results of this study were also strengthened by previous research which stated that subjective norms proxied by mutual commitment among friends had a positive effect on the intention to make purchases online.

Cheng and Chu (2014) in his study stated that subjective norms influence the intention to behave and actual behavior. Cheng and Chu also stated that the use of the theory of planned behavior is better than social cognitive theory to predict intention to behave.

2.3 Perceived Behavior Control

This behavior control is the ability of individuals to control themselves or refrain from certain behaviors. Behavioral control is determined by the control of beliefs about the existence of factors that can help or hinder behavior and the power to do or not do a particular behavior. Factors that influence control of behavior are:
1. Locus of Control
2. Personal Perception
3. Self Efficacy

Attitudes towards behavior, subjective norms, perception control influence and can explain the relationship to behavioral intentions. Individual intentions and self-assessment are the best predictors of individual behavior. Martin and Kulima (2004) show that the use of the theory of planned behavior with attitudes toward behavior variables, behavioral control influences students’ intention to play an active role in physics. The ability to explain its effect on dependent variables is 59%. The approach with the behavioral theory that is planned to explain the intentions of the results is better than the theory of self-efficacy

2.4 Intention Behavior

The intention to behave or intention to behave is a proposition that connects itself to the action that will come. The intention is a plan to perform actions or behavior specifically to achieve goals. Factors that influence behavioral intention are:
1. Referential Intentions
2. Preferential Intention
3. Exploratory Intentions

The intention in the theory of planned behavior is influenced by attitudes toward behavior, subjective norms and perception control. Intention also becomes a moderating variable on behavior variables. A previous study taking samples of students in Kenya shows that purchase intentions are influenced by attitudes toward behavior directly. While subjective norms and gender as moderating variables do not influence the purchase intention.

The results of the previous research show that attitudes toward behavior proxied by risk perception, value perception and subjective norm variables influence interest. Intention variables affect actual behavior

Some studies of the low intention of Muslim communities to utilize Islamic banks in particular or sharia-based investments in Indonesia, the first is the lack of understanding of the
community about sharia-based activities and cannot distinguish the concept of sharia investment with conventional investments. Secondly, there is no special treatment for Islamic banking in business competition, the limited number of capital owned by Islamic banks makes it difficult to face business competition.

Studies in Islamic banking can be grouped into two groups. The first category is the study from the internal side of sharia banking itself. This study includes the implementation of the promotional mixes such as promotional advertisements and so on, as well as performance such as the size of the profit ratio for customers or the services provided by Islamic banking to its customers. Research conducted by Siddiqui (2007) criticized the lack of attention of the government, especially in Muslim countries and the lack of serious Islamic banking itself in promoting the community to develop Islamic banking with the concept of profit sharing. This lack of knowledge, especially for prospective customers, creates a low intention of the community to invest/save in Islamic banks.

Maski (2012) shows that service variables and trust in banks have the greatest influence on consumer decisions in using Islamic banking. The results of this study are the same as the results of Astuti et al. (2012) and friends of the BRI Syariah Cab. Surakarta which shows that service quality is a major factor in the selection of Islamic banks. The implications of the results of the two studies show that sharia banking consumers in Indonesia want the quality of Islamic banking services to be the same as conventional banking. The normal consequence of the results of the study is clear that the policy of sharia banking marketing in Indonesia replicates from conventional banking marketing policies and strategies.

The second research on Islamic banking emphasizes the psychological aspects of customers. This assumes that for Muslims investing both in the banking sector and in the capital market is not solely seeking profit but rather towards halal investment. This is what causes the religious factor to be very dominant for Muslim investors. Customer psychology approach becomes very important to be highlighted by Islamic banking in attracting potential investors/customers. By changing its marketing strategy, it is expected that Islamic banking not only increases the number of customers but also creates loyal customers.

Previous research conducted a study of 350 customers from 5 Islamic banks in Pakistan, and the results showed that attitudes toward Islamic banking would affect service quality and satisfaction which in turn will increase customer’ trust and loyalty of sharia banking customers. The results of this study were reinforced by research of banking customers in Malaysia conducted by Asjraf Wajdi Dasuki and Nurdianawati Irwani Abdullah about the decision of customers to use Islamic banking, the results show that the most influential factor is customer satisfaction which is strongly influenced by the quality of bank services in this case including how Islamic banks treat their customers. From the two studies above it is clear that investment behavior is strongly influenced by factors within the investor (internal) and from outside the investor (external / Islamic bank).

Research on investor behavior in Indonesia conducted by Elfachmi (2012) shows that the religiosity background influences the degree of satisfaction and degree of customer loyalty. Research conducted by Muhlis (2011) who divided the sample into three groups. The first group is a sample that saves in a Sharia bank solely for religious reasons. The second group is a sample that saves at Bank Syariah for religious reasons and profits, and a sample of the third group is a bank customer from a non-Muslim group. The results show that religiosity factors only affect saving behavior for first group customers. This shows that some of the Muslim community behaves rationally in saving, not only regarding religion but also in profit, and it can be concluded that among Muslims in Indonesia there are still differences in perceptions of Islamic banks.
Previous research shows that attitudes, subjective norms, perceived control, religiosity, education income and age affect the intention to save in Islamic banks.

3 Research Methodology

3.1 Type and Design of Research

The type of research used is explanatory research with non-experimental research designs, explaining the causality relationship between dependent/indigenous variables (Y). The dependent variable is the behavior of choosing Islamic banks with independent variables of intention to behavior, attitudes toward behavior, subjective norms, control of perceived behavior as independent/exogenous variables (X).

This study describes the behavior of customers to make decisions by answering questions asked in the questionnaire to perceive their behavior. The research method used is a survey method, by collecting respondents' data to explain, comparing their knowledge, intentions or behavior. By using primary data which is done by distributing questionnaires to respondents.

3.2 Analysis Unit

The unit of analysis is the group or group members who are examined in the study. In this study, the unit of analysis was students from Esa Unggul University students in Jakarta

3.3 Types and Sources of Data

The source of data in this study is primary data, by collecting data directly by distributing questionnaires to respondents. Data in the form of opinions, attitudes, experiences, behaviors or characteristics of respondents individually. This data is quantified by changing into a Likert scale.

3.4 Population, Sample and Sampling Technique

a. Population.
   The population is a set of research objects with the same characteristics. Population In this study were Esa Unggul University Students in Jakarta.

b. Research Sample.
   The research sample is part of the population taken to be used as respondents. A sample survey is a procedure to retrieve and determine the part of the population that will be examined by its characteristics (Cooper et al. 2006). According to Heir and friends (1998), the number of samples is 5-10 x the number of indicators. While according to Ferdinand (2003) using Maximum likelihood estimation (MLE), the number of samples needed is 100-200 respondents. In this study, the number of samples used was 150 respondents.

c. Sampling technique.
   The sampling technique in this study uses non-probability sampling, this technique is used if the population is not known, or the criteria of the research subject have been determined in advance (Sekaran and Bougie, 2016), with a purposive sampling method of sampling techniques that are non-probability sampling using criteria certain to facilitate the sampling process. The criteria used for the sample in this study are:
   1) Active Esa Unggul University Students at Even Semester 2016/17 Academic Year.
   2) Moslems.
3) Being at the location when distributing questionnaires

3.5 Research Model

The research model used in this study is as shown in Figure 2.

![Research Model Diagram]

Figure 2. Research model

3.6 Data Analysis Methods

1. Analysis of Validity and Reliability
   This study uses secondary data, so before the research is carried out, it is necessary to test the validity and reliability.

2. Validity Test
   Validity test is used to test whether the questionnaire used can measure data validity or not. The validity test uses product moment correlation

   \[
   r_{XY} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}
   \]

   Where
   - N = Amount of Data
   - X = independent variable.
   - Y = variable depends
   Data is valid if the results of data analysis show $\text{Sig} \leq \alpha$, or vice versa. The level of confidence used is 95%.

3. Reliability Test
   Reliability tests are used to test the stability and consistency of questionnaires to predict parameters based on concepts/theories (Sekaran and Bougie, 2016). Reliability testing of this questionnaire uses Cronbach Alpha.
CA = Cronbach's Alpha coefficient.
K = number of questions in items
Sigma b squared = question variance
Sigma t squared = total variance
Data is reliable if the results of data analysis are more than 0. 615 (≥0.615)

4. Cross Tab
   Make a tabulation and mapping answers from respondents to then conclude the tendency of respondents' answers. From the demographic data, respondents can be influenced by the tendency of the respondent's behavior.

5. Quantitative Analysis
   Quantitative analysis is carried out using SEM (Structural Equation Modeling). To test the hypothesis of the effect of the independent variable on the dependent variable. The results of the regression equation that are expected later are as follow.

Model 1
\[ Z = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + \ldots \ldots + b_{11} X_{11} + \varepsilon \]

Savings intention (Z) is influenced using Attitudes towards behavior proxied by:
1) Degree of benefit (X1)
2) Risk Degrees (X2)
3) Degree of Religiosity (X3)
4) Bank services (X4)
5) Bank advertisement (X5).

Subjective norms proxied by:
1). Family influence (X6).
2). Friend influence (X7).
3) Influence of religion leaders/ulama (X8).
4). Influence of mass media (X9).

Perceived behavioral control proxied by:
1). Internal self-control (X10).
2). External / controllability control (X11).

\[ Y = a + b_{10} X_{10} + b_{11} X_{11} + b_{12} Z + \varepsilon, \]

The decision of saving behavior (Y) is influenced using Perceived behavioral control proxied by:
1) Internal self-control (X10).
2) External / controllability control (X11).
3) Intention to save (Z).

3.7 Definition of Operational Variables and Variable Measurements
   This study uses variables and measuring instruments as follows.
1. Attitude towards Behavior

Attitudes toward behavior can be interpreted as positive or negative beliefs and feelings, as a result of evaluation if individuals do or do not do the desired behavior (Jogiayanto, 2007). According to research by Zhang et al. (2015) attitudes towards this behavior are influenced by environmental knowledge and moral obligation.

In this study attitudes toward behavior were proxies with:
1) Knowledge of the benefits of saving (investment) in a bank as X1.
2) Knowledge about risk saving in the bank as X2.
3) Degree of Religiosity. This aspect measures the investor's understanding of the investment concept in sharia as X3.
4) Bank services. Measuring how important aspects of the service of Islamic banks according to customer perception (X4).
5) Bank advertising. How much advertising is done by Islamic banking in influencing the attitudes of customers (X5)

2. Subjective Norms

Subjective norms are social norms adopted by individuals that will influence their behavior. The form of subjective norms is social pressure to do or not do something. In this study, subjective norms are proxied by:
1) Friend's opinion as X6.
2) Family income as X7.
3) The approach of religious leaders (ulama / religious leaders) as X8.
4) Information from Mass Media (X9)

3. Perceived Behavior Control

Perceived behavioral control can be interpreted as the ease or difficulty of an individual to control his perception of behavior. According to Ajzen, there are two factors in perceived behavioral control, namely factors from the individual's internal or self-efficacy and factors outside the individual or locus of control. In this study perceived behavioral control was proxied by:
1) Internal control or self-efficacy (X10)
2) External Control or locus of control (X11)

4. Behavioral Intention or variable Z

Intention can be interpreted as a desire to conduct behavior. This intention is not static but can change over time.

Intention to behavior is a function of control of behavior, attitudes toward behavior and subjective norms. According to Chiffman and Kanuk in Riska Septifani et al. (2014) the intention to buy is a psychological feeling that arises because of feelings (affective) and mind (cognitive) of the goods or services that you want to buy.

This intention variable became an intervening variable at the time of analysis between attitude variables, subjective norms and perceived control of behavioral variables.

5. Behavior or Variable Y

Behavior is a function of intentions towards behavior, attitudes, subjective norms and perceived behavioral control. Intention to strong behavior will encourage the emergence of strong behaviors as well. According to the previous research results, there is a positive and very strong correlation between intentions and recycling behavior.
All data in this study are measured ordinal scale, where the answers from the respondents are assumed by using a linkers scale. This study used an error of 5% ($\alpha = 0.05$), or the confidence level used was 95%. Hypothesis testing is done using a two-sided test (two tails).

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References

Performance Comparative Analysis Boyer Moore, Horspool, Zhu Takaoka Algorithms on the Indonesian Translation Hadith Bukhori

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Abstract. Along with the times, technological advances are increasing, especially information technology. This encourages the emergence of new innovations in the presentation of digital information. String matching (string matching) is a necessity in presenting information, especially in text search. Therefore, a string matching algorithm is needed which is used to search for one or more strings in a set of strings (text). This research was conducted to compare the performance of several String Matching Algorithms, such as Boyer Moore, Horspool, and Zhu Takaoka Algorithms in the string search process. To assess the performance of the algorithm, this study uses runtime parameters and memory consumption. Both parameters must have the smallest possible value to get the best performance value. The input parameters in this study are several characters and a number of words divided into several scenarios and outputs from this research are runtime and memory consumption. Both parameters are calculated using the Exponential Comparison Method (MDE) to find out the best results. The final result of this study shows that the Boyer Moore algorithm shows the best memory consumption and the Zhu Takaoka Algorithm produces the best runtime. And the calculation results Rank Exponential Comparison Method The algorithm shows Boyer Moore in the first position, then Horspool, and Zhu Takaoka in the last position.

Keywords: Algorithm Analysis, Boyer Moore Algorithm, Horspool Algorithm, Zhu Takaoka Algorithm, Runtime, Memory Consumption, Simulation Method.

1 Introduction

Every religion has its own guidelines in giving instructions to its adherents. As with the religion of Islam, the Qur'an is a guide to living life in the world and in the hereafter. In addition to the Al-Qur'an, Islam also has a Hadith as a source of law that has a second position in the source of Islamic religion after the Qur'an. Therefore, the Hadith must be believed by Muslims, because the hadith is the words and deeds of the Prophet Muhammad that can be used as a foundation.

In addition to creating innovation in the presentation of information, string matching (string matching) becomes a necessity in information processing, especially in text search. So that by using one or more keywords from the contents of the hadith, can quickly obtain information about the hadith. Therefore, a string matching algorithm is needed which is used
to search for one or more strings in a set of strings (text). Algorithm is a systematic arrangement of steps to resolve a problem [1].

According to Kurniadi, a good algorithm is a step that produces an effective output in a relatively short time and memory usage is relatively little (efficient) with finite steps and the procedure ends either in a situation obtained by a solution or there is no solution. Algorithms for string search have been growing day by day. String search algorithms are considered to have the best results in practice, namely algorithms that move to match strings from right to left. The Boyer-Moore algorithm is one example of an algorithm that uses directions from right to left [2].

In a journal entitled Implementation of the Zhu-Takaoka Algorithm on the Android-Based Music Terms Dictionary Application explains that the Zhu-Takaoka Algorithm is a development of the Boyer-Moore Algorithm. [3] In addition, in the journal entitled Comparison of the Use of the Boyer-Moore Algorithm and Horspool Algorithm on String Search in Media Language explained that the Horspool Algorithm was a distinction from the Boyer-Moore Algorithm, because the results of a researcher named R. Nigel Horspool suggested the added idea of the Algorithm Boyer-Moore [4].

So the author makes a study that discusses the performance of the Boyer Moore Algorithm and the development of the algorithm, namely the Horspool Algorithm and the Zhu Takaoka Algorithm on the Indonesian translation of the hadith repository with the case study of Bukhori Hadith. After that, the author will compare the performance of the three algorithms when doing the word search process based on the processing time speed in one process (runtime) and the amount of memory (memory consumption) used. In addition, the author will present the exactness of the word sought in the processing of each algorithm. Therefore, the author gives the title of this study "Comparative Analysis of Boyer Moore, Horspool, and Zhu Takaoka Algorithms on Indonesian Translation Hadith Bukhori Repository".

2 Related Works

There are four studies used in this study. First, research conducted by Ditya Geraldy, Eko Sediyono, and Yos Richard (2016) conducted a search for three String Matching Algorithms, namely Brute Force Algorithm, Knuth Morris Pratt Algorithm, and Boyer Moore Algorithm to find text errors based on Android with time as parameters [5]. Furthermore, the second study, namely research conducted by Alwin Fau, Mesran, and Guidio Leonarde (2017), they conducted a study comparing Boyer Moore Algorithm and Knuth Morris Pratt Algorithm (KMP) using the exponential select (MPE) method. The calculation that becomes the criterion of the MPE is the amount of memory used and the amount of time needed from each process [6]. The third study, namely the research conducted by Adhi Kusnadi and Abraham Khrisnandi Wicaksono (2017), they analyzed the Horsewater Algorithm accurately and Zhu-Takaoka on searching desktop-based strings by measuring the performance of the two algorithms. The performance used is time in searching patterns in text files [7]. The last is research, conducted by Handrizal, Andri Budiman, Desy Rahayu (2017), they do an accurate analysis of the Zhu Takaoka Algorithm and the Knuth Morris Pratt Algorithm that is implemented in the dictionary based on android with time as a parameter processing. By performing performance measurements, it can be used measurements that can be used, and the accuracy of the words searched in one process from each algorithm. Android with times as parameter processing [8]. The last research, we use Repository developed by Atqia Aulia, et.al (2017), WatsaQ : Repository of Al hadith in Bahasa (Case Study: Hadith Bukhori)[9] [11].
3. Simulation Method

In this research, we use simulation method which consists of: problem formulation, conceptual model, input/output data, modelling, simulation, verification and validation, experimentation. [10]

3.1 Problem Formulation

After collecting data through literature study, the writer can formulate a problem, namely performance comparison analysis on the use of Indonesian translation of hadith repositories using Boyer Moore Algorithm, Horspool Algorithm, and Zhu Takaoka Algorithm. This aims to provide a better solution in the matching string process in the repository.

3.2 Conceptual Model

At this stage, the author makes the concept model which is classified into two, namely the first is the internal concept of the Boyer Moore, Horspool, and Zhu Takaoka algorithms, the second is the concept of the simulation process. The first concept describes an example of a search that occurs in the internal process of the Boyer Moore Algorithm and the Boyer Moore-Horspool Algorithm manually in a word. For the second concept, it explains how the first concept is packaged based on the formulation of the problem generated from the previous stage into a simulation that will be carried out later. In this case, the author describes the flow of the word search process that will be run to get the calculation of the processing time involved in the process of matching strings and data retrieval processing time.

3.3 Input / Output data

The next step is to determine which input will be processed and the output to be obtained. The input needed in this simulation is the hadith keyword that you want to look for in the repository. The output obtained in this simulation is the contents of the hadith, runtime data memory consumption, and the accuracy of the searched word.

3.4 Modeling

At this stage, the author determines the scenario model to be used in the simulation phase. There are four scenario models based on a combination of four data values inputting the size of the pattern. Each algorithm is good for the Boyer Moore Algorithm, Horspool Algorithm, and the Zhu Takaoka Algorithm, each of which carries out four scenarios.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Range of Characters</th>
<th>Output</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-10 Characters</td>
<td>Runtime, Memory Consumption, Accuracy</td>
<td>Wahyu</td>
</tr>
<tr>
<td>2</td>
<td>10-20 Characters</td>
<td>Runtime, Memory Consumption, Accuracy</td>
<td>Umar Bin Khatab</td>
</tr>
<tr>
<td>3</td>
<td>20-30 Characters</td>
<td>Runtime, Memory Consumption, Accuracy</td>
<td>Tanda-Orang Munafik</td>
</tr>
</tbody>
</table>
3.5 Simulation

At this stage, the system will be run to simulate the performance of each algorithm according to the concept and also the predetermined scenario. And the simulation results will be recorded and then the verification phase will be carried out.

3.6 Verification and Validation

At this stage, the author verifies and validates the simulation that has been carried out in the previous stage. Verification is done to ensure that there is an error (error) that occurs when calculating the processing time in Boyer Moore, Horspool, or Zhu Takaoka Algorithms while validation is done to ensure the suitability of the simulation based on the concept model with the formulation of the problem that has been made. If the validation is not fulfilled, then the writer returns to the stage of the concept model to create a new fronting model.

3.7 Experimentation
At this stage, the author conducts experiments according to the scenario model created during the modeling stage. Each scenario model is carried out each experiment four times in each algorithm.

- **Scenario 1**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>RunTime (s)</td>
<td>0,158</td>
<td>0,084</td>
<td>0,138</td>
</tr>
<tr>
<td>Memory</td>
<td>110,22</td>
<td>115,96</td>
<td>110,13</td>
</tr>
<tr>
<td>Consumption (kb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

- **Scenario 2**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>RunTime (s)</td>
<td>0,118</td>
<td>0,086</td>
<td>0,052</td>
</tr>
<tr>
<td>Memory</td>
<td>110,19</td>
<td>115,95</td>
<td>110,01</td>
</tr>
<tr>
<td>Consumption (kb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

- **Scenario 3**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>RunTime (s)</td>
<td>0,114</td>
<td>0,098</td>
<td>0,12</td>
</tr>
<tr>
<td>Memory</td>
<td>110,14</td>
<td>115,91</td>
<td>110,05</td>
</tr>
<tr>
<td>Consumption (kb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

- **Scenario 4**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>RunTime (s)</td>
<td>0,112</td>
<td>0,106</td>
<td>0,108</td>
</tr>
<tr>
<td>Memory</td>
<td>110,13</td>
<td>115,98</td>
<td>110,04</td>
</tr>
<tr>
<td>Consumption (kb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

- **Scenario 5**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>RunTime (s)</td>
<td>0,112</td>
<td>0,106</td>
<td>0,108</td>
</tr>
<tr>
<td>Memory</td>
<td>110,13</td>
<td>115,98</td>
<td>110,04</td>
</tr>
<tr>
<td>Consumption (kb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
### Scenario 6

**Table 7. Scenario 6**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool l</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runtime (s)</td>
<td>0,106</td>
<td>0,106</td>
<td>0,084</td>
</tr>
<tr>
<td>Memory Consumption (kb)</td>
<td>110,13</td>
<td>115,98</td>
<td>110,04</td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Scenario 7

**Table 8. Scenario 7**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool l</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runtime (s)</td>
<td>0,094</td>
<td>0,114</td>
<td>0,136</td>
</tr>
<tr>
<td>Memory Consumption (kb)</td>
<td>110,05</td>
<td>115,8</td>
<td>109,97</td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Scenario 8

**Table 9. Scenario 8**

<table>
<thead>
<tr>
<th>Output</th>
<th>Boyer Moore</th>
<th>Horspool l</th>
<th>Zhu Takoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runtime (s)</td>
<td>0,072</td>
<td>0,12</td>
<td>0,104</td>
</tr>
<tr>
<td>Memory Consumption (kb)</td>
<td>109,98</td>
<td>115,74</td>
<td>109,89</td>
</tr>
<tr>
<td>Accuracy (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### 3.8 Output Analysis

In this last stage, the researcher analyzed the outputs and simulations carried out at the time of experimentation. The output is represented in the form of tables and graphs that state the value of processing time (runtime), the memory used (memory consumption), and the accuracy (accuracy) of each algorithm at the time of each scenario. The final discussion will discuss the overall analysis of the results of all simulation scenarios. In addition, the analysis discusses the relationship between input data values and the influence of each variable. The output of the scenario will be calculated with the Exponential Comparison Method.
- The process of calculating the total value in the 1st process:
  Boyer Moore Value = \((0,158)^{0.5} + (110,22)^{0.5}\)
  = 0.397492 + 10,49857
  = 11,0583
  Horspool Value = \((0,084)^{0.5} + (115,96)^{0.5}\)
  = 0.289828 + 10,768473
  = 10,89606
  Zhu Takaoka Value = \((0,138)^{0.5} + (110,13)^{0.5}\)
  = 0.371484 + 10,49428
  = 10,86577

- The process of calculating the total value in the 2nd process:
  Boyer Moore Value = \((0,118)^{0.5} + (110,19)^{0.5}\)
  = 0.343511 + 10,49714
  = 10,84065
  Horspool Value = \((0,086)^{0.5} + (115,95)^{0.5}\)
  = 0,293258 + 10,768008
  = 11,06127
  Zhu Takaoka Value = \((0,052)^{0.5} + (110,01)^{0.5}\)
  = 0,228035 + 10,48857
  = 10,7166

- The process of calculating the total value in the 3th process:
  Boyer Moore Value = \((0,114)^{0.5} + (110,14)^{0.5}\)
  = 0,337639 + 10,49476
  = 10,8324
  Horspool Value = \((0,098)^{0.5} + (115,91)^{0.5}\)
  = 0,31305 + 10,766151
  = 11,0792
  Zhu Takaoka Value = \((0,12)^{0.5} + (110,05)^{0.5}\)
  = 0,34641 + 10,49047
  = 10,83688

- The process of calculating the total value in the 4th process:
  Boyer Moore Value = \((0,112)^{0.5} + (110,13)^{0.5}\)
  = 0,334664 + 10,49428
  = 10,82895
  Horspool Value = \((0,106)^{0.5} + (115,98)^{0.5}\)
  = 0,325576 + 10,769401
  = 11,09498
\[
\text{Zhu Takaoka Value} = (0,108)^{0.5} + (110,04)^{0.5} \\
\quad = 0.328634 + 10.49 \\
\quad = 10.81863
\]

- The process of calculating the total value in the 5th process:
  \[
  \text{Boyer Moore Value} = (0,106)^{0.5} + (110,06)^{0.5} \\
  \quad = 0.325576 + 10.49095 \\
  \quad = 10.81652
\]

  \[
  \text{Horspool Value} = (0,106)^{0.5} + (115,84)^{0.5} \\
  \quad = 0.325576 + 10.762899 \\
  \quad = 11.08848
\]

  \[
  \text{Zhu Takaoka Value} = (0,084)^{0.5} + (109,97)^{0.5} \\
  \quad = 0.289828 + 10.48666 \\
  \quad = 10.77649
\]

- The process of calculating the total value in the 6th process:
  \[
  \text{Boyer Moore Value} = (0,094)^{0.5} + (110,05)^{0.5} \\
  \quad = 0.306594 + 10.49047 \\
  \quad = 10.79707
\]

  \[
  \text{Horspool Value} = (0,114)^{0.5} + (115,8)^{0.5} \\
  \quad = 0.337639 + 10.761041 \\
  \quad = 11.09868
\]

  \[
  \text{Zhu Takaoka Value} = (0,136)^{0.5} + (109,97)^{0.5} \\
  \quad = 0.368782 + 10.48666 \\
  \quad = 10.85544
\]

- The process of calculating the total value in the 7th process:
  \[
  \text{Boyer Moore Value} = (0,09)^{0.5} + (110,02)^{0.5} \\
  \quad = 0.3 + 10.48904 \\
  \quad = 10.78904
\]

  \[
  \text{Horspool Value} = (0,118)^{0.5} + (115,78)^{0.5} \\
  \quad = 0.343511 + 10.760112 \\
  \quad = 11.10362
\]

  \[
  \text{Zhu Takaoka Value} = (0,11)^{0.5} + (109,94)^{0.5} \\
  \quad = 0.331662 + 10.48523 \\
  \quad = 10.81689
\]

- The process of calculating the total value in the 8th process:
  \[
  \text{Boyer Moore Value} = (0,072)^{0.5} + (109,98)^{0.5} \\
  \quad = 0.268328 + 10.48713 \\
  \quad = 10.75546
\]
Horspool Value  = (0,12)^{0.5} + (115,74)^{0.5} \\
= 0.34641 + 10,758253 \\
= 11,10466

Zhu Takaoka Value  = (0,104)^{0.5} + (109,98)^{0.5} \\
= 0.32249 + 10,48284 \\
= 10,80533

- Calculate the priority value of the decision
  Total Value Boyer Moore  = 10,89606 + 10,84065 + 10,8324 + 10,82895 + 10,81652 + 10,79707 + 10,78904 +10,75546 \\
  = 86,55015

  Total Value Horspool= 11,0583 + 11,06127 + 11,0792 + 11,09498 + 11,08848 + 11,09868 + 11,10362 + 11,10466 \\
  = 88,68919

  Total Nilai Zhu Takaoka  = 10,86577 + 10,7166 + 10,83688 + 10,81863 + 11,08848 + 10,85544 + 10,81689 + 10,80533 \\
  = 86,80402

- Determine Results or Priority Decisions
  After obtaining the final value or total value of each alternative, the next step that needs to be done is to determine the priority of the decision based on the value of each alternative. The results of priority decisions can be seen in the table below:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boyer Moore Algorithm</td>
<td>86,55015</td>
<td>1</td>
</tr>
<tr>
<td>Zhu Takaoka Algorithm</td>
<td>86,80402</td>
<td>2</td>
</tr>
<tr>
<td>Horspool Algorithm</td>
<td>88,68919</td>
<td>3</td>
</tr>
</tbody>
</table>

From the results of calculations using the Exponential Comparison Method, it can be seen that the most effective algorithm with runtime parameters and memory consumption is the Boyer Moore Algorithm. Next, the second position is the Zhu Takaoka Algorithm and the last position is the Horspool Algorithm. However, each of these algorithms has their advantages and disadvantages. From the performance analysis that the author has done, for runtime parameters, Boyer Moore Algorithm is the best algorithm used for word search with a large number of characters, while Horspool algorithm is the best algorithm used if you want to find words with a small number of characters.

For memory consumption parameters, the more characters are searched, then each algorithm will need less memory. However, from the results of the analysis that the author has done, the smallest memory consumption is the Zhu Takaoka algorithm and is followed by the Boyer Moore algorithm.

### 4 Conclusion
The results of the comparison of the Boyer Moore Algorithm, Horspool Algorithm, and Zhu Takaoka Algorithm in the Indonesian hadith translation repository using a simulation method consisting of problem formulation stages, conceptual models, input and output data, modeling, simulation, verification and validation, experimentation, and output analysis and after calculating with the Exponential Comparison Method (MPE) with runtime and memory consumption parameters shows that the Boyer Moore Algorithm has the best value, followed by the Horspool Algorithm and finally the Zhu Takaoka Algorithm.

5 Suggestion

1. The algorithm used or compared can be added with other String Matching algorithms, such us Turbo-Boyer Moore or Tuned-Boyer Moore
2. To find out the broader comparative results can use a programming language different from the implementation to other objects than the author uses.

Acknowledgements. This paper in conjunction with The 1st International Conference on Islam, Science and Technology (ICONIST 2018) in Malang, East Java.

References

[8] Handrizal, dkk.2017. analysis of the Zhu Takaoka Algorithm and the Knuth Morris Pratt Algorithm that is implemented in the dictionary based on android with time as a parameter.
Talaqqī-Musyāfahah in Technology Based Learning
Al-Qur'an Reading

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Abstract. Talaqqī-Musyāfahah is a key requirement in learning the Quran. Talaqqī-Musyāfahah means the teacher and students must be through face-to-face meetings so that the teacher could clearly know the mouth of the students when reciting verses of the Quran. The culture of Talaqqī-Musyāfahah has existed since the time of the Prophet (PBUH). This culture has continued for generations until the time of the ulema (Muslim scholars) of the Qur'an. the transmission of the Quran is carried out under strict supervision so that the teacher is very responsible for the correctness of the pronunciation of students when reciting the Quran. However, this culture has begun to erode following the developments of science and technology. Consequently, internet access makes ones easily in learning to recite the Quran. This has in turn resulted in a decrease in the willingness of those willing to meet the teacher, finally, someone prefers to build a self-directed learning in dealing with the Qur'an without the Talaqqī-Musyāfahah. This article will explore several internet programs related to learning the Qur'an and its tajwid rules. In addition, it will also evaluate the culture of the community in learning the Qur'an through the internet without Talaqqī-Musyāfahah, including its impacts. The main purpose of this article is to prove that technological offerings related to learning the Quran could not deny the importance of Talaqqī-Musyāfahah between the teacher and students. This research is important because it will help open up the public insight. That the internet is only a tool to facilitate any learning process. However, the Quran recitation must be shown to the teacher through face-to-face meetings to be corrected.

Keywords: Talaqqī-Musyāfahah, Transmission, Science and Technology

1 Introduction

Learning is a two-way communication process. Teaching is done by teachers as educators and people who are taught as students. Likewise the learning of al-Qur'an reading requires educators and students. The Prophet Muhammad as the first person to receive the revelation of the Koran has provided an example of the learning process of reciting the Koran. History has noted that God as the owner of the Qur'an delegates the angel Gabriel to become a "teacher" who corrects the Qur'anic recitation of the Prophet Muhammad. This is recorded in a narration of Imam Bukhari;

"Ibn Abbas said about the word of God," Do not move your tongue in reading the Qur'an in a hurry. "Ibn Abbas said, that the Messenger of Allāh tried to overcome difficulties when receiving revelation, by moving his lips. Ibn Abbas said, "I moved my two lips before you as the Prophet moved his lips," then the verse of
the Qur’an comes down, "Do not move your tongue in reading al-Qur’an in a hurry, in fact We have collected it (the Qur’an) "He said," Allah has gathered the Qur’an in your heart and read it. "Allah said," If We recite the Qur’an follow the reading. "Or" listen and be quiet, "God said." Then We are the only to give the explanation, "then you read it to us (the Qur’an). Rasulullah SAW, when Gabriel visited him, listened carefully; then when Gabriel left, he read it as Gabriel read."

The position of the angel Gabriel as a listener and the Prophet Muhammad as a person who was listened to in the history led to a learning theory of al-Qur’an reading which requires a meeting between the instructor and the learner. This learning method continues from generation to generation, namely someone who learns to read the Qur’an must have a teacher. The Companions studied with the Prophet Muhammad, the Tabi’in studied with the Companions and followers of the tabi’inwith the tabi’in. So on, the Kiai (teachers) taught their students, to become Kiai, and then taught their students, so that there were scientific networks between teachers and students.†

This tradition has also been entrenched in Indonesian society. However, along with the advancement of science and technology, the method of learning to read the Koran is also increasingly sophisticated. Through the internet network that can be accessed in computers or even cellphones, one can easily find material or theories of learning to read the Koran. One example of the Qur’an learning program through technology includes:

1. Quantum Reading Qur’an by Ust. Abu Rabbani. Easy learning to read the Qur’an method "AYU AYUN MANNATHAHAN" (focus on Mad Thabi’i and Ghunnah learning) watched 707,002 times, uploaded on June 14, 2016.³

2. Learn to Read the Qur’an with the correct Tajweed by Ust. Ahmad FaridHasan. This learning only exemplifies reading al-Syamsiyah surah. Watched 2,267,469 times, uploaded on December 7, 2016.⁴

3. Learning Techniques and Tricks to Read Al-Qur’an correctly The "Al-Nur" method by Ust. H. Muammar Z. A. This method uses Arabic numerals. Watched 16,856 times, uploaded on February 2, 2018.⁵

4. An easy way to recite al-Qur’an by Ust. Yudi Imana. An easy method of reading the Qur’an which is introduced in the form of software. This application has been watched more than one thousand fifteen hundred times.⁶

Some programs on YouTube about learning to read the Qur’an provide theories of recitation of makhārij al-ḥurūf, the law of reading nūn sukūn and tanwīn, the letters rā’, and so on. Programs like this can be used by anyone who wants, both academic and non-academic, both young and old. Thanks to this technological advancement, someone who wants to learn to read the Qur’an is simply to sit in front of a computer or hold a cellphone, without having to go to a particular place with a particular teacher.

This is a phenomenon that nowadays occurs in this country. Learning al-Qur’an like this is so comfortable that it is not realized that it has eliminated the two main conditions exemplified by the Prophet Muhammad, namely Talaqqi and Musyāfahah. Talaqqi (meeting) means that the Al-Qur’an learning process requires meetings between teachers and students.

---

However, only a meeting is not enough, so it must be equipped with Musyāfahah. That is, a teacher must be able to see clearly the mouth or oral of the student so that the teacher can correct each mistake directly. This is the problem which will be examined. The religious spirit of the Indonesian people that seems to be increasing should be directed properly. This study will explore several learning programs for reading the Koran on YouTube, especially those visited a lot. Do these programs allude to the importance of Talaqqī-Musyāfahah? Is there an offer to learn to read al-Qur'an based on technology but still pay attention to the Talaqqī-Musyāfahah?

2 Methodology

This type of research is library research, because the object of this research is a video that spreads among the community through social networking namely YouTube. The research steps that will be carried out are:

First, browsing some videos spread on YouTube social networks related to the learning process of al-Qur'an reading. There will be more searches on information circulating on the internet network related to YouTube videos.

Second, analysis on the search results using descriptive qualitative methods or approaches with semiotic analysis. The paradigm used is being critical with data collection techniques from YouTube videos.

Aims

This study aims first to categorize the learning program for reading al-Qur'an on YouTube, in terms of material. Second, to provide technology-based solutions but still with Talaqqī-Musyāfahah.

3.1 Talaqqī-Musyāfahah in The Era of Prophet Muhammad

The ability of the Prophet Muhammad to read the Qur'an did not come suddenly, but through processes or stages. This process has been recorded in QS. al-Qiyamah verses 16-19:

"Do not you (Muhammad) move your tongue (to read the Qur'an) because you want to quickly (master) it. Verily We will gather it (in your heart) and read it. If we have finished reading it then follow the reading. Then verily We will explain it."

This group of verses explains the process of accepting the Qur'anic verses from Allah through the angel Gabriel to the Prophet Muhammad. There are six (6) educational values contained in those verses; first, there are teachers and students. This is reflected in God's communication (through Gabriel) as a teacher to the Prophet Muhammad as a disciple. The occasion of this verse is that when the angel Gabriel delivered several verses of the Qur'an to the Prophet Muhammad, spontaneously the Prophet Muhammad moved his tongue to mimic the verses of the Koran recited because he was afraid of forgetting. So, Allah reprimanded the Prophet Muhammad not to spontaneously imitate Gabriel's words. This is the main function of the teacher's presence in the learning process, including learning to read the Qur'an. a teacher can directly reprimand his student if there is a mistake. This is what talaqqī means, literally translated with meeting. Therefore, learning to read the Koran without the presence of a teacher in front of him is not the process of learning the Koran recommended by the Prophet Muhammad.
Second, the teacher can clearly see the oral of the student. There is no slightest barriers that cover the face of the student and the face of the teacher, so the teacher can exemplify the way to read the verses of the Qur'an including how to pronounce the letters one by one in the verses.

Likewise students can easily see the oral of the teacher, then practice properly and correctly. Therefore, the process of reading the Qur'an in which there is something that hinders the oral of the teacher or student is not a learning process recommended by the Prophet Muhammad. This is what is called Musyāfahah, meaning that they each can see other's oral.

Third, there is patience, not being in a hurry. This attitude is also reflected in the verses. When the Prophet Muhammad recited the verse of Al-Qur'an by Gabriel, he hurriedly recited it by moving his mouth to imitate the teacher's words. With great compassion, God also rebuked the Prophet Muhammad, his disciple. Patience from the teacher or student is needed in the learning process, including learning to read the Qur'an. The tendency of the instantaneous modern society cannot be applied when they learn the Qur'an. Through this patience the teacher calmly delivers the material, as well as students can easily calm and comfortably receive little by little material from the teacher. Thus, the instant and hasty learning process of the Qur'an is not the learning modeled by the Prophet Muhammad.9

Fourth, the teacher has responsibility for the success of the learning process. This ethic is painted in the verses, when Allah affirms that it is His responsibility to collect all the verses of the Qur'an in the "chest" of the Prophet Muhammad. Prophet Muhammad did not need to fear that the verses were lost from memorization, thus disrupting the success of his preaching. Thus, the learning process of the Qur'an in which the teacher is indifferent, does not want to care for the success of his students, is not the sunnah or example of the Prophet Muhammad.

Fifth, listening then imitating. This ethic is found in QS. al-Qiyāmah verse 18. God ordered the Prophet Muhammad to listen carefully to the verses of the Koran recited by the angel Gabriel, then imitated them. As with the acquisition of a baby's knowledge. The first source of knowledge is the sound that is heard, then imitated. This theory is ultimately used in the world of education. Allah's rebuke to the Prophet Muhammad, who rushed to imitate simultaneously, showed that students must listen first to the material being taught, then imitate it. This is the best method that has been exemplified by the Prophet Muhammad.10

Sixth, the teacher must provide an explanation. Verse 19 of al-Qiyāmah confirms that Allah as the owner of the verses of the Qur'an requires Himself to give to the Prophet Muhammad an explanation of revealed verses. This is part of the knowledge acquisition process that God has given. A student has the right to receive explanations of the material he receives. While the teacher has the obligation to explain the material.11

3.2 Learning to Read al-Qur’an through Technology

The learning process includes learning objectives, materials, methods and media, evaluation and feedback. A learning will succeed if you pay attention to this matter, including learning to read the Koran.

Technological progress greatly affects the spirit of someone to look for teachers to read al-Qur'an. At present, almost every human being has a cellphone (HP) as a means of communication and a means of providing all information, including knowledge of how to read the Koran. According to Christine Wibhowo and RidwanSanjaya, technology science is the result of human engineering to obtain or provide information quickly and more widely. The science of technology brings together high-speed communication and communication for data, voice and video. Technological advances bring positive and creative values for some people to
continue to produce something. One of them is the application which makes it easy to learn Tajwīd. There are several choices of learning programs to read the Qur'an along with the knowledge of recitation which can be easily accessed from YouTube, including the method of 'Asyarah.

The method of 'asyarah is one method of learning to read the Qur'an. This method is presented in the form of software and was introduced on October 10, 2004 by Yudilmana. The material presented is Makhārij al-Ḥurūf, Madd, Ghunnah, Qalqalah, Lām al-Ta'rīf, Madd Far'ī, Lāfīl al-Jalālah, Rū, and Idghām laws. These materials are packaged in the form of song lyrics sung cheerfully so that they delight the users. This application has been watched more than 1,500.

Another method that is also widely visited is the Quantum Reading Qur'an Method which is guided by Abu Rabbani. One of the terms offered to facilitate material is "AyuAyunMannatahan". This term stands for "Ayu" and "Mannatahan". Ayu is an abbreviation of three Mad letters namely a / ә - i / ɪ - u / ʊ. If the reader of the Qur'an finds these three letters in a state of "sukūn" then the way of reading is swung so that the sound coming out will be in harmony with the two movements. While the term "Mannatahan" is manna is an abbreviation of the letter mim and nun with tasydid. If the reader of the Qur'an discovers the mim and nun letters with tasydid, the reading must be retained so that the sound coming out will be in harmony with two beats.

Abu Rabbani used the term to explain the reading of Madd Thabī'ī and Ghunnah. According to him, it is often heard that someone who reads Madd Thabī'ī exceeds the length should be two ḥarakat. So, these two ḥarakat he made easy with the term one swing.

### 3 Result and Discussion

Two methods that have been described are a small part of the various methods of reading the Koran on YouTube. Search results for these videos show:

1. Generally, there are 2 video models downloaded; first, the video is the result of recording the learning activities of reading al-Qur'an as the method of 'Asyarah, so that there are communicative teachers and students. Thus, talaqqi-musyafahah in the model can be found. Second, not the recording of learning activities but the recording of the teacher who explained the material of recitation. While the audience or students are the audience or anyone who is accessing it, as well as quantum reading quran. Thus, this model does not have talaqqi-musyafahah.

2. Videos that have been traced have no one to access that the videos being watched are only supporting media that cannot be used as the main teacher.

3. Some people who have watched these videos say they feel they have learned enough to read the Koran through the internet.

4. When linked to the examples of the Prophet Muhammad that have been described in the previous chapter, it shows that:

<table>
<thead>
<tr>
<th>Table 1. Result of Prophet’s Way and Internet (Youtube)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>
Gabriel
Disciple: Prophet
Muh\'ammad

2. Teacher can correct the disciple
3. Being patient, not in hurry
4. Responsibility for learning success
5. Students can listen and imitate
6. The teacher explains misunderstanding

<table>
<thead>
<tr>
<th>Gabriel</th>
<th>Disciple: viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher can correct the disciple</td>
<td>Video has no ability to correct</td>
</tr>
<tr>
<td>Being patient, not in hurry</td>
<td>Not in a hurry by repeating watching (playing)</td>
</tr>
<tr>
<td>Responsibility for learning success</td>
<td>No responsibility</td>
</tr>
<tr>
<td>Students can listen and imitate</td>
<td>Students can listen and imitate</td>
</tr>
<tr>
<td>The teacher explains misunderstanding</td>
<td>It can not explain</td>
</tr>
</tbody>
</table>

Paying attention to the evaluation results, here we find many things required:

1. Socialization of the necessity of talaqqī-musyāfahah in learning to read the Qur'an.
2. If you are forced to use the internet it should be an online video call or the like so that the 6 points that have been exemplified by the Prophet Muhammad can be realized or accomplished.

References

https://www.YouTube.com/watch?v=oZP3R1_vso4
Development of Qur’an Search Engine For The Indonesian Language Query

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Abstract. This study aims to build a search engine for the Qur’an verses of Indonesian keywords that are furnished by thematic index of the Qur’an. The query is inputted using the Indonesian keyword which will be matched with the translation database of Al Qur’an in Indonesian language. The resulting query results shown will provide the highlight on the search keyword, users can save the result to xls and/or pdf format. If users feel the search results are less relevant to the desired theme, they can search based on the list of thematic classifications available in tree form.

Keywords: Qur’an Search Engine, Thematic Verse Classification. Indonesian Query

1 Introduction

The website www.quran.com holds a search feature that can be used to search for Qur’an verses with keyword input in the Indonesian language, but the search results are sometimes less relevant to the purpose users desire [1]. Also search results cannot be directly downloaded. The website www.alquranalhadi.com holds a fairly complete thematic index and allows users to search for the desired Qur'an verse [2]. Based on observations on both websites, a questionnaire was developed to explore the needs of users on a search engine of the Qur’an verses.

The results of the questionnaire distribution showed the results that the main needs of a search engine site of the Qur'an are: (1) users can input the keyword of the verses to search, (2) users can download the search results, (3) users can search the Qur'an verse according to the desired theme, (4) users can search the Arabic root from search results, (5) users get relevant search results, even if they do not contain the keywords entered. Based on the results, the research was conducted with the aim to develop a website that accommodates the main needs.

The research is limited to three main features: (1) searching for Qur’an verses using Indonesian keywords, (2) searching for Qur’an verses based on thematic index, (3) downloading facility of search results. The first feature will be tested for its accuracy and relevance. The second feature will be tested from its usability qualitatively by users. The third feature will be tested from the accuracy between the results of the download with the display on the web.
The Qur'an database and its translation was obtained at http://tanzil.net/docs/resources. System was developed using Rapid Application Development (RAD), implemented using PHP and MySQL language. The thematic classification index is built on the Qur'an Syaamil thematic index [4]. The website interface was designed using Task-Centered System Design (TCSD) approach. Downloaded files are stored as xls and pdf files format.

2 Research Development On Qur'an Search Engine

Computational systems for analyzing and explaining the Qur'an on a morphological basis were developed at the University of Haifa. The copy of the Qur'an used is a phonemic transcription of a standard Arabic text. This transcription is based on ASCII notation. This system performs a number of questions on the Qur'an text that makes references not only with words but also for its linguistic attributes. Thus, users can extract from the text of certain words or word patterns, using feature words (such as root, pattern, lexical, gender, number, dependent, tense and aspect, etc.); or a combination of words that fit a particular structure [7]. The Corpus Al Qur'an produced by the University of Haifa is considered a gold standard which is suitable for comparing Arabic morphological analysis results, reformatted and adapted as the gold standard in MorphoChallenge 2009, a research content on morphological analysis.

Another way to explore information in the Qur'an is by stemming the transliteration of the Qur'an verses. The technique used is proven to provide superior results over other stemmers developed for Arabic. By using transliteration the basic Arabic word can be obtained and the frequency of its appearance is calculated. It also facilitates the creation of thematic structures of chapters of the Qur'an. Qur'an verses that have similar themes, are grouped in a cluster and recorded in relation to one verse with another. The construction and interpretation of the cluster tree semantics based on lexical frequencies are proven to be a useful approach for finding thematic links between letters and verses of the Qur'an.

This method is easier to implement than using stemming in its Arabic script. The Qur'an question and answer system of Al Bayan Question Answer accepts inputs in the form of questions about the Qur'an in Arabic, takes the most relevant verses of Qur'an, then extracts the sections containing the Qur'an and Tafseer's answers [8] Mechanisms: (1) Preprocessing Operations; (2) Question Analysis; (3) Information Retrieval (IR); (4) Answer Extraction.

Formal methods are also used in the Qur'an search system. The formal method is a math-based technique for description and verification of software and hardware system specifications. The one of studies on the use of formal methods for Natural Language Processing in the Qur'an Searching System (QSS). Z notation is used to express the formal specification of three QSS search techniques that are text based, stem-based and synonymous based. QSS allows users to search for keywords in the Qur'an and retrieve relevant verses. The Z/EVES tool is used to check and analyze Z specifications. [9] each type of specification is entered and checked one paragraph at a time.

3 System Development Method

On an outline basis, the system development consists of several stages: (1) stage of users need determination, (2) design stage, and (3) implementation stage. The need determination
stage generates three main needs of the search feature of the Qur'an verse. At the design stage an architecture design and system interface are conducted. The design of the system architecture including the design of the Qur'an database. Interface design consists of four stages: (a) identifying tasks, (b) determining users need from tasks, (c) designing interface scenarios, (d) evaluating existing scenarios. Implementation stage is to apply the design with PHP programming language, MySQL database and perform users acceptance test.

4 Results and Discussion

4.1 Requirement Planning

At the stage of determining the needs of users then the results are obtained: (a) Al Qur'an database is required with Indonesian translation from the Indonesian Ministry of Religious Affairs which can be downloaded from www.databasequran.org website. (b) The index and theme classification are selected from Syaamil Qur'an and created one table in the database.

4.2 Workshop Design

The downloaded Qur'an database is modified by adding one table to collect classification index data. The result of the modification is shown in figure 1.
Figure 1. Relational Table on the Qur'an Database
The design result of this system interface is shown in figure 2.

Figure 2. Home Page of Quran Search Engine for Bahasa
Figure 3. Thematic Classification
4.3 Usability Implementation and Testing

The design is implemented using PHP programming language with MySQL database. Furthermore, usability testing is performed to ask the representative users to evaluate the performance of the Qur'an search engine. Two participants have been selected, one expert represents the Qur'an (Al Hafidz - memorized 30 juz) and another represents the novice users. Based on the observation, the usability testing results obtained are:

1. The search menu is easy to recognize and keywords are easily inputted.
2. Users easily search with keyword input.
3. The search results are easy to read and downloaded into xls and pdf files format.
4. Search results still have weaknesses where irrelevant verses to the keyword are found.
5. Users easily use the classification menu to search for Qur'an verse themes
6. Users can search for Qur'an verses through the classification menu “Per Juz”.

4.4 Recall and Precision Testing

The testing of search engine functional using 8 keywords and focus only the verses in *juz 1* (chapter 1). The basis for query retrieval is the Convenience Sampling method, that is, the researcher assumes that the words at the top are often used, while the bottom is rarely used.

<table>
<thead>
<tr>
<th>No</th>
<th>Query</th>
<th>Number of Verses</th>
<th>Number of Words</th>
<th>Recall</th>
<th>Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Israil</td>
<td>50</td>
<td>52</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>Bani Israil</td>
<td>66</td>
<td>53</td>
<td>100%</td>
<td>80.30%</td>
</tr>
<tr>
<td>3</td>
<td>Yahudi</td>
<td>37</td>
<td>40</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>Nasrani</td>
<td>22</td>
<td>25</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>Yahudi Nasrani</td>
<td>38</td>
<td>40</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>6</td>
<td>Baitul</td>
<td>13</td>
<td>14</td>
<td>100%</td>
<td>28.57%</td>
</tr>
<tr>
<td>7</td>
<td>Maqdis</td>
<td>3</td>
<td>3</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>8</td>
<td>Baitul Maqdis</td>
<td>13</td>
<td>3</td>
<td>100%</td>
<td>21.43%</td>
</tr>
</tbody>
</table>

In table 1 it can be seen that the key words of *Bani Israil* produced 66 verses with the correct number of words of the *Bani Israil* as many as 53. There are 2 verses which mention the words of *Bani Israil* and the words of *Israil* together in the same verse. Therefore, when searching with keyword of *Israil*, 50 verses were obtained, with the number of *Israil* words being 52. While the words that contain the word *bani*, but are not relevant to the *Bani Israil* keywords in detail can be seen in the table below:

Table 2. Irrelevant Words Founded by The Keywords of
Likewise, when using **Yahudi** dan **Nasrani** keywords when searching in 1 word, **Yahudi** or **Nasrani**, get recall and precision 100%. However, if you use **Yahudi dan Nasrani** keywords, the system will display 4390 verses. This is due to the word and which is included in the search term. words **dan** is not sought after by word but become a unity in **Yahudi dan Nasrani** phrases.

The keywords **Baitul Maqdis** produces 13 verses, but these verses only contain 3 phrases of **Baitul Maqdis**. This is contrary to the keyword **Baitul**, which produces 14 words of **Baitul** which are contained in 13 verses. The verses, 10 words of **Baitul** are taken from pieces of the word **Baitullah**. This is not relevant to the purpose of the keyword **Baitul**. Number of verses containing the phrase **Baitul Maqdis**. This causes precision values of only 21.43%.

### 5 Conclusion

The created search system can already be used by users to search for Qur'an verses based on Indonesian keywords. Search results can also be downloaded to xls and pdf files format. The search results still contain the sections that are less relevant to users intent. This is due to a search that only searches for a match between a keyword and an existing word in the database. All menus have been performed from usability testing, and meet the requirements of users. The system has produced the correct query answer, this is indicated by the recall value of 100%. but the precision is still low, below 30%.

### 6 Future Work

The created search system can already be used by users to search for Qur'an verses based on Indonesian keywords. Search results can also be downloaded to xls and pdf files format. The search results still contain the sections that are less relevant to users intent. This is due to a search that only searches for a match between a keyword and an existing word in the database. All menus have been performed from usability testing, and meet the requirements of
users. The system has produced the correct query answer, this is indicated by the recall value of 100%. but the precision is still low, below 30%.

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References

Using Online Recount Texts to Improve the Eighth Graders’ Reading Comprehension

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Abstract. This study was intended to apply online recount texts to solve the problems of the eighth graders of SMPN 1 Sukodono in 2013/2014 academic year in reading recount texts. The reading materials were taken from the British Council site. This design consisted of one cycle involving four steps or procedures. They are planning, implementation, observation, and reflection. The finding showed that by using online recount texts, the students could improve their reading comprehension. This was proved by improving the students’ score from 68.6 in the preliminary test to 79.7. The numbers of students who passed the passing grade (75) improved from 36.12% in the preliminary test to 88.88% after the implementation of the strategy. Their reading skills developed, mainly in identifying main idea and detailed information, and classifying the text structure. Lastly, in terms of the students’ attitude or response toward the application of online recount texts, 91% students gave positive responses.

Keywords: online texts, recount text, reading comprehension

1 Introduction

Reading is an essential skill in English that should be mastered by the students. As stated on the content standard, the objective of teaching English in the junior high school especially eighth graders, students should master the procedure, descriptive, recount, narrative, and report text types [1]. The eighth grade students in the second semester are expected to be able to do the following reading skills. Firstly, they are expected to be able to read aloud a functional, short and very simple descriptive and recount text with good pronunciation, stress, and intonation. Secondly, the students are expected to be able to respond to the meaning in functional short texts accurately, fluently, and appropriately. Thirdly, they are expected to be able to respond to meaning and rhetorical structures in short, simple descriptive and recount texts accurately, fluently, and appropriately [1].

In this digital era, students continuously have an access to new information and this forces them to move from “learning to read” to “reading to learn”. Reading to learn means student’s purpose of reading is to get information. Students then have to integrate the new things into their knowledge, build new understanding, and adapt existing conceptions, belief and theories. Hence, the researchers considered eighth graders as the subject of this study since the researchers claim that they have enough background knowledge. Students who have less background knowledge may struggle to gain access, to join and to advance throughout the curriculum, in which reading to learn is a must in order to gain success. Besides, as stated on
Based on the unstructured interview with the English teacher and some of the students of 8D class of SMPN 1 Sukodono, it was revealed that the students’ ability in reading was poor. The result of a preliminary study conducted by the researchers at school found some students’ problems in reading skill, namely: the students got difficulties in understanding the texts and also had low mastery of vocabulary. Besides, the students were less enthusiastic in learning English reading. Most students disliked reading skill, it was because they thought that reading English texts was difficult and they could not understand the content. Meanwhile, from the teacher’s side, students claimed that most activities in learning reading English were dominated by the teacher. In the preliminary study, some students were also assigned to do a reading test. Their reading test score on average indicated that it was below the minimum passing level (Kriteria Kentutasan Minimal) that is 68 from 75. The number of students who passed this level was 13 out of 36 students who took the test. From the description above, it can be assumed that the students’ difficulty in understanding a text aroused from interrelationship between the effort of remembering a lot of vocabulary which frustrates the students and the teacher-centered instruction.

Therefore, as teachers, we must convince the learners that reading is interesting, for instance by giving them fun reading materials so that they will not get bored or we can make some fun activities. As [2] states, reading is an enjoyable and private activity. Reading is not only to give the students information but also it also need to give pleasure toward the students. Providing an interactive and productive reading class is one of the teachers’ tasks. Teacher might have to take it into account that not every students have ability to understand reading texts.

Referring to the above information, it showed that students of 8D have low ability in reading skill especially in terms of understanding the text. Therefore, it gives an overview for the researchers to do an action research in this class. This is meant to bring about the changes for the improvement in English teaching and learning process. For that reason, there is a need to implement another teaching strategy that will bring the improvement. The researchers, thus, proposed to utilize one of the effective strategies in teaching reading by using extensive reading with the integration of technology. Here the researchers used online recount texts as the proposed solutions. Students need to read as much as possible and the teachers need to provide texts that interest students and are at students’ level of difficulty. Hence, extensive reading can help building students’ vocabulary [3]. Moreover, this method also aims at increasing students’ fluency and speed in reading.

The availability of electronic devices and the internet within our society may contribute to declining students’ time for reading. Prensky said that today’s generation can be referred as digital natives [4]. Digital Natives are those who are born in the nowadays era in which that their brains are automatically into electronic devices, such as computers, smartphone, and the internet. Researchers claim that this generation needs to be more electronically engaged activities. Indeed, children and teenagers today are more attracted to electronic devices than any other type of entertainment [4], [5], [6].

In order to fulfill the needs of students’ literacy development, researchers and educational authorities claim that traditional teaching styles should be modified [4], [5], [6]. They also claim that technologically engaged class will provide the educator with relevant and more efficient education towards their students.[7] Such technologies include PowerPoint presentations, online communication systems, online discussion boards, online reading materials and multimedia teaching techniques within the classroom [5].
Online recount texts are one of internet resources offered related to reading materials. These resources consist of any kind of short stories, which can be explored and read online, or offline. These features process new characteristics which differentiate from the printed ones. They belong to, first, non-linear hypertext because there is a combination of images and sounds, and second, multimedia text which many hyperlinks embedded with short passages [8]. Dealing with the new characteristic possessed by web-based material, readers are required to possess ‘new literacy skill in order to process the text. This skill deals with electronic literacy which involves readers’ ability to navigate for information and critically interact with the online text in the web.

The consideration for choosing Online recount texts for teaching reading was based on several reasons. The students could learn English through various kinds of reading materials that are taken from the internet. Pictures, animations, or videos help readers catch the meaning of sentences that appear by pages. Oral reading helps the students maintain their pronunciation. Reading exercises and games in the form of vocabulary and comprehension quizzes facilitate the students to understand the content of the text. By using internet as a media, it can help the teacher to solve the problems of access and expense. Teachers are possible to find other sites which provide various materials that are downloadable and print them out for students’ use, if the school has limited facilities for internet access. Besides, many advantages can be obtained obtained from web-based materials in teaching reading for the students. As stated in [9], a class which use a highly advanced technology will enhance both students and teachers. The students will also be more active, well-motivated and more involved in language learning process in the class. By using internet as media, it can motivate the pupils and engage them in the speaking, writing, reading and listening skill. Moreover, Web-based activities can encourage weak learners to interact with the teacher without inhibition. The teacher can find out each student’s weaknesses and thus provide her or his advice, guidance and support in terms of learning. Along with multimedia progressing in education, web-based extensive reading program helps students learn vocabulary, read for main ideas, and increase speed and fluency in reading a text.

Online recount texts in teaching reading is a significant strategy since it provides an alternative for the schools that have high accessibility on the internet but has limitation on providing students reading materials. The researchers choose this strategy because the appearances are more interesting. Students can use this strategy by online during the class or offline by downloading the materials before. There are many websites which provide short stories as materials, but here, the researchers focus only one website that is British Council Learn English kids.

Online recount texts as an alternative material for teaching reading, the researchers focus on teaching recount texts. Through recount texts, students are expected to be able to learn language easily. They were encouraged to understand the story chronologically [10]. Students will also encourage their comprehension on explicit and implicit elements of the story, and generic structure used by the author in the text. Besides, based on the objective of teaching English in the junior high school, recount text and descriptive text are one of the genre texts which the students should master.

A study entitled ‘ICT and Reading: In the Technology-Enhanced Extensive Reading Classroom’ found that ICT, especially computer or internet has major benefits on students’ achievement in reading [9]. These technologies motivate students to read both intensively and extensively, strengthen their reading competence and make them enjoy the reading process.

Concerning with the problems in reading ability, the researchers conducted a research entitled “Using Online recount texts to Improve Eight Graders’ Reading Comprehension in
SMP N 1 Sukodono”. The researchers believe that online recount texts equipped with valuable features can benefit teaching reading on recount text especially as a medium and materials. The study, then, was conducted in this school because it has internet access. The eighth graders students were chosen as subjects of this research under consideration they have been familiar with internet browsing. Recount texts are presented in Standar Kompetensi of eighth graders of SMP/MTS as being mentioned also in Standar Kompetensi Lulusan. Thus, learning can be delivered through online recount texts that cover the material.

2 Methods

The study used a method of classroom action research. The classroom comprised of eighth graders students of SMPN 1 Sukodono. This cycle was implemented in five meetings and conducted on May 12th to June 9th 2014.

2.1 Design of the Study

The design of this study is a classroom action research (CAR) that focused on a particular group of students. It is collaborative research where in conducting the research, the researchers were backed up by one of their colleagues at school [11].

The researchers as the practitioners handled the teaching process of reading comprehension through the strategy to the students of the class being investigated while the teacher as the collaborator observed and recorded all the data found during the implementation. In this case, the researchers worked together with her collaborator who was involved from the beginning up to the end of the process of the research activities. Besides, in adjusting the strategy the researchers targeted to obtain the way out of the classroom strategy problems in teaching reading.

Before conducting the research, a preliminary study was done to identify students’ problems before implementing the plan. It aims at finding out the students’ cases in reading comprehension. Furthermore, this activity was done in order to design the appropriate planning to solve the problems.

This study employed a Classroom Action research model developed by Kemmis and Mc Taggart which covered four steps, namely: planning, implementing, observing and reflecting. In this research, collaboration and cooperation are needed in terms of providing a powerful medium of reflection. In conducting collaborative classroom action research, the researchers needed a teacher as a collaborator. The researchers made collaboration with one of the English teacher of SMPN Sukodono. The researchers took their role as teacher-practitioners who applied the strategy proposed. The collaborator acted as an observer who assists in handling the research from the beginning to the end. It included the procedures of the strategy, the impact on the students’ learning, and examined the students’ performance.

In line with the action research procedure, in the planning stage, some preparations were made, including preparing teaching strategy, designing a lesson plan, and setting the criteria of success. In implementing stage, the teacher implemented the strategy to the students in the teaching and learning process while the observation stage is dealing with the data collection. In the last stage, the reflection stage refers to data analysis.

2.2 Setting and Subjects of the Study
The research was conducted at SMP N 1 Sukodono Sidoarjo. The school had twenty-seven rooms for classroom teaching learning activity, supported by one language laboratory, one computer laboratory, and one library. The research was conducted at the eighth graders of SMP N 1 Sukodono at the second semester in the 2013/2014 academic year. The class consisted of 36 pupils. This subject was chosen because their reading comprehension skill in this school was quite low.

2.3 Procedures of the Research

This research started with the general idea of how students’ reading comprehension could be well improved by the use of Online recount texts strategy. Then, it is implemented and observed. The reflection was carried out to identify all facts including success and failure. The procedures of the actions were adapted from Kemmis and Mc Taggart which consists of four steps as follow: (1) planning, (2) implementing, (3) observing and (4) reflecting.

The strategy that was employed in this study is online recount texts. The role of Online recount texts as a strategy was under the reason that this strategy can be any kind of tools or ways that the teacher uses to help learners learn [12]. Online recount texts were ready used materials for reading comprehension that were taken from the internet. British Council site is the site that was chosen for this study. The researchers took all the reading materials from this website. This website presents many recount texts; imaginative recount and personal recount in numerous topics. This website appropriates reading materials since the themes are interesting and attractive for teenagers. The stories are in the form of animation and video which is supported with printable materials for each story. Sentences which appear in every page are combined with images illustrating the meaning and sounds showing how to read and pronounce the words correctly. Besides, there are some features of reading comprehension exercise, list of vocabulary, and puzzle for each text. These features provide students some instrument for self-improvement on their reading skill. Furthermore, these media and materials cover the diversity of students’ learning styles, and meet the provision of constructivism where the students are allowed to maintain their roles to construct their knowledge by interacting with their environment; computer, worksheet and teachers and friends [12].

To make the students able to learn effectively, a well-designed lesson plan was set up as teacher’s guideline to implement the strategy. This included the standard competence, learning objectives, instructional media and materials, teaching and learning activities and assessment. It is linear with the basic competence stated in the content standard of Junior High School. The instructional objective of the eighth graders was to respond to meaning and rhetorical structures in short, simple recount and descriptive texts accurately, fluently, and appropriately related to the students’ close environment [1].

The instructional media and materials were online recount texts. Since using online recount texts was the strategy of this research, the reading activities were mostly facilitated by the use of computer and internet as media. Here, the internet was used as a main medium and material source. The material was focused on recount text for its appropriateness to eight grade level as being stated in syllabus. Some tasks were arranged by adapting some exercises that followed the online stories in order to maintain the students’ attention and help their comprehension.
The teaching and learning activities were divided into three phases, Pre-reading, Whilst-reading and Post-reading. These three phases were chosen in the regard of the needs to build students’ base knowledge, present a modeling and facilitate students in group work to individual work. Pre-reading stage was maintained to prepare the students readiness, such as open their knowledge related to the materials. Whilst-reading was focused on the reading with the worksheets that have been prepared. And Post-reading provides time for rechecking comprehension and doing reflection for learning process.

The assessment was constructed in order to know the students’ improvement. Referring to learning objectives and the activities, the researchers set on-going assessment both for group and individual. The researchers used worksheets completed with scoring rubric through which the researchers could analyze the score as the evidence of their progress. However, the students’ achievement cannot be seen only after the first meeting has been implemented. Referring to [13], suggests that the teacher as researchers must bring students to be familiar with the strategy first, so that students’ progress will possibly appear after two meetings, the researchers modified the activities in every meeting in the lesson plan as well as the format of worksheets.

In this study, the researchers prepared the rooms that would be used as well as the internet access. Here the researchers used science laboratory because this room can reach the internet connection to open the website. Besides, to avoid students’ distraction, the researchers prepared a written guide which consisted of the web addresses from which the materials were taken, the steps of browsing so that the students could find out online materials properly. This way is thought to be effective for teacher’s instruction since most students like to ask directly when they got difficulties.

The criteria of success were established to confirm whether the implementation of the strategy had influenced the students in improving their reading comprehension ability. The decision for the criteria of success was determined based on the improvement on both of the students’ scores, their active participation in the learning process, and their responses towards the strategy. The result of the reading test in the preliminary study showed that students average score was 68 which indicated that they did not pass the minimum passing level that is 75. However, if 80% of the students gained an average score 75 after the implementation of the strategy, or the scores after the action gained 7 points higher than their score in the task before, it could be claimed the action was successful to improve the quality of their ability in reading texts. However, if it does not achieve it, the action must be continued.

The achievement reading test was used to measure the students’ achievements in understanding the recount texts by using online recount texts. They were 25 items of multiple choices and had to be finished in 60 minutes. The test items were constructed based on analyzing the content of the test and the materials required in the English syllabus of the second year of the junior high school. The purpose of analyzing is whether the content of the test represents the basic competence of reading for eighth graders of junior school in English syllabus.

3 Results and Discussion

The discoveries of this study indicated that the use of online reading materials in reading comprehension teaching and learning could solve the problem they are facing in reading, as the previous studies indicated [12], [14]. As identified in preliminary study, the students had
problem in reading in terms of difficulty to understand the texts and the students had low mastery of vocabulary. The discoveries of the strategy effectuation were broken down from the four research instruments used, observation checklists, field notes, reading comprehension test and questionnaire. The learning and teaching process qualitative data regarding the interaction between teacher and students were ensued from the observation checklists and field notes. Those were then confirmed with the analysis on the questionnaire. The students achievement qualitative data were obtained from the grade they got both in daily exercise and the reading comprehension exercise.

The effectuation of using online recount texts strategy to help students of SMPN 1 Sukodono, especially the 8th grader to enhance reading ability in this research was conducted in one cycle because the result of this one cycle indicates that they have succeeded. This cycle was effectuated in five meetings and conducted on May 12th to June 9th 2014. The time allocation of each meeting was 2x45 minutes. The first meeting to the fourth meeting was used to implement online recount texts and its application, while the fifth meeting was used to administer the reading test.

The topic of recount texts in each meeting was different. The recount text in the first meeting was about ‘My Secret team’; the second meeting was about ‘No Dogs’; the third was about ‘The lucky Envelope’ and the fourth meeting was about ‘A Dogs Life’. In the fifth meeting, the researchers reviewed all the topics and gave the students exercise. Each topic of the text was presented in the form of online texts and printed materials downloaded by the researchers before class for students’ worksheet.

3.1 The Result of Reading Test

To evaluate the students’ participation during the teaching-learning process, the researchers used an observation checklist, field note, and questionnaire. The reading test taken in the form of multiple choices consisted of 25 questions items. All the questions were based on the reading texts that they had learned before. The number of students who became the subjects of this research was 36 students.

The students’ reading test was administered at the fifth meeting of the cycle. The test was intended to know the implementation of the strategy applied, to know how well the students’ reading ability was, and to evaluate the students’ reading comprehension. The implementation of online recount texts in the learning process was accompanied by some worksheets that provided scaffolding questions for comprehension. The worksheets used during the four meetings contained story map and reading comprehension exercise based on the text adapted given in each meeting.

In addition, there was also an improvement in students’ scores. There were 32 students (88.88%) who achieved scores in the good category (≥ 75) and 4 students (11.12%) who achieved score in the “poor” category (< 75) compared to the preliminary study showing that there were 13 students (36.12%) who got scores in good category (≥ 75) and 23 students (63.89%) who got scores classified as "poor” category (< 75). It can be concluded that most of the students got higher scores in cycle 1 than the previous score that they obtained in the preliminary study.

3.2 The Students’ Involvement in the Teaching and Learning Process

The collaborator completed the data of the students’ involvement during the implementation of this strategy in this meeting during the teaching and learning process based on the specific guide written down in the observation checklist.
From the data presented in the observation checklist, it was found that in the first meeting, 19 to 30 students were involved and performed good activity in the teaching and learning process such as paying attention to the teacher’s explanation and used online dictionary in another page to find the meaning when they could not guess the meaning of difficult words. Because this strategy was new for the students so in the first meeting most of the students asked for help when they got some difficulties in browsing and asked for explanation on the worksheet. There were 10 up to 18 students who gave comments or responses to the teacher’s instructions and questions and had great willingness to work on the worksheets both in group and individually. But, only some students could finish their work quickly before time was up. It occurred because most of the students were still confused about their worksheet. The percentage of the students’ involvement was 75%.

In the second meeting, the students participated very well in showing their enthusiasm and interest in the teaching and learning process and paying attention to the teacher’s explanation while 21 to 30 students did good activities such as responding to the teacher’s instructions, doing the exercise in group and answering the teacher’s questions. The percentage of the student’s involvement was 78.5%. Then, in the third meeting, 31-36 students were very good in paying attention to the teacher’s explanation, understanding the teacher’s explanation, responding to the teacher’s instruction, feeling comfortable and enjoyable in attending the class and showing enthusiasm and interest in the teaching and learning process, while 19 to 27 students performed in good condition like asking the teacher if the students did not understand, got difficulties in browsing, understand the teacher’s instruction, answering to the teacher’s questions and working in individual or group to solve the problem. The quantity of students who were able to finish their work quickly before the time was up was greater than previous meetings. The percentage of students’ involvement is 82.1%.

In the fourth meeting, most the students were very good in paying attention to the teacher’s explanation, answering the teacher’s instructions and questions, having great willingness to finish their worksheet either in individual or group and also most of them finished their work before the time was up, while there were 19 up to 27 students asked for help when they did not understand about their worksheet, got difficulties when browsing and opening the online dictionary to find the difficult words in the text. The percentage of students’ involvement in this fourth meeting is 89.2%.

From the result of observation sheets, it can be concluded that the condition and situation in the teaching and learning process in reading class by using Online recount texts was good and students always got improvement from the previous meeting to the next meeting. It could be seen in the percentages of the first meeting which was 75% to 78.5% in the second meeting, 82.1% in the third meeting and 89.5% in the fourth meeting. The average of the students’ participation in the teaching and learning process obtained from observation checklist was 81.3%. The percentage was obtained from the result of percentage in four meetings divided into four. That number met one of the criteria of success set in this research.

3.2 Reflection

The presented data above concludes that researchers could attain the standard of success in the progress, the product, and the students’ responses. As in the previous subchapters, the students’ involvement score during the use of online recount texts in Class 8D was more than 80%; it was 81.3%. In addition, there were more than 80% of the students who passed. There had been 88.88% students who had score above 75 (see Appendix 9). Similarly, the percentage of the students who response positively toward the whole activities in the process-
genre approach was also more than 80%; there had been 91% students. All in all, Cycle 1 concludes that the researchers could fulfill the success standard; hence they did not have to go for another cycle.

4 Conclusion

The discoveries of this study conclude that the use of online recount texts in teaching and learning reading could solve the eighth grader’s students’ problem in reading ability. This can be concluded by seeing that the students improved in three aspects. Those three aspects includes how active the student is participating in class activity, the students’ reading test, and how many students who respond positively toward the application of online recount texts.

The use of online recount texts in teaching and learning reading process used three stages of activity (pre-reading activities- whilst reading activities- post-reading activities) method and the stages in using this method were (1) explaining the topic and showing how to browse the texts through the internet, (2) delivering the texts and giving worksheets based on the texts in every meeting then discussing the result, and (3) giving pre-reading test as the exercise in the last meeting before giving the final reading test.

The process of implementing online recount texts helped the teacher and the students in the teaching and learning of reading class. This was proved by the results of the observation checklist, field note, questionnaire and 32 of 36 students (88.88%) successfully passed the final reading test.

Finally, the finding showed that the implementation of online recount texts had successfully improved the students’ ability in reading text especially recount. This online recount texts also made them work with enthusiasm; they also had new possibilities to access knowledge in a different way to improve their reading comprehension.

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References

Robustness Analysis of a Steganography File Against a Media Sharing Process In Instant Messaging Applications

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Abstract. The main challenge in digital communication is not only the need to share information but also to protect that information from attacks from irresponsible people, such as hackers. One method that effectively protects data is steganography. The application of steganography includes media such as images, audio, and video. The survey ‘We are Social’ in 2016 described the most widely used instant messaging applications in Indonesia as BlackBerry Messenger (BBM), WhatsApp, and Messenger. All these applications can be used for sharing media in the form of images, audio, and video, which means steganographic messages can be sent through these applications. However, in order to share media there is an inherent process of editing or compression of the files. This is one of the weaknesses of steganography. In this research, the authors will attempt a simulation by sending steganographic files of images, audio, and video through three instant messaging (BBM, WhatsApp, Messenger) applications. The results obtained indicate that the majority of steganographic files are lost after going through the sharing process, which means instant messaging applications are not suitable for use as media to send steganographic files.

Keywords: component; Steganography; Instant Messaging; Robustness; Sharing Media.

1 Introduction

Information technology is growing rapidly. Almost all methods of communication have changed into digital and to exchange information just using internet. However, there is a possibility that the information can be illegally taken and collected, transferred and used by others for their own interests. The main challenges faced in data privacy are the need to share information or data but also must protect the information against people who are not authorized to view such material, such as hackers. One method to protect data effectively is called steganography [1]. Steganography technique has been developed to hide a message in a picture or photograph. Steganography hide all the text information that only the sender and the recipient will be able to know that in the picture there is a hidden message. Some examples of steganography software are OpenPuff, OurSecret, S-Tools, Hide and Seek, and etc [2].

Based on the research conducted by WeAreSocial in their Digital, Social, and Mobile Report in 2016, the most widely used instant messaging application is the BlackBerry Messenger (BBM) at 19 %, the second is WhatsApp, followed by Messenger, Line and
WeChat [3]. The fifth application can be used to send images, audio, and video. In the sending process in those applications, there is a media compression process. One disadvantage of steganography in this case is the lack of robustness of the hidden data, as only a small attack, such as editing the picture and also the process of compressing the data may cause the hidden data to be corrupted or lost [4].

This research aims to analyse of a steganography file against a media sharing process in instant messaging applications (Whatsapp, Messenger, and Blackberry Messenger). The remainder of the paper is organized as follows. Section II describes literature review to this research and Section III shows briefly the experiment and the result. Section IV provides the conclusion of this paper.

2 Literature Review

2.1 Steganography

Steganography is a word derived from the Greek meaning "hide in plain sight". As defined by Cachin, steganography is the art and science of communicating in such a way that the presence of a message cannot be detected. Simple steganography techniques have been used for hundreds of years, but with the increasing use of files in an electronic format, new techniques for information hiding have become possible [5].

Steganography, encryption, and watermarking have been widely known and used to hide messages. Steganography is used to insert messages into another object called the cover or carrier. In cryptography, the sender of the message transforms plaintext into ciphertext using an encryption key and then the encrypted message is sent to the receiver. The receiver will change the ciphertext back into plaintext with the same key. In contrast, digital watermarking is a technique used to insert the information into images or other documents that can be seen or cannot be seen [6].

2.2 OpenPuff

OpenPuff is a steganography and watermarking tool that is well known and widely used. OpenPuff was first developed by Cosimo Oliboni in 2012. OpenPuff grants a license as freeware under the Windows operating system. OpenPuff can hide data in multiple data types such as images, audio, and video. An Open puff carrier can combine multiple files to hide a secret message, which will make the message more difficult to decrypt illegally [7].

2.3 OurSecret

OurSecret is free software that can be used to hide secret information in images, audio, and video. OurSecret can be used to encrypt and hide secret messages in other files. In the first stage of using OurSecret the carrier determines the file and password to be used. Then, the secret message to be added will be inserted into the carrier [8].

2.4 Instant Messaging

In recent times, however, a new wave of mobile communications services called mobile instant messaging (MIM) applications have gained considerable momentum. Applications such as WhatsApp, BBM and Messenger allow mobile users to send real-time text messages to individuals or groups of friends at no cost. The third party application provides a messaging service for free to users either individually or as part of a group. This type of application has
arisen along with the development of many emerging smartphone technologies that support the development of many MIM applications [9].

2.5 WhatsApp

One example of a MIM application that is widely used is WhatsApp which is an instant messaging application that can be used on multiple platforms such as Android, iOS, Windows, and BlackBerry. WhatsApp makes it easy for users to communicate by sending messages that may include location information, images, audio and video in real-time and for free. At the time of writing, WhatsApp handles more than 10 billion messages per day and is one of the most popular cross-platform applications [9].

2.6 BBM

Another MIM application that is quite popular is the Blackberry Messenger (BBM). The Blackberry Messenger is a messaging application that is widely used on Blackberry devices. BBM requires users to exchange a pin to be able to communicate with it. BBM can also tell whether the messages are sent or read messages. In BBM users can exchange short messages, photos, video, or audio [10].

2.7 Messenger

One other MIM application that is widely used is Messenger or Facebook Messenger. All Facebook users can use this application. This application is not only able to send a short message, but is also able to send pictures, video, and audio, as well as location information and in addition can make free calls [11].

2.8 Related Work

The authors used several resources as literature sources based on earlier research. In [12], the research analysed the robustness of image steganography files after being sent through Facebook. This study also examined many tools of steganography, but only focused on images and one social media.

The research in [13] discussed tracing of steganography files in three social media applications (Facebook, Badoo, and Google+). This study also examined many tools of steganography, but only focused on images.

In [14] the study discussed image steganography in terms of sharing using social media applications. The research focused on improving security in steganography files. The deficiencies of this research are that it just focused on images and security and not on the robustness.

Based on previous research, the current authors will conduct research to analyse the robustness of a steganography file against a media sharing process in an instant messaging application. The purpose in performing this research is to determine the robustness of hidden messages in images, audio, and video after the sharing process via BBM, WhatsApp, and Messenger applications.

3 Experiment and Result

3.1 Input/Output Collection

This stage describes the input/output data used in this study.
Table 1. Secret Message

<table>
<thead>
<tr>
<th>File</th>
<th>File Name</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>.txt</td>
<td>Rahasia</td>
<td>7 bytes</td>
</tr>
</tbody>
</table>

Table 1 describes the secret message that will be used. The secret message used the .txt form with a size of 17 bytes named “Rahasia” (meaning “Secret” in the Indonesian language). The secret message is the message or information that will be inserted into the carrier file.

Table 2. Carrier File 1

<table>
<thead>
<tr>
<th>File</th>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Cute</td>
<td>.png</td>
<td>885KB</td>
</tr>
<tr>
<td>Image</td>
<td>easter</td>
<td>.bmp</td>
<td>351KB</td>
</tr>
<tr>
<td>Image</td>
<td>cat</td>
<td>.jpg</td>
<td>518KB</td>
</tr>
<tr>
<td>Audio</td>
<td>Simple</td>
<td>.mp3</td>
<td>2.82MB</td>
</tr>
<tr>
<td>Audio</td>
<td>Happy</td>
<td>.wav</td>
<td>3.16MB</td>
</tr>
<tr>
<td>Video</td>
<td>Pigeons</td>
<td>.3gp</td>
<td>7.32MB</td>
</tr>
<tr>
<td>Video</td>
<td>Pigeons</td>
<td>.mp4</td>
<td>10.5MB</td>
</tr>
</tbody>
</table>

Table II describes Carrier File 1. There are three image files (PNG, BMP, JPG), two audio files (MP3, WAV), and two video files (3GP, MP4). The same secret message is inserted in every carrier file.

Table 3. Carrier File 2

<table>
<thead>
<tr>
<th>File</th>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td>Cartoon</td>
<td>.png</td>
<td>261KB</td>
</tr>
<tr>
<td>Image</td>
<td>Pooh</td>
<td>.bmp</td>
<td>538KB</td>
</tr>
<tr>
<td>Image</td>
<td>cartoonjpg</td>
<td>.jpg</td>
<td>109KB</td>
</tr>
<tr>
<td>Audio</td>
<td>minions</td>
<td>.mp3</td>
<td>993KB</td>
</tr>
<tr>
<td>Audio</td>
<td>cat meow</td>
<td>.wav</td>
<td>3.36MB</td>
</tr>
<tr>
<td>Video</td>
<td>Sponge</td>
<td>.3gp</td>
<td>9.9MB</td>
</tr>
<tr>
<td>Video</td>
<td>Sponge</td>
<td>.mp4</td>
<td>21.7MB</td>
</tr>
</tbody>
</table>

Table III describes carrier file 2. There are three image files (PNG, BMP, JPG), two audio files (MP3, WAV), and two video files (3GP, MP4). The same secret message is inserted in every carrier file. The difference between Carrier File 1 and Carrier File 2 is the size of the file.

3.2 Scenario I

In Scenario 1 the simulation involved sending the images via WhatsApp, Messenger, and BBM. The image formats were: JPEG, BMP, and PNG. The tool used to insert the secret message was Open Puff.

Table 4. Scenario 1 Result

<table>
<thead>
<tr>
<th>File</th>
<th>File</th>
<th>Size</th>
<th>Secret</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table IV describes the results of Scenario 1, in which all the secret messages sent through WhatsApp were missing, while in Messenger only the PNG file in Carrier 1 and Carrier 2 preserved the message. For BBM only the JPEG file in Carrier 2 preserved the message. The format of the image files that were sent through WhatsApp all turned into JPEG format, while for BBM only the PNG files were changed to the JPEG format. In Messenger the format of all files was not affected.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Size</th>
<th>Secret Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cute</td>
<td>.png</td>
<td>924KB</td>
<td>x ✓ x</td>
</tr>
<tr>
<td>easter</td>
<td>.bmp</td>
<td>351KB</td>
<td>x x x</td>
</tr>
<tr>
<td>cat</td>
<td>.jpg</td>
<td>518KB</td>
<td>x x x</td>
</tr>
<tr>
<td>Cartoon</td>
<td>.png</td>
<td>388KB</td>
<td>x ✓ x</td>
</tr>
<tr>
<td>Pooh</td>
<td>.bmp</td>
<td>538KB</td>
<td>x x x</td>
</tr>
</tbody>
</table>

x: Secret message missing, ✓: Secret message present

Fig. 1 shows the difference that the left side (a) describes histogram of the image before being sent through Whatsapp, and the picture on the right (b) describes histogram of the image after being sent through Whatsapp. It is shown that the file size has been reduced, it is also that the quality of the image has been decreased which makes the secret message are missing.

3.3 Scenario 2

Scenario 2 simulated sending the image files via WhatsApp, Messenger, and BBM. The image formats were: JPEG, BMP, and PNG. The tool that was used to insert the secret message was OurSecret.

Table 4. Scenario 2 Result

<table>
<thead>
<tr>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
<th>Secret Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cute</td>
<td>.png</td>
<td>924KB</td>
<td>x ✓ x</td>
</tr>
<tr>
<td>easter</td>
<td>.bmp</td>
<td>351KB</td>
<td>x x x</td>
</tr>
<tr>
<td>cat</td>
<td>.jpg</td>
<td>518KB</td>
<td>x x x</td>
</tr>
<tr>
<td>Cartoon</td>
<td>.png</td>
<td>388KB</td>
<td>x ✓ x</td>
</tr>
</tbody>
</table>

x: Secret message missing, ✓: Secret message present
Table V shows the results of Scenario 2 whereby all the secret messages sent through the WhatsApp, Messenger, and BBM applications were missing. The format of the image files that were sent through WhatsApp all turned into JPEG format. For BBM, only the PNG files were changed into the JPEG format, while in Messenger the format of all files remained unchanged.

<table>
<thead>
<tr>
<th>Pooh.bmp</th>
<th>538KB</th>
<th>x</th>
<th>x</th>
<th>x</th>
</tr>
</thead>
</table>

Table V: Secret message missing, ✓: Secret message present

Table V shows the results of Scenario 2 whereby all the secret messages sent through the WhatsApp, Messenger, and BBM applications were missing. The format of the image files that were sent through WhatsApp all turned into JPEG format. For BBM, only the PNG files were changed into the JPEG format, while in Messenger the format of all files remained unchanged.

Table V: Secret message missing, ✓: Secret message present

Figure 2. Image histogram before and after being sent through WhatsApp

Figure 2 shows the difference that the left side (a) describes histogram of the image before being sent through WhatsApp, and the picture on the right (b) describes histogram of the image after being sent through WhatsApp. It is shown that the file size has been reduced, it is also that the quality of the image has been decreased which makes the secret message are missing.

3.4 Scenario 3

The simulation in Scenario 3 sent audio files via WhatsApp, Messenger, and BBM. There were two audio formats: MP3 and WAV. The tool that was used to insert the secret message was OpenPuff

Table 6. Scenario 3 Result

<table>
<thead>
<tr>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
<th>Secret Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>.mp3</td>
<td>2.82MB</td>
<td>✓</td>
</tr>
<tr>
<td>Happy</td>
<td>.wav</td>
<td>3.16MB</td>
<td>x</td>
</tr>
<tr>
<td>Minions</td>
<td>.mp3</td>
<td>993KB</td>
<td>✓</td>
</tr>
<tr>
<td>Cat meow</td>
<td>.wav</td>
<td>3.36MB</td>
<td>x</td>
</tr>
</tbody>
</table>

Table 6: Secret message missing, ✓: Secret message present

Table VI describes the results of Scenario 3, in which all the secret messages sent through Messenger were missing because audio files cannot be downloaded but only heard via
streaming. For WhatsApp the secret message was found in the MP3 file both in Carrier 1 and Carrier 2, while for BBM all the secret messages were found to be present.

![Audio spectogram before and after being sent through BBM](image)

**Figure 3.** Audio spektogram before and after being sent through BBM

Figure 3 shows the difference that the left side (a) describes audio spectogram of the audio before being sent through BBM, and the picture on the right (b) describes audio specrogram of the audio after being sent through BBM. It shown that the audio file after being sent through BBM did not changed whether the quality or size. That's why all the secret messages were found to be present.

### 3.5 Scenario 4

In Scenario 4 the simulation sent an audio file via WhatsApp, Messenger, and BBM. There were two audio formats: MP3 and WAV. The tool that was used to insert the secret message was OurSecret.

Formats: 3GP and MP4. The tool that was used to insert the secret message was OpenPuff.

<table>
<thead>
<tr>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
<th>Secret Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>WhatsApp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Messenger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table VII shows the results of Scenario 4. All the secret messages sent through Messenger were missing because audio files cannot be downloaded but only heard via streaming. For WhatsApp the secret message was found in the MP3 file both in Carrier 1 and Carrier 2, while for BBM all the secret messages remained intact.

<table>
<thead>
<tr>
<th></th>
<th>Format</th>
<th>Size</th>
<th>✓</th>
<th>x</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>.mp3</td>
<td>2.82MB</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Happy</td>
<td>.wav</td>
<td>3.16MB</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Minions</td>
<td>.mp3</td>
<td>993KB</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Cat meow</td>
<td>.wav</td>
<td>3.36MB</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
</tbody>
</table>

x: Secret message missing, ✓: Secret message present

Figure 4. Audio before and after being sent through WhatsApp

Figure 4 shows the difference that the left side (a) describes audio spektogram of the audio before being sent through WhatsApp, and the picture on the right (b) describes audio spektogram of the audio after being sent through WhatsApp. It shown that the mp3 file after being sent through WhatsApp did not changed whether of quality or size. But all the wav file that were sent through WhatsApp all turned into .aac format, and makes the secret message are missing.

3.6 Scenario 5

In Scenario 5 the simulation involved sending video files via WhatsApp, Messenger, and BBM. There were two video formats: 3GP and MP4. The tool that was used to insert the secret message was OpenPuff.
Table 8. Scenario 5 Result

<table>
<thead>
<tr>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
<th>Secret Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigeons</td>
<td>.3gp</td>
<td>7.32MB</td>
<td>x</td>
</tr>
<tr>
<td>Pigeons</td>
<td>.mp4</td>
<td>10.5MB</td>
<td>x</td>
</tr>
<tr>
<td>Sponge</td>
<td>.3gp</td>
<td>9.9MB</td>
<td>x</td>
</tr>
<tr>
<td>Sponge</td>
<td>.mp4</td>
<td>21.7MB</td>
<td>x</td>
</tr>
</tbody>
</table>

x: Secret message missing, ✓: Secret message present

Table VIII describes the results of Scenario 5. All the secret messages sent through Messenger were missing. For WhatsApp all video files could not be delivered, while for BBM all the secret messages were found to be present except for mp4 file in carrier 2, those file cannot be delivered because the file size is too big.
b.) After Sending

Figure 5. Video packet size before and after being sent through Messenger

Figure 5 shows the difference that the left side (a) describes video packet size before being sent through BBM, and the picture on the right (b) describes video packet size after being sent through BBM. It shown that the 3gp file after being sent through WhatsApp did not changed the quality. That’s why all the secret messages were found to be present.
b.) After Sending

Figure 6. Video packet size before and after being sent through Messenger

Figure 6 shows the difference that the left side (a) describes video packet size before being sent through Messenger, and the picture on the right (b) describes video packet size after being sent through Messenger. It shown that the the video file after being sent through Messenger loss the quality. It makes all the secret messages sent through Messenger were missing.

3.7 Scenario 6

In Scenario 6 the simulation sent video files via WhatsApp, Messenger, and BBM. There were two audio formats: 3GP and MP4. The tool that was used to insert the secret message was OurSecret.

<table>
<thead>
<tr>
<th>File Name</th>
<th>File Type</th>
<th>Size</th>
<th>Secret Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigeons</td>
<td>.3gp</td>
<td>7.32MB</td>
<td>x</td>
</tr>
<tr>
<td>Pigeons</td>
<td>.mp4</td>
<td>10.5MB</td>
<td>x</td>
</tr>
<tr>
<td>Sponge</td>
<td>.3gp</td>
<td>9.9MB</td>
<td>x</td>
</tr>
<tr>
<td>Sponge</td>
<td>.mp4</td>
<td>21.7MB</td>
<td>x</td>
</tr>
</tbody>
</table>

x: Secret message missing, ✓: Secret message present

Table IX describes the results of Scenario 6. All the secret messages sent through WhatsApp, Messenger, and BBM applications were missing.
140

Figure 7. Video packet size before and after being sent through BBM

Figure 7 shows the difference that the left side (a) describes video packet size before being sent through BBM, and the picture on the right (b) describes video packet size after being sent through BBM. It shown that the video file after being sent through BBM have changed both of quality and size, and makes the secret messages are missing.

4 Conclusion

The conclusion of this research is as follows. Based on the results of the simulation work, the majority of secret messages which were inserted in pictures were lost when transmitted over instant messaging applications WhatsApp, Messenger, and BBM. This means that the robustness of image steganography sent via messaging applications is not good. PNG and BMP image files that were sent through WhatsApp and BBM were converted to the JPEG format. For the Messenger app, audio files could not be downloaded, as they can only be heard via streaming. For WhatsApp, if the secret message was inserted into a video file using OpenPuff, the video could not be sent. All the secret messages inserted in audio files sent using BBM were present when OpenPuff and OurSecret applications were used. Based on this study, the currently available instant messaging applications cannot be used as a tool to send secret messages by steganography because the majority of the secret messages will be lost.
Acknowledgements. This work was supported in part by the Institute for Research and Community Services (LP2M) UIN Syarif Hidayatullah Jakarta. This paper in conjunction with the 1st International Conference On Islam, Science, And Technology (ICONIST) 2018, Malang, East Java

References


Printed or Digital Qur'an? The Voices of Young Muslims in the Digital Era

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Abstract. This study is intended to voice the use of digital Qur'an by Islamic university students. In the midst of the digital age and the increase of various types of digital applications that increasingly facilitate human life, it turns out that the presence of digital Qur'an as a substitute for printed Al Quran still need to be revisited from several aspects. The respondents of this study are 137 students studying at Islamic universities. The results of this research indicate that there is still the need to use the printed Qur'an. Students feel that they cannot leave the printed version of Qur'an or have not yet fully switched to digital Qur'an. This is due to several factors, namely: (1) there is still some questions about reading the Qur'an, whether to perform ablution or not before reading the digital Qur'an, (2) the digital Qur'an has been reported to be less comfortable than the printed Qur'an because several students stated that their eyes is irritated and tired when reading Digital Quran in a long duration.

Keywords: digital Qur'an; young muslim; digital era

1 Introduction

The Internet massive advancement has brought about many changes in human life, ranging from stimulating different modes of communication, transportation, knowledge hunting and worshiping. Naisbit [1] stated that this condition is referred to the Technological Drunk zone, which characterized by a complex relationship between humans and technology. The Internet World Statistics (2012) noted the increase of the internet users to five times during 2000 – 2012. This signs that more than 2 billion (30%) of the world’s population uses the internet and approximately 25% of those are Muslims [2]. Various usage of the internet are employed by the Muslims. Razaly[3], Elhadj[4], and, Yahya [5] reported that the internet is used for conducting online education, teaching Al Qur’an, doing Online business, banking, spreading information, and communicating. Some studies even reported that the internet was also used by the Islam radical group to spread propaganda and violent ideologies [6, 7].

Massive usage of the internet was more or less also stimulated by the appearance of smartphones and android-based gadgets in 2007. Android itself is a Linux-based operating system designed specifically for mobile phones. Abundance sources of information has flooded human by the existence of the internet deployed through the application on their mobile phones.
Smart phones and gadgets then become inseparable to human daily activities. It then turns to become a soul mate for a human. People will take their phone to wherever they go, both to Formal and nonformal occasions. The development of the smartphone application then has grown so rapidly. Several applications were then developed to support religious activities, including Islamic ritual activities. Currently there have been many applications for Android-based Islamic content such as Al-Quran[8], Hadith[9], zakat [10], Tajweed [11], memorization of the Koran [12], prayer[13], Fiqh [14], etc. Inspite of the diversity of the application available in the smartphone, some study noted that more concern is given to the Al Qur’an digital application. There are even some Al Qur’an digital application to support people with disabilities[15] and early childhood[16]. A small research conducted on September 17, 2018, using “the Qur’an” as the keywords in play store revealed that there are 253 application of the digital Qur’an, both free and paid.

Each Al Qur’an application has different features. For example, the Pro Qur’an application has listed the best Qur'anic readers in the world, such as Abdul Rahman Al-Sudais, Sheikh Mishary Rashid Alafas, and Sheikh Saad al Ghamedi. This application developed by Quanticapps Ltd, London. In addition, its simple appearance also makes readers feel that they read the printed version directly. Furthermore, it can be read offline. Another example is the Indonesian Qur’an version which contains a complete Qur’an and provides Indonesian translations. It even provides word by word translation. The Indonesian version is not only has an attractive appearance but it is also easy to use. Additionally, this Qur’an version has a “verse sharing” feature, a prayer time reminder and a Qibla compass. The “search” feature is also provided to provide reader with several information related to the Qur’an. Another research that build a digital print to learn islamic is done by Atqia et.al.[18]

More than fifty percent of thousands of android users around the world are teenagers.[17] This also the case in Indonesia. Downloading easily and freely from the play store has attracted the teenagers to express themselves by downloading unique application for social media, game, camera and photography.

The digital era is just like two sided of coins. In one hand, it provides a benefit for human and on the other hand, it provides a negative impact as well. Although many people has rejected the digital technology acceleration, they actually can feel the benefits of the advancement of technology.

With the technological enhancement, there is not again any reason of difficulty of accessing to Qur’an. One can easily get any information about the Qur’an, its verses, its translation version and so on. The Qur’an application can be accessed online or offline. The software version of Qur’an is more practical to be carried and can be read anywhere. Considering this condition, this article is aimed to investigate the use of digital Qur’an by the Islamic University students. This paper will uncover whether the easy access to read the Qur’an supported by the technological advancement affected the intensity of reading the Qur’an among the young generation in Indonesia.

2 Literature Review

Literally, Qur’an means “reading” or “a collection”. However, the definition of Al Qur’an has grown overtime. Al Qur’an nowadays is not only reading materials but also research materials. This definition has differentiated between Qiraah (reading) with tilawah (reciting). Reading Qur’an using good mind is called the Qira’atul Qur’an, while reading the Qur’an only
verbally is called Tilawatul Qur’an. Another literal meaning of the Qur’an is a collection of materials that must be read and studied. Muslims believe that Qur’an was mu’jizat (miracle) revealed by God to prophet Muhammad through the angel of Gabriele with the pronounce and meaning from Allah SWT. The Qur’an is divided into surah (chapters) which are then divided into verses. The Qur’an starts with surah Al-Fatiha and ends with surah An-Nas. Indeed, the Qur’an is a noble reading. The Qur’an is a book that proves Muhammad SAW as the prophet of Allah SWT. KH. M. Quraish Shihab strengthen this case by stated that the Qur’an is commonly defined as “the words of God delivered by the angel of Djibril of the lord to Prophet Muhammad SAW and accepted in humility (tawatir)”.

When we look closely to the word Qur’an, it appears about seventy times in the Qur’an book itself, giving various different meaning. It is known as the verbal noun form (masdar) of the Arabic verb *qara’a* which mean “he read” or “he recited”. An important meaning of the word Qur’an is the “act of reciting”, as reflected in an early Qur’anic passage, “it is for us to collect it and to recite it (*qur’anahu*)”.

Along with the invention and development of new science and technology, the digital version of the Qur’an was born. In Indonesia, the reuters has been reported that the first emergence of the digital Qur’an is around 2007. The digital version of the Qur’an has been increasingly popular since then in Indonesia. This application then experienced much advancement into application which can be downloaded in the smartphones.

The application advancement was really supported by both the private and the government sector in Indonesia. Detik.com reported that on the 30th of August 2016, the Ministry of Religious Affair has launched the official digital Qur’an application developed by the Indonesian Ministry of Religious Affair. The minister, Dr. Lukman Hakim Saifuddin in the event stated that “he hopes that this application could progressively improve both the contents and the facilities”.

In this research, the term digital Qur’an refers to the Qur’anic text which are processed and spread as an electronic text and or more specifically refers to an electronic device used to display the text of the Qur’an and playing digital recording of Qur’an recitations. One example of the Qur’anic software on CD-Rom has been developed since the early 1990s. However, with the presence of more powerful smartphones, the focus has changed on the production of Qur’anic software for such devices rather than dedicated digital Qur’an devices.

Several features are noted to be available in the digital Qur’an application, such as audio playback of recorded recitations of the Qur’an with synchronized on screen Arabic text, basic navigation of the Qur’an with the ability for the user to select a specific surah (chapter) and verse, and other languages translation including *bahasa Indonesia* translation which sometimes synchronized with the original Arabic recitations. With several benefits found in digital Qur’an, this should call for the increasing of better understanding of the Qur’an and the increasing of better Muslims that applied Islamic norms and traditions especially among the young generation.

### 3 Research Methods

The participants for this study are Islamic University students (N=137). Most of the respondents studied at religious department (55.5%), and the rest studied at non- religious department (44.5%). Most of the respondents are female (60.6%) and others are male (39.4%).
They have different educational backgrounds, coming from general high school has the highest rank which is 38.7%, followed by pesantren (Islamic boarding school) which is 32.8% and the last is Madrasah (Islamic based school) which is 28.5%.

The Instrument are a questioner consist of 15 questions related to the Al Qur’an digital utilization are deployed to gain the data. The questions were mainly made to find out the descriptive statistical data related to (1). Whether the students have the digital version of Qur’an, (2). Preferences or fondness of the digital version of Qur’an, (3) the frequency of reading the digital version of Qur’an, (4) whether the procedure for using digital Quran is similar to using non-digital Quran, and (5) the benefits of using digital Quran. Statistic descriptive is occupied to analyze the data, using SPSS software.

4 Results

Presented below in table 1 is the finding of this study which is the owner of the printed and the digital version of the Qur’an.

<table>
<thead>
<tr>
<th>Having both Digital Qur’an and Printed Qur’an</th>
<th>Having only digital Qur’an</th>
<th>Having printed Quran only</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 respondents</td>
<td>2 respondents</td>
<td>23 respondents</td>
</tr>
</tbody>
</table>

The data revealed that the majority of students at Islamic University, 110 respondents out of 137 respondents, have both digital and printed Qur’an. This data also proved that only 2 people have digital Qur’an only. The data indicated that there is still a need to use printed version of Qur’an. Students feel that they cannot leave the printed Qur’an and have not yet fully switched to digital Qur’an.

Table 1.B. Features of Digital Qur’an Available on The Students’ Downloaded Version

<table>
<thead>
<tr>
<th>Features available in the downloaded digital Qur’an</th>
<th>Total respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verses, bilingual (Arabic and Indonesian translation), audio, tajwid</td>
<td>46</td>
</tr>
<tr>
<td>Verses, bilingual (Arabic and Indonesian translation), audio</td>
<td>61</td>
</tr>
<tr>
<td>Verses and bilingual (Arabic and Indonesian translation)</td>
<td>24</td>
</tr>
<tr>
<td>Verses only</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 1.b above explains that the majority of respondents (131 respondents) have not only the Qur’an verses features, but also the Indonesian translation feature, audio and even the tajwid recitation. This fact remind us that various features available in the digital Qur’an is important for the young Muslim. Furthermore, table 2 presents the young Muslim fondness to digital Qur’an usage.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
From Table 2, we can see that some Islamic university students are less happy to use digital Qur’an, which are 17 respondents. It is interesting though to explore this phenomena on further research. The students are known as the millennial generation who prioritize practicality and modernization, however it seems that the students are still affected by the Islamic culture and tradition which placed Al Qur’an as a sacred book and cannot be replaced with the digital form. The young Muslim reasons for using digital Qur’an are presented in the following table:

Table 3. The Reason of Using Al-Quran Digital

<table>
<thead>
<tr>
<th>Reasons:</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be read anytime and anywhere</td>
<td>74</td>
</tr>
<tr>
<td>Practicality, easy to be carried</td>
<td>38</td>
</tr>
<tr>
<td>Easy to search specific verses</td>
<td>24</td>
</tr>
<tr>
<td>As a collection</td>
<td>1</td>
</tr>
</tbody>
</table>

From Table 3, it is known that most of the students choose the digital Qur’an because the Qur’an can be read anytime and anywhere. In other words, the Qur’an reading session is not limited to specific space and time, and does not need special schedule or place. These findings are in line with the reasons given by respondents regarding the digital Qur’an function which can be seen in Table 4.

Table 4

<table>
<thead>
<tr>
<th>AlQuran digital function</th>
<th>Total respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>More diligent (istiqmah) in reading the Qur’an</td>
<td>78 respondents</td>
</tr>
<tr>
<td>To support in doing homework</td>
<td>21 respondents</td>
</tr>
<tr>
<td>To support in remembering the Qur’an</td>
<td>30 respondents</td>
</tr>
<tr>
<td>Just for fun</td>
<td>8 respondents</td>
</tr>
</tbody>
</table>

Interesting results were gathered and presented in the following Table 5.

Table 5. The Frequency And Normative In Reading The Qur’an

<table>
<thead>
<tr>
<th>Taking Wudhu before reading digital Qur’an</th>
<th>Total respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>20 respondents</td>
</tr>
<tr>
<td>Seldom</td>
<td>17 respondents</td>
</tr>
<tr>
<td>Sometimes</td>
<td>74 respondents</td>
</tr>
<tr>
<td>Never</td>
<td>26 respondents</td>
</tr>
<tr>
<td>Are you reciting Al-Quran everyday?</td>
<td>Total respondent</td>
</tr>
<tr>
<td>Always</td>
<td>32 respondents</td>
</tr>
<tr>
<td>Seldom</td>
<td>42 respondents</td>
</tr>
<tr>
<td>Sometimes</td>
<td>63 respondents</td>
</tr>
</tbody>
</table>
From Table 5 above, it appears that the majority of students at Islamic universities are still spend some of their time to read Qur’an everyday. However, some norms in reciting the Qur’an such as whether they perform wudhu before reading the digital Qur’an, only 20 students out of 137 students admitted that they are taking wudhu before reading the digital Qur’an. The data also explained that even 26 students are not even taking wudhu before reading the digital Qur’an. This research further tried to compare the students behavior in reading the printed and digital version of Qur’an.

Table 6. The Comparison of Students Behaviour In Reciting The Digital and Printed Version of Qur’an

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Digital Qur’an</th>
<th>Printed Qur’an</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading for 1-2 times / day</td>
<td>109</td>
<td>99</td>
</tr>
<tr>
<td>Reading for 3-4 times / day</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Reading for 5-6 times / day</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Reading &gt; 7 times / day</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total Verses</td>
<td>Digital Qur’an</td>
<td>Printed Qur’an</td>
</tr>
<tr>
<td>&gt;20 verses / day</td>
<td>25</td>
<td>56</td>
</tr>
<tr>
<td>16-20 verses / day</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>10-15 verses / day</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>&lt;10 verses / day</td>
<td>59</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 6 above illustrated that the printed Qur’an is still more superior in terms of pushing students to read Qur’an diligently. Based on the number of verses read, more respondents are noted to read printed Qur’an more than 20 verses a day (a total of 56 respondents) rather than reading digital Qur’an. The data signed a dilemma of reading the digital Qur’an. In one hand, it has been developed to support people to read Qur’an more diligently, but on the other hand it turns out that the digital Qur’an function is not as good as the printed Qur’an in stimulating students to read Qur’an diligently. Lastly, this research is tried to compare the effect of reciting the printed and digital Qur’an on students.

Table 7. Comparing The Effect of Reciting Printed and Digital Qur’an

<table>
<thead>
<tr>
<th>Direct effect of reciting Qur’an</th>
<th>Digital Qur’an</th>
<th>Printed Qur’an</th>
</tr>
</thead>
<tbody>
<tr>
<td>Become a better human</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Calming</td>
<td>84</td>
<td>113</td>
</tr>
<tr>
<td>No effect</td>
<td>38</td>
<td>5</td>
</tr>
<tr>
<td>Restless</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 7 explained that the effect of printed Qur’an is higher than the digital Qur’an. Some students (38 respondents) even mentioned that the got no effect when they read digital.
5 Discussion

The results of this study provide an overview of the use of digital Qur’an among Islamic university students. In the midst of the digital age and the increase of various digital application which support human life, the existence of digital Qur’an as a replacement of printed Qur’an is still need to be considered from several aspects. This study indicated that there is still a high demand of the printed version of Qur’an among the young Muslims. It seems that they have not fully switched to using digital Qur’an only.

In terms of function, digital Qur’an is indeed able to attract the interest of young people, because through one application, individuals can have various features, such as audio function, checking the tajweed (the best way in reciting the Qur’an). The easy access to Qur’an in which it can be read anytime and anywhere with no specific schedule and place has undoubtedly greatly attract young Muslims generation.

Based on some facts found in this research, it can be summed up that several students are still fond of using the printed Qur’an rather than digital Qur’an. This interesting phenomenon should call of further research about some factors affecting the students’ choices. Possible factor that might affects the choice is that the students accept Qur’an as a sacred book that might not be replaced by the digital version. However, the fact that the students do not taking wudhu before reciting digital Qur’an contradicts the former idea. By considering this gap, how far the sanctity and sacredness of the digital Qur’an need to be revisited in this globalization era.

Another issue that comes up in this study is the convenience factor. Several students mentioned that the light of the mobile phone has made their eyes irritating and tired. This reason actually signed the level of the technology integration. There should be follow up research about the level of the technological acceptance among young Muslims in Indonesia.

6 Conclusion

From this research, it can be concluded that the technological integration in Islamic sector should be investigated. Although the application of technology has helped a lot in our every day life, the technology integration in the religious area are still contradictive. It faces positive and negative reaction from the users. As the technology noted to give several benefits, some modifications in the technology are still needed in order to be able to increase the level of religiosity of young Indonesian Muslim.

References


Synthesis of Maghemite Pigment ($\gamma$-Fe$_2$O$_3$) from Lathe Waste Using Precipitation-Calcination Route

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Abstract. Lathe waste from iron craft industry encompassed high iron that potential to be ferric precursor to synthesize maghemite pigment. In this research work, maghemite pigment was synthesized by the precipitation-calcination method using the variation of temperature: 300, 350, 400 and 450°C. The XRD data indicated the formation of magnetite at precipitation stage and then transformed into maghemite after calcination. X-ray diffraction data showed that maghemite has a tetragonal structure with space group P43212. The result showed that the particle size of maghemite increase with increasing temperature. Based on the color parameter, maghemite synthesized at 350°C has the highest lightness. From the SEM-EDS data shows that maghemite has the distribution of particle size was not a uniform and still have impurities, such as carbon and Manganese.

Keywords: Maghemite; Pigment; Lathe Waste; Precipitation-Calcination Route

1 Introduction

Lathe waste is solid waste that generated from iron craft industries. Every day the quantity of 3-4 kg of lathe waste per industry was resulted [1]. The lathe waste has 97.11% iron content that contribute to environmental pollution [2]. One of the process to reduce these waste with treatment efficiency, low cost, and improve added value of waste is the synthesis of maghemite.

Maghemite ($\gamma$-Fe$_2$O$_3$) is a brown iron oxide with cubic or tetragonal structure [3][4] that rarely used to be pigment [5]. Maghemite pigment is a widely used in coating, construction materials [6][7] and other application, because have advantage including chemical stability, biocompatible, nontoxic, biodegradable, stable, and resistance at high temperature [2][8]. Many methods have been developed in synthesizing maghemite, such as hydrothermal [9], microwave-assisted reduction [10], ferrhydrite reduction [11], reduction-precipitation method [12], co-precipitation [13,14] precipitation-calcination [7][15], thermal decomposition [16], and sintering treatment [17]. Precipitation-calcination method is reproducible, simple, low cost, and large yield quantity of product [13][14]. In the calcination route, the structure, phase, particle size, and morphology of iron oxide depend on temperature [18][19][20][21].

In this work, maghemite was synthesized using the precipitation-calcination method using the variation in calcination temperature, in order to establish the composition of iron oxide pigment. The products are well characterized by various characterization techniques such as

2 Materials and Methods

2.1 Materials

All reagents used to synthesis were analytical grade and without further purification. Sulfuric acid (H₂SO₄), nitric acid (HNO₃), ammonium hydroxide (NH₄OH), and sodium hydroxide (NaOH) were purchased from Merck, Germany. Iron lathe waste used to synthesize were from Malang, Indonesia.

2.2 Methods

**Ferrous (Fe²⁺) and Ferric (Fe³⁺) Precursors Preparation**

In ferrous precursor (Fe²⁺) preparation, 30 gr of a sample was mixed with 150 mL of dilute sulfuric acid for 24 hours. The greyish white slurry heated until dry.

The ferric precursor (Fe³⁺) prepared by mixing 30 gr of sample with 300 mL of dilute nitric acid for 24 hours. The deep brown slurry heated until dry.

**Synthesis of Maghemite Pigment (γ-Fe₂O₃) with Calcination Temperature Variations.**

The synthesis was prepared by precipitation of ferrous and ferric precursors. Ferrous and ferric precursors (60 gr:30 gr) were dissolved into 540 mL of distilled water by stirring. After the pH ± 11 by adding NH₄OH, the reaction system kept 60°C for 90 minutes under vigorous stirring. After 24 hours, the black precipitates were separated and washed until the ammonia odor disappeared. The relevant chemical reaction below:

\[
\text{Fe(OH)}_2(s) + 2\text{Fe(OH)}_3(s) \rightarrow \text{Fe}_3\text{O}_4(s) + 4\text{H}_2\text{O}(l)
\]

Then, the black precipitate was oxidized to maghemite in the furnace at 300, 350, 400 and 450°C for 3 hours. The reaction of maghemite formation was:

![Fig. 2. XRD pattern of magnetite and maghemite](image-url)

(1)
2Fe₃O₄(s) + ½ O₂(g) → 3γ-Fe₂O₃(s)  (2)

2.3 Characterizations

The X-rays diffraction (XRD) analysis were performed using a Cu Kα (1.5418 Å) source (40 kV, 40 mA) from Philip X-Pert to know structure and phase of the product. Crystallite size determines by Scherer formula. Color characteristics were analyzed using white Xenon lamp with D65 illuminate from Minolta CR-10. The Lightness (L*), green-red (a*) and blue-yellow (b*) parameters were analyzed using a color reader. Chroma (C*) and hue (H°) data calculated from a* and b*. The morphology of particle and composition product at an optimum temperature in this research was analyzed by the EVO® MA 10 BRUKER scanning electron microscope-energy dispersive x-ray.

3 Results and Discussion

3.1 A. X-ray diffraction

Figure 1 shows the XRD pattern of magnetite that obtained at precipitation stage. They matched well with the standard patterns of magnetite (ICSD 158505). The reflection of magnetite can be indexed in agreement with the expected cubic crystal with space group FD-3M has unit parameter cell a= 8.310964 Å) with cell volume 574.055847 Å³.

![XRD pattern of maghemite (Fe₃O₄) obtained at precipitation stage](image)

Figure 1. XRD pattern of maghemite (Fe₃O₄) obtained at precipitation stage

Magnetite transformed into maghemite after calcination (Fig. 2). Maghemite was successfully synthesized using this method and was highly crystalline. This result in accordance with reference [22] that magnetite can be transformed into maghemite after
calcination 300°C. The reflections of all the variation temperature have an agreement with the standard pattern of maghemite (ICSD 87121). The reflection of maghemite revealed with tetragonal structure with space group $P4_{3}2_{1}2$ as predominant phase.

In addition, the differentiation between magnetite and maghemite were showed by crystal lattice data (Table 1). Magnetite has the lower lattice than maghemite. The lattice of magnetite has similar to magnetite’s result on reference [23] that magnetite has a spinel structure. Based on refinement data by Le Bail refinement method, the increased temperature caused the lattice crystal decreased. Maghemite at 350°C has $R_p$, $R_{wp}$ and $\chi^2 (<4\%)$ value lower than others, that indicated maghemite using calcination 350°C the most similar with the standard.

Table 1. Difference Between Magnetite And Maghemite

<table>
<thead>
<tr>
<th>Product</th>
<th>Crystal lattice (Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>Magnetite</td>
<td>8.3109</td>
</tr>
<tr>
<td>Maghemite 300°C</td>
<td>8.3453</td>
</tr>
<tr>
<td>Maghemite 350°C</td>
<td>8.3393</td>
</tr>
<tr>
<td>Maghemite 400°C</td>
<td>8.3241</td>
</tr>
<tr>
<td>Maghemite 450°C</td>
<td>8.3338</td>
</tr>
</tbody>
</table>

Magnetite and maghemite have similar peaks position at 2θ with reflection peaks at 220, 311, 400, 422, 511 and 440. The most intense peaks were observed at 220, 311 and 440, which were compared with ICSD values. At the maghemite sample, there was a peak appears at 2θ (33) that correspond to hematite phase, that indicated using calcination with high temperature can affect nucleation of hematite. Hematite phase established is affected possible thermodynamically less stable due to the higher surface energy of the particle.

Table 2 shows the average crystallite size that evaluated by Scherrer’s equations at the highest intensity peak (311 planes). Increasing temperature caused the increased crystal size, in contrast to crystal lattice was decreased. Increasing temperature causes the loss of grain boundaries when nucleating so that the crystallite size increases.

Table 2. Crystallite Size Of Products

<table>
<thead>
<tr>
<th>Products</th>
<th>$k/l$</th>
<th>crystallite size (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetite</td>
<td>11</td>
<td>4.94</td>
</tr>
<tr>
<td>Maghemite 300°C</td>
<td>11</td>
<td>7.72</td>
</tr>
<tr>
<td>Maghemite 350°C</td>
<td>11</td>
<td>1.20</td>
</tr>
<tr>
<td>Maghemite 400°C</td>
<td>11</td>
<td>9.92</td>
</tr>
<tr>
<td>Maghemite 450°C</td>
<td>11</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Fig. 5. Value of a* and b* color space of

Figure 3. Visual aspect of Maghemite obtained at
3.2 Color Parameter

The visual aspect of maghemite has dark brown colored. The color parameter of maghemite in Fig. 4 have high positive of lightness. Maghemite synthesized at 350°C has the highest lightness level which occurs due to the highest particle size. The particle size decreases as increase the lightness (L*) level. The* (green-red) and b* (blueness-yellow) of maghemite have a positive value that shows maghemite have red and yellow composition. Fig. 5 shows maghemite obtained at 350°C has highest b*.

Figure 4. Parameter of lightness of Maghemite

The chroma of maghemite at 350 and 400°C overly identically, due to the narrow differentiation of temperature. Based on hue (Fig. 6), maghemite products were not hue range of standard, but on hematite range, which occur due to hematite phase present, influenced by acid type at a formation of precursors process, and increased of temperature at calcination.

Figure 5. Value of a* and b* color space of Maghemite
The shape and particle size distribution of maghemite were analyzed by scanning electron microscopy (SEM) as shown in Fig. 6. It is clearly observed maghemite particle have shape and size were not uniform. There are few large particles which are found to be aggregated, which may due long-range magnetic dipole-dipole interaction between particles.

The composition of maghemite was observed using EDS. The EDS data presented (Table 3) that maghemite from lathe waste has high iron and oxygen content. These results indicate the purity of the synthesis product. Although, there are impurities such carbon and manganese.

| Table 3. Composition of Maghemite 350°C |

<table>
<thead>
<tr>
<th>Element</th>
<th>Content (wt%)</th>
</tr>
</thead>
</table>

Figure 6. Color parameter (Chroma and Hue) of Maghemite

Figure 7. SEM Micrograph of Maghemite 350°C
4 Conclusion

Maghemite was synthesized from lathe waste using precipitation-calcination route have a tetrahedral structure with space group $p4_{2}2_{1}2$. Maghemite has identically brown color and the highest lightness achieved at 350°C. The morphology of maghemite was not uniform and there were impurities such as carbon and manganese.

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References


Implementation of Load Balancing Technology Using Raspberry Pi as a Server for Computer Based Examination

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Abstract. Since 2014, the Indonesian government has implemented a computer-based National Examination as a substitute for paper-based National Examination. Schools that conduct computer-based National Examinations should provide the Server as a provider of questions for students to work on. Not all schools have sufficient funds for server procurement. This research demonstrates load balancing technology in the server of computer-based examination at an educational institution using Raspberry Pi as a first step to handling the computer-based National Examination. Raspberry PI is a relatively low-cost single-board computer technology that will serve as a solution to reduce costs for conducting the computer-based examination. This research using PPDIOO method as a research methodology to design and implement the Raspberry Pi as a load balancing server for the computer-based examination server. The result shows that Raspberry Pi can be used as a server and the load balancing technology can also be implemented to improve the access quality of user in the server.

Keywords: load balancing technology, raspberry pi, computer networking.

1 Introduction

Computer-based exams are derivatives that refer to the Computer-Based National Examination which since 2014 has been implemented by the government as a Computer Based Test (CBT) Test and replaces the National Examination (UN) system based on paper. The implementation of UNBK currently uses a semi-online system where the exam is sent from the central server in real time through the network to be synchronized to local servers in schools. The student exam will be served by a local server offline. When finished, the test results are sent back from the local server to the central server online.

Based on data from the Ministry of Education and National Culture (Kemendikbud) of the Republic of Indonesia as of February 5, 2018, stated that in the academic year of 2016/2017 55,802 schools could not implement UNBK. This figure is higher than the number of schools that can implement UNBK, namely 23,342 schools throughout Indonesia. While 3,682 schools join in implementing UNBK by referring to schools that have been able to implement UNBK. The data illustrates that there are still many schools in Indonesia that cannot implement UNBK.
This UNBK turned out to motivate several schools to create a system similar to UNBK as a school examination system. By making a similar system as a first step, it is hoped that further UNBK implementation can run better. Also, the computer-based examination system will facilitate teachers in correcting values (Susanti, 2016).

In building a server on a local network, a server that is flexible and easy to carry around is needed. This needs to be considered because the computer-based exam process is usually done in class. With this in mind, a server with flexible specifications is needed to adjust to the place.

The development of Raspberry Pi as a web server and the load balancer is exciting to be used as research because Raspberry Pi as a small computer that has a Linux-based operating system, does not require large power and data storage power to be operated into server clusters (Putra and Sugeng, 2016). With this Raspberry Pi, the server on computer-based exams will be built.

The purpose of this study is to make Raspberry Pi as a load balancing server so that it can become a high availability server and reduce the cost of procuring infrastructure to create a computer-based exam system. The next section will discuss the previous research, followed by research methodology and the steps taken to design and use Raspberry Pi as a server. The results of the study will be discussed in the fourth and final section, concluded in the conclusion part and subsequent work.

2 Research Methods

This server design will be made with Cisco Lifecycle Service or PPDIOO method (Chandrashekhar et al., 2011; Fernando et al., 2016; Hernandez and Jimenez, 2018). Figure 1 shows a framework of thought which describes the steps of the method for developing the system.
3 Implementation of Raspberry Pi as server

In this section, detailed steps are carried out according to the research methodology chosen to implement the Raspberry Pi as a server that can be used as a computer-based Exam server.

3.1 Preparation

Topology design for Computer Based Exams is almost the same as UNBK but does not use the Internet as shown as in Figure 2.

![Figure 2. UBK topology](image)

3.2 Plan

Computer networks in this study were described as follows:
- The type of computer network used is client-server.
- The Network Topology used is the Bus Topology on the client network and the Star topology on the server network.
- The computer cluster technique will be used which will form the server design.
- The type of cluster computer for the server to be used is load balancing.

3.3 Design

The topology design that will be implemented in a computer laboratory as shown in Figure 3.

![Figure 3. UBK topology](image)

The diagram block that will be used in load balancing using Raspberry Pi is shown in Figure 4.
In designing this application, it will be made using programming methods with native PHP language. This is done as an effort to maximize performance on load balancing. The structure of the web application page can be seen in Figure 5.

![Figure 4. Raspberry Pi load balancing diagram block](image)

![Figure 5. Web application page structure](image)

### 3.4 Implementation

The first implementation step is setting up an Internet Protocol (IP) address. The IP address of each device that will be implemented in the topology can be seen in Table 3.

<table>
<thead>
<tr>
<th>Device Name</th>
<th>IP Address</th>
<th>Subnet Mask</th>
<th>Gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Balancer</td>
<td>Eth0: 192.168.10.1&lt;br&gt;Eth1: 192.168.0.1</td>
<td>255.255.255.2&lt;br&gt;40&lt;br&gt;255.255.255.0&lt;br&gt;40</td>
<td>-&lt;br&gt;-</td>
</tr>
<tr>
<td>Web Server 1</td>
<td>Eth0: 192.168.10.2</td>
<td>255.255.255.2&lt;br&gt;40</td>
<td>192.168.10.1</td>
</tr>
<tr>
<td>Web Server 2</td>
<td>Eth0: 192.168.10.3</td>
<td>255.255.255.2&lt;br&gt;40</td>
<td>192.168.10.1</td>
</tr>
<tr>
<td>Server Database</td>
<td>Eth0: 192.168.10.4</td>
<td>255.255.255.2&lt;br&gt;40</td>
<td>192.168.10.1</td>
</tr>
<tr>
<td>Computer Admin</td>
<td>Eth0: 192.168.10.5</td>
<td>255.255.255.2&lt;br&gt;40</td>
<td>192.168.10.1</td>
</tr>
</tbody>
</table>
3.5 Operate

At this stage, several scripts will be created on the connected connection to see which web server is actively serving the user. The script is using PHP as follows:

```php
<?php
header('Content-Type: text/plain');
session_start();
echo “Web Server 1 <br>”;
echo "IP Server: ":$_SERVER['SERVER_ADDR']; ?>
```

3.6 Optimize

To find out the performance optimization of the load balancer and web server, it will be tested with Web Server Stress Tool software. This can generate reports in the form of data from each user connection.

The following are the scenarios that will be carried out to optimize performance optimization:

- **Scenario 1**
  Method: Load Balancing  
  *Device: Raspberry PI 3 Model B*  
  *Optimization Duration: 60 minutes*  
  *Number of Simulation Users: 50 users*  
  *Each User’s Click Time: 5 seconds*

- **Scenario 2**
  Method: Load Balancing  
  *Device: Raspberry PI Model B*  
  *Optimization Duration: 60 minutes*  
  *Number of Simulation Users: 100 users*  
  *Each User’s Click Time: 5 seconds*

- **Scenario 3**
  Method: Load Balancing  
  *Device: Raspberry PI 3 Model B*  
  *Optimization Duration: 60 minutes*  
  *Number of Simulation Users: 150 users*  
  *Each User’s Click Time: 5 seconds*

- **Scenario 4**
  Method: Load Balancing  
  *Device: Raspberry PI Model B*  
  *Optimization Duration: 60 minutes*  
  *Number of Simulation Users: 200 users*  
  *Each User’s Click Time: 5 seconds*

- **Scenario 5**
  Method: Single Server  
  *Device: MSI i5-6400 CPU @ 2.70GHz 16GB*  
  *Optimization Duration: 60 minutes*  
  *Number of Simulation Users: 200 users*
Each User’s Click Time: 5 seconds

4 Results and Discussions

The following are the test results and the results of the implementation and discussion that has been carried out. This discussion will be explained based on each research factors.

1) Scenario 1

<table>
<thead>
<tr>
<th>URL No.</th>
<th>Click</th>
<th>Error</th>
<th>Error [%]</th>
<th>Time Spent [ms]</th>
<th>Avg. Click Time [ms]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.187</td>
<td>0</td>
<td>0</td>
<td>1.711.964</td>
<td>537</td>
</tr>
<tr>
<td>2</td>
<td>3.192</td>
<td>0</td>
<td>0</td>
<td>1.684.130</td>
<td>528</td>
</tr>
<tr>
<td>3</td>
<td>2.239</td>
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5) Scenario 5

| AVG | 4.550 | 4.377 | 96 | 2.238.805 | 12.644 |

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<td>10.442.384</td>
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<td>1</td>
<td>13.278.219</td>
<td>2.256</td>
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Table 4. Scenario 3 website page testing

Table 5. Scenario 4 website page testing

Table 6. Scenario 5 website page testing
In Table 10, the number of clicks is different. Average errors, time spent on requests, and the average time for each click.

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<th>Time Spent [ms]</th>
<th>Avg. Click Time [ms]</th>
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According to Figure 6, the most significant amount of clicks occurs in scenario 4 as many as 7,626 and scenario 1 gets the lowest number of clicks which is only 2,558. This can happen because the higher number of users, the higher number of clicks will be
The time spent on the website for each user request follows the number of users themselves. The more the users, the busier the website’s response will be. This is illustrated by the table where the total time spent in scenario 4 is greater because in this scenario the number of users reaches 200 within 60 minutes. Greater than other scenarios.

According to Figure 9, the average time for each click in scenario 2 is the biggest, which is 12,644 ms, this is because in scenario 2 there is an error during testing.

Server and Bandwidth Test Result
1) Scenario 1

Figure 10. Scenario 1 server and user bandwidth test
As shown as in Figure 10, the average bandwidth is so large, and in scenario 1 it can be seen that the bandwidth of the server is much larger.

2) Scenario 2

![Graph of Scenario 2 server and user bandwidth test]

Figure 11. Scenario 2 server and user bandwidth test

According to Figure 11, in scenario two the amount of bandwidth was not stable, this is affected because in scenario 2 there are many up to 96%.

3) Scenario 3

![Graph of Scenario 3 server and user bandwidth test]

Figure 12. Scenario 3 server and user bandwidth test

As shown as in Figure 12, in the third scenario, there was an increase in the user’s average bandwidth.

4) Scenario 4

![Graph of Scenario 4 server and user bandwidth test]

Figure 13. Scenario 4 server and user bandwidth test

5) Scenario 5
From some of these results, it can be concluded that the bandwidth of the clustering load balancing system can meet bandwidth with up to 200 users in 60 minutes.

Results of Data Transfer Test, Memory System, and CPU Load

In the graphs, as shown in Figure 15 until 19, show the traffic on the network that is related to memory and the load that will be received by the server CPU. The following is the graph:

1) Scenario 1

![Figure 15. Scenario 1 data transfer, memory system, and a CPU load test](image)

2) Scenario 2

![Figure 16. Scenario 2 data transfer, memory system, and a CPU load test](image)

3) Scenario 3
Figure 17. Scenario 3 data transfer, memory system, and a CPU load test

4) Scenario 4

Figure 18. Scenario 4 data transfer, memory system, and a CPU load test

5) Scenario 5

Figure 19. Scenario 5 data transfer, memory system, and a CPU load test

5 Conclusions

The following are the conclusions obtained from the results of this study. The conclusions are as follows:

a. The use of Raspberry Pi can be implemented in the computer lab of SMPN 89 Jakarta with 30 students per class.
b. Raspberry Pi with Raspbian/Linux system operation can be used as a load balancer, web server, database server, FTP server and as a cluster system
c. The higher the number of users will affect the average response time for each click and the response time for each click will be longer
d. The number of clicks will be directly proportional to the number of users. Where if there are many users, then the click received by the server is even greater.
e. The higher the number of users, the website's response will be busier greater the number of average click time that the user receives.

f. Stable bandwidth in each test indicates that the bandwidth in the clustering system with one Raspberry Pi as a load balancer, two Raspberry Pi as web servers and one Raspberry as database server is enough to meet the number of users as many as 200 users for 60 minutes.

g. Traffic on load balancing is still stable with a period of 60 minutes, and the number of users is between 1-200.

References


Spatial Information System for Heritage of Islam Banten Culture

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Abstract. Banten has a very close history to the glory of Islam. Remains of the glory of Islam can still be seen from the many Islamic cultural heritage in Banten. The number of Islamic cultural heritage is due to the history of Banten, which has an Islamic kingdom, the Banten Sultanate. The traces of the glory of Islam in Banten can still be seen from the remnants of historical heritage such as in the area of the old city of attack. To preserve the cultural heritage the education and culture services form the Cultural Heritage Conservation Center to carry out protection, development and utilization and facilitation of preservation of reserves. Culture in the area of work. However, in applying the preservation of cultural heritage, BPCB still has constraints such as registration of cultural heritage that is still manual and the unavailability of a spatial information system on the distribution of cultural heritage causes a lack of information on cultural heritage. Based on this, researchers designed the Banten Islamic Heritage Spatial Information System to support cultural preservation activities. Designing this system the author performs several stages including the stages of requirements planning, workshop design and implementation using Rapid Application Development (RAD) system development methods and using the Unified Modeling Language (UML) tools. This research produces Heritage of Islam Banten cultural reserve spatial information system with the output in the form of web-based Islamic Spatial Information System Islamic Application. The developed system can be used by companies to provide information about Islamic cultural heritage and can assist the (Balai Pelestarian Budaya Banten) BPCB in collecting cultural heritage by using the cultural heritage registration feature. In addition, this system can also be used by the community to obtain information about Islamic cultural heritage and also facilitate the registration process of cultural heritage.

Keywords: Spatial Information System; Heritage of Islam Banten Culture; Rapid Application Development (RAD); Unified Modelling Language (UML);

1 Introduction

Indonesia is the biggest archipelago country in the world. The total area of Indonesia is around 1,904,569 km². The number of islands in Indonesia reaches 13,466 km. Not only that, Indonesia has many ethnic groups, languages and customs that make Indonesia a great nation. Based on this diversity, Indonesia has a very diverse culture in it. This diversity cannot be separated from the long history of the Indonesian people who have long been in contact with other nations because of the trade process. Because of its strategic location with the trade route causing acculturation of culture. Foreign traders come to the archipelago by bringing
their customs and culture as a result affecting the indigenous culture of the archipelago. This has an impact on cultural diversity in Indonesia.

Indonesia has a long history from prehistoric times to the era of independence. That can be seen from the many historical relics that still exist today or which can be called cultural heritage. Cultural heritage has important values for history, science, education, religion and culture. Cultural heritage has a unique, rare, fragile, non-renewable nature, cannot be replaced by the same technology and materials, and is important because it is evidence of past human activities. According to Law No. 11 of 2010 Cultural heritage is categorized into 5, namely cultural heritage objects, cultural heritage buildings, cultural heritage structures, cultural heritage sites, and cultural heritage sites on land and sea [1].

To preserve the cultural heritage the Ministry of Education and Culture issued a Regulation of Minister of Education and Culture No. 52 of 2012 established the Center for Preservation of Cultural Heritage has the task of carrying out protection, development and utilization and facilitation of preservation of cultural heritage in its working area. Conservation must be based on a feasibility study that can be accounted for academically, technically and administratively. In its implementation, cultural preservation activities must refer to laws and regulations, be carried out or coordinated with conservation experts and with due regard to the ethics of preservation.

It is noted that there are around 1390 cultural reserves that have been designated as provincial level cultural heritage by the Ministry of Education and Culture. In Banten there are 28 provincial cultural heritage sites and 227 district / city level cultural heritage objects. According to the Banten Center for Cultural Heritage Conservation, there are around 245 recorded cultural reserves. All recorded data are cultural heritage from prehistoric times to independence.

![Figure 1. Chart of Number of General Cultural Heritage and Islamic Heritage in 2016](image)

Banten Province is a province famous for its pilgrimage and religious tourism. That can be seen from the history of Banten which has an Islamic kingdom, namely the Sultanate of Banten. During the Banten Sultanate, the Banten Region experienced rapid development. Banten area is the center of trade on the island of Java and also as the largest Islamic study center in Southeast Asia. There are 44 Islamic cultural reserves that have been designated as cultural heritage, 25 are registered but not yet established, and 13 are not registered.
Figure 2. Graph number of Islamic cultural heritage in Banten Province in 2016

Current cultural heritage problems are caused by various things. The issue of ownership or control of cultural heritage, human activities such as development, in addition to the lack of attention from the government and the participation of the community in conservation so that cultural heritage is not maintained or damaged. On the other hand there are still many historical relics that have not been registered as cultural heritage by the government, causing them to be damaged or destroyed by human actions. Problems like this are often encountered but are difficult to prevent because the status of the cultural heritage has not been established. That is because there is still a lack of available data to make it a cultural heritage so that the cultural heritage is not maintained and damaged and may also be lost due to eroded development.

In Law No. 11 of 2010 paragraph 28 explained that the district/city government cooperates with everyone in registering. But in the implementation the Banten provincial government itself still uses registration manually. Whereas according to Law No. 11 of 2010 paragraph 30, namely the Government facilitates the establishment of a digital and/or non-digital system and network for registration of cultural heritage [1].

Referring to Law No. 11 of 2010 Article 95 paragraph 2 points "d" the Government and Regional Government in accordance with their level have the task of providing cultural heritage information for the community. However, the Banten Provincial Government itself has not provided cultural heritage information for the community. Whereas according to Law No. 11 of 2010 article 39 which reads the Government and Regional Government make an active effort to record and disseminate information about cultural heritage while still considering the security and confidentiality of data deemed necessary in accordance with the provisions of the legislation. But in its implementation the Banten provincial government was less active in providing information about cultural heritage [1].

With the technological advances that exist today we easily get information quickly and precisely. Geographic Information System (GIS) is a computer-based information system, designed to work using data that has spatial information (spatial references). This system captures, checks, integrates, manipulates, analyzes, and displays data that spatially references the location of the earth's surface. By using GIS we can utilize spatial data that is processed for the preservation of the cultural heritage. From the spatial data, the limits of the extent and space utilization can be determined through the zoning system. And from the zoning system, cultural heritage can be protected, developed and utilized easily. With the management of 3
aspects of conservation it will provide results for the cultural heritage. This system is expected to help the government through institutions in registering, regulating and managing cultural heritage data, and can contribute knowledge to the historical development of Islamic culture, preserving it so that Indonesia always has a diversity of Islamic culture all the time that can be known, read and utilized by the whole community.

2 Literature Review

F. Petrescu 2007, The Use Of Gis Technology In Cultural Heritage’, This paper is a report that attempts to describe the current status of GIS use in cultural heritage. Data provided by national CIPA delegates represent the main source of information on which the report is based [2].

MI. Santoso, Z. Arham and E. Khudzaeva, 2016, with title” Design of a web-based Geographic Information Systems Spatial for Distribution of Historic Site”, Spatial information system can be designed based on archaeological site data which is located in the island of Java and the system was built using webBase system using Google Maps API that directly connected with Google Maps making it easier for the user to find the location of the site of history, besides that this system is also equipped with a direct location that can show the direction of the place of origin to the place where the site is located. [3]

G. Vacca, D.R. Fiorio and D. Pili 2017, This paper has the purpose of learning the techniques of building the 13-18th century in the region of Sardinia (Italy) for their knowledge, conservation and promotion. and was established with a multidisciplinary approach involving several specialists who integrated their expertise and provided their input for dimensional knowledge, technical constructs, merochemological, material, physical-mechanical, and energy performance features [4].

W. Lou, et al, 2017, his paper takes spatial analysis of Geographic Information Systems (GIS) as a basic technology and all history and cultural resources in Zhejiang Province of China as objects of research, and find accumulation and accumulation spaces Zhejiang Province's historic cities and cultural resources through overlay analysis and density analysis, etc. Then it will be discussed reasons for the formation of this accumulation area and accumulated belts by combining with physical geography analysis and historical geography and so on, and ultimately, linking tourism planning and traffic planning at the provincial level, providing advice on exhibitions and use of accumulated areas and accumulated belts from historical cities and cultural resources [5].

3 Methods

The author uses the system life cycle, Rapid Application Development (RAD).

3.1 Phase Requirement Planning

1. Data collection and information requirements
The researcher collected data and information through direct observation, interviews, and literature studies, so that the following data and information were obtained:
   a. Profile of Banten Cultural Heritage Conservation Center.
b. The organizational structure of the Banten Cultural Heritage Conservation Center.
c. Duties and functions of the Banten Cultural Heritage Conservation Center.

2. System Identification
After data and information is obtained, the author will identify the system to develop the existing system as follows:
   a. Identifying Problems in a Running System Analyzing and identifying what are the weaknesses of the old system that is still running today
   b. Proposed System Analysis Making recommendations in the form of a proposed system based on the identification of problems found in the running system as a solution to overcome the problems that exist in the old system.

3.2 Workshop Design Phase
   1. Process design
      a. Use Case Design
      b. Activity Design
      c. Sequence Design
      d. Class Design
   2. Database design
      Researchers design and create a database of the Islamic spatial information system for Islamic cultural heritage. Database creation is done using the MySql server database.
   3. Interface design
      Researchers designed the interface, namely, the spatial information system of the Islamic cultural heritage of Banten. Customized views based on running system analysis related to cultural heritage so that users can not get into trouble when using the proposed system.

3.3 Implementation Phase
   1. System development stages
      In the initial stages, researchers made several maps needed in Banten Islamic cultural heritage spatial information system by digitizing and processing data and information collected using the ArcGis application. Then the researchers made the back end and front end systems in accordance with the analysis and design process that was made.
   2. System testing stages
      Researchers tested the proposed system using the blackbox testing method to ensure that there were no processes that were not in accordance with the design and design of the proposed system.

4 Result

4.1 Requirement Planning
   Running System Analyst
1. Members register cultural heritage to the BPCB by providing data to the sub-administration.
2. The protection, development and utilization section conducts verification of Cultural Heritage data.
3. The protection, development and utilization section includes cultural heritage data in the database.
4. The community submits a letter of application to obtain cultural heritage data and information to the sub-administration.
5. The administration sub-agency submits the application letter to the section on protection, development and utilization.
6. The protection, development and utilization section retrieves data from the database.
7. The protection, development and utilization section provides data to the sub-administration.
8. The administration sub-agency provides data in accordance with community requests.

**Proposed System**

1. Member registers to create an account on the system.
2. Member registers cultural heritage owned.
3. Admin manages employee accounts in the system.
4. Admin validates registered member accounts.
5. News Management Admin about cultural heritage.
6. The protection, development and utilization section validates the registered cultural heritage.
7. The protection, development and utilization section carries out the management of cultural heritage that has been recorded in the BPCB inventory.
8. Section for protection, development and utilization of historical management.
9. The public sees the registered cultural heritage data.
10. The community accesses the map to see the spread of Islamic cultural heritage.
11. People see the history of Islam in Banten.
12. People access to the location to see the fastest route to cultural heritage.
13. People access news to see the latest news related to Islamic cultural heritage.

4.2 Workshop Design

**Use case Diagram**

![Use case Diagram](Figure 5. Use case Diagram Of Spatial Information system Heritage of Islam Banten Culture.)

**Class Diagram**
5 Conclusion
1. The Islamic cultural heritage spatial information system is expected to help BPCB Banten to provide cultural heritage information to the community.
2. The spatial information system of Islamic cultural heritage provides a distribution map of Islamic culture that can be used to store information and history about Islamic culture in Banten.
3. The spatial information system of Islamic cultural heritage provides an online cultural heritage registration system to make it easier for people to register cultural heritage.

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References

The Influence of Methods For Fractination of Free Fatty Acid Fraction From Coconut Milk Hydrolysis Using Coconut Lipase Endogeneus Enzyme

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Abstract. The coconut milk that is hydrolyzed will get the oil fraction in the form of free fatty acids, monoglycerides and diglycerides. Free fatty acids in the form of lauric acid and monoglycerides in the form of monolaurin have very high antibacterial and antiviral abilities. This research aims to study the method of fractionation of oil fractions resulting from hydrolysis of coconut milk using the enzyme lipase. The study was conducted by hydrolyzing coconut milk using endogenous lipase enzyme. Hydrolysates are separated by oil fractions by several methods, namely heating, fishing, papain enzyme and salting. The separation fraction of oil was measured for yield, free fatty acid levels. Furthermore, the separation of free fatty acids from oil and hydrolyzed coconut. The free fatty acid fraction obtained was tested for yield and fatty acid composition. The results showed that, the method of separation with fishing oil yielded the highest yield of 47%. Then followed by salting method and papain enzyme method respectively 40% and 39%. The lowest yield obtained by heating method is 28.69. But the enzyme papain method produces the highest levels of free fatty acids, which is 0.07 ml mol / ml. While the method of fishing and salting oil has the lowest free fatty acid level, which is 0.04 ml mol / ml. The results of the most free fatty acid separation were obtained from hydrolyzed coconut milk at 5.32%. Whereas free fatty acids obtained from the oil fraction were 4.52%.

Keywords: Lipase; coconut milk; hydrolysis; fractination

1 Introduction

Coconut milk is one of the processed products from coconut meat which can be processed into coconut oil. Coconut milk is a naturally formed emulsion. In coconut milk there is coconut oil, water and emulsifier. According to [1], coconut oil contains lauric acid 52.26%, myristic acid 16.82%, caprilic acid 8.21%, capric acid 7.79%, caproic acid 0.24%, palmitic acid 6, 59%, stearic acid 1.51%, oleic acid 4.83% and linoleic acid 1.33%.

Coconut oil contains many medium chain fatty acids (MCFA) such as capric acid and myristic acid, which is very useful as an anti-bacterial agent [2], anti-microbial [3], can inhibit the development of the HIV virus [4], herpes virus, influenza and sarcoma [5]. In addition, lauric acid can reduce blood cholesterol levels [6].
These fatty acids can inhibit the growth of Pneumococci, Streptococcus, Micrococcii, Candida, S. aureus, S. epidermidis. Lauric acid only requires a concentration of 0.062 micro mol / ml which can inhibit pneumococci. Whereas capric acid and myristic acid each need 1.45 micro mol / ml and 0.218 micro mol / ml to inhibit the same microbes [3].

These fatty acids have anti-bacterial ability if in the form of free fatty acids and monoglycerides. Fatty acids in the form of diglycerides and triglycerides, do not have anti-bacterial activity.

Lauric acid in the form of free fatty acids requires a concentration of 0.62 micromol / ml to inhibit Micrococcii bacteria. Whereas in the form of monolaurin (monoglyceride) only requires 0.09 micromol / ml [3].

Lauric acid in the form of dilaurine and tri laurin cannot inhibit Micrococcii growth to a concentration of 6 micromol / ml. While capric acid requires 2.90 micromol / ml and in the form of mono caprin requires 0.10 micromol / ml. Whereas in the form of capaprin it is not able to inhibit Micrococcii [3].

Hydrolysis of oil into free fatty acids can be done using the lipase enzyme. Lipase in plant seeds plays a role in hydrolyzing oils (triglycerides), diglycerides and mono glycerides into free fatty acids (lauric acid, etc.) and glycerol [7]. The lipase enzyme is able to hydrolyze ester bonds from oil (glycerides) to produce free fatty acids [8].

Lipase enzymes from other source, namely coconut houstorium, can hydrolyze coconut oil into free fatty acids. Hydrolization produces 40.20% of the total fatty acids in coconut oil [9].

Further research on lipase enzyme isolation from coconut milk has been carried out by [10]. The results showed that coconut milk contained lipase enzyme of 3.15 units / ml and specific activity was 1.41 units / mg of protein.

The free fatty acid fraction was obtained from hydrolysis of coconut milk made by adding 1: 1 water to grated coconut then squeezed. Hydrolysis was carried out for 72 hours. Endogenous enzymes in coconut milk will hydrolyze coconut oil into free fatty acids during incubation. After separation, the free fatty acid fraction obtained was 48.98% of the total coconut oil in coconut milk. The free fatty acid fraction contained lauric acid 53.86%, myristic acid 16.71%, caprylate acid 7.86%, capric acid 7.76% and palmitic acid 6.60%. The fraction is called fraction rich in lauric acid because lauric acid is the highest fatty acid [11].

This fraction can kill pathogenic bacteria such as Salmonella at a concentration of 3.13%, Stafilococcus aureus at 6.25% and E. Coli at 6.25%. Whereas in spoilage bacteria, the free fatty acid fraction can kill Micrococcii at 30% concentration, Bacillus stearothermophilus at 50% concentration and Pseudomonas with a concentration of 70% [12].

The addition of fractions rich in lauric acid into soy milk with a concentration of 20% can increase the storage of soy milk up to 2 days with a total microbes of 1.00 x 104 cfu / ml, free fatty acids 0.12 m mol / ml, pH 5.05 and scores aroma 4 (likes). On the 3rd day soy milk has begun to experience damage [13].

This study was conducted to separate the oil fraction resulting from hydrolysis of coconut milk using endogeneous enzymes. The oil fraction obtained is expected to contain high free fatty acids. This is because fatty acids that have anti-bacterial activity are in the form of free fatty acids.

Fractination oil from coconut milk can be done by several methods including (1) chain breaking method (stirring), (2) enzymatic method, (3) salting method, (4) fishing rod method, (5) centrifuse method and (6) freezing method.

Chain breaking method (mixing) is done by stirring coconut milk at high speed using a mixer. During the stirring process there will be a break in the chemical bond on the emulsifier.
Emulsifiers in coconut milk function to stabilize coconut milk so that coconut oil is not separated from coconut milk. If the chemical bond on the emulsifier breaks, the oil will be separated from the coconut milk [14].

The enzymatic method uses enzymes to damage the coconut milk emulsion. The enzyme used is the protease enzyme, an enzyme that can break down proteins. Some protease enzymes that are easily obtained are papain from papaya or bromelin enzymes from pineapple and zingibain enzyme from ginger rhizome [15].

The fishing oil method is done by adding oil or virgin coconut oil as an angler to the coconut milk (cream). Then it was allowed to stand for 10-12 hours so that the oil from the cream was separated [16].

The salting method was carried out by added CaCl2 salt into coconut milk and allowed to stand for 12 hours to obtain pure coconut oil [17].

Each method of fractionation has its own strengths and weaknesses. There are methods that produce high yield, but low quality. Conversely, there is a method with low yield but good quality. These research aims to obtain oil separation methods that produce high yields and good quality.

2 Materials and Methods

This research was conducted from February to December 2017 at the Widya Gama University Chemistry and Biochemistry Laboratory in Malang. Several stages of research were carried out at the Gajah Mada University Biochemistry Laboratory.

The tools used in this study included a set of glassware, plastic filters, stainless steel blades, stainless steel (Brilliant) grate tools, mortars, centrifuges, analytical balance sheets (Mettler Toledo AL 204), stirrer stirrers, heaters (Janke-Kunkel), oven, pH-meter (Orion 201), space thermometer, UV-Vis (Genesys 10 UV series) spectrophotometer, gas chromatography device (model 5890 series HP) with CBPS column.

The ingredients used are, among others, deep varieties of coconut fruit from Lawang Malang Regency, virgin coconut oil (VCO), aquades, ion-free distilled water, NaCl salt, papain enzyme. Chemicals include arabic gum, ammonium sulfate salt, NaOH, pp indicator, K2HPO4, KH2PO4, Dietylete, petroleun ether, NaCO3, HCl, ethanol.

2.1 The process of hydrolysis of coconut milk uses endogenous lipase

The hydrolysis process uses a coconut milk substrate. Coconut milk was made by coconut shelled, then grated. Grated coconut added with distilled water in a ratio of 1:1, then obtained so that coconut milk was obtained.

Coconut milk was hydrolyzed using endogenous lipase that was already in coconut milk. Hydrolysis was done by incubating coconut milk at 35 oC for 72 hours. During incubation, stirring was carried out using a stirrer at a speed of 150 rpm. Products from hydrolysis are called hydrolysates. Hydrolysate was tested for free fatty acids, then fractionated to separate oil and non-oil fractions.

2.2 Separation of the oil fraction from Hydrolysate
Fractionation aims to get the oil fraction from hydrolyzate. The resulting hydrolyzate will form 3 fractions namely oil (top), cream (middle) and water (bottom). Cream fraction is an oil-rich fraction. The cream fraction will then be separated (fractionated).

The first stage, fractionation was carried out on the cream fraction using several methods, namely (1) fishing using virgin coconut oil (vco), (2) salting, (3) papain enzyme and (4) heating. Fractionation results were obtained by the oil fraction and the non oil (water) fraction. Each fraction was tested for yield and free fatty acid levels.

2.3 Separation of free fatty acids

The fractionation method that produces the highest free fatty acids was the method that uses the enzyme papain. The separation of free fatty acids was carried out using three different samples 1) oil fraction, (2) non-oil fraction and (3) Whole hydrolyzate (still containing oil and non-oil fractions. The yield of free fatty acids from each sample was tested for yield and free fatty acid composition.

Free fatty acid composition test using Gas Chromatography (GC). the average pore sizes of microporous and mesoporous materials, respectively. Thermogravimetric analysis (TGA) was performed using a differential scanning calorimeter/thermogravimetric analyser (Mettler-Toledo, TGA/DSC 1) from 30°C to 800°C using 5°C min in air atmosphere.

3 Discussion

3.1 Fractions in Hydrolisate

Coconut milk which has been hydrolyzed for 72 hours at 35 oC (hydrolysate) obtained three fractions, namely oil, cream and water. The results of each fraction of hydrolyzed coconut milk can be seen in Table 1.

Table 1. The Results of Each Fraction of Hydrolyzed Coconut Milk

<table>
<thead>
<tr>
<th>Sample</th>
<th>Total (ml)</th>
<th>Before hydrolysis</th>
<th>After hydrolysis</th>
<th>FFA(m mol/ml)</th>
<th>Total FFA (m mol) in 200 ml coconut milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut milk</td>
<td>200</td>
<td>0</td>
<td>0.20</td>
<td>40.50</td>
<td></td>
</tr>
<tr>
<td>Oil fraction</td>
<td>0</td>
<td>34.25</td>
<td>0.14</td>
<td>4.74</td>
<td></td>
</tr>
<tr>
<td>Water fraction</td>
<td>0</td>
<td>131.50</td>
<td>0.23</td>
<td>29.92</td>
<td></td>
</tr>
<tr>
<td>Cream fraction</td>
<td>0</td>
<td>30.00</td>
<td>0.21</td>
<td>6.15</td>
<td></td>
</tr>
</tbody>
</table>

The water fraction is the most fraction among all fractions, followed by the oil fraction and at least the fraction of the cream. The water fraction consists water contained in coconut and water added during coconut milk making. Water added in ratio 1 : 1 on making process coconut milk. Therefore, the amount of water fraction is the most due to the addition of water when making coconut milk.
Oil fraction is oil in coconut milk which is separated from coconut milk during the hydrolysis process. This oil separation occurs due to the emulsifier damage whose components consist of protein. Emulsifier damage is caused by the activity of protease enzymes in coconut milk which hydrolyze proteins in emulsifiers, causing oil to come out of the coconut emulsion system.

Cream fraction is a fraction that contains oil, emulsifier, protein and some water. Oil that is not released from coconut milk during the hydrolysis process will be in the cream fraction. The next research was to separate oil from the cream fraction.

### 3.2 Separation of the Oil Fraction from the Cream Fraction

The separation of oil from the cream fraction used a different (fractionation) separation method between heating methods, salting, papain enzyme and giving coconut oil from the outside to stimulate oil separation (fishing).

This separation is done to determine the efficiency and effectiveness of some of the fractionation methods.

#### Yield

The results of the separation are obtained by two factions, namely oil fractions and non-oil (water) fractions. The oil fraction contains hydrolysis products in the form of free fatty acids, mono glycerides and diglycerides. Whereas the water fraction contains many non-oil compounds such as proteins, carbohydrates and other compounds which dissolve in water. The oil fraction produced by several separation methods in different samples can be seen in Table 2.

<table>
<thead>
<tr>
<th>Separation Method</th>
<th>Oil Fraction (%)</th>
<th>Non-Oil Fraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing</td>
<td>47.26</td>
<td>52.74</td>
</tr>
<tr>
<td>Salting</td>
<td>40.02</td>
<td>59.98</td>
</tr>
<tr>
<td>Papain enzyme</td>
<td>39.86</td>
<td>60.14</td>
</tr>
<tr>
<td>Heating</td>
<td>28.69</td>
<td>71.31</td>
</tr>
</tbody>
</table>

Table 2 shows that the separation using heating produces the lowest yield. This is because some of the oil obtained is left behind in blondo (the rest of the oil-making process) thus reducing the amount of oil obtained.

#### Free Fatty Acid Levels in the Oil Fraction

The levels of free fatty acids contained in the oil fraction obtained by different separation methods can be seen in Table 3.

<table>
<thead>
<tr>
<th>Separation Method</th>
<th>Free Fatty Acid (m mol/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing (vco)</td>
<td>0.04</td>
</tr>
<tr>
<td>Salting</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Table 3 shows that the highest levels of free fatty acids were obtained in the fraction resulting from separation by the enzyme papain method. This is because the separation method using papain enzyme was incubated for 24 hours after the addition of papain enzyme. During this incubation, there is still oil hydrolysis by lipase enzymes in cream and coconut milk samples. According to [10], coconut milk contained lipase enzyme of 3.15 units / ml. Endogenous enzymes in coconut milk will hydrolyze coconut oil into free fatty acids during incubation [11].

Whereas in the heating method, incubation is not carried out. Because, heating can denature lipase enzyme. According [18], the free fatty acid content of virgin coconut oil processed by heating is lower than that of it which is processed by other methods.

The fishing method is actually incubated. Allegedly, during the incubation, the oil fraction immediately separated from the water fraction because of the addition of oil from outside as an angler. Thus, hydrolysis by the lipase enzyme cannot occur because the lipase enzyme can work if the oil is still an emulsion with water. While the salting method, also does not occur hydrolysis by the enzyme lipase because salt causes protein denaturation including the lipase enzyme found in coconut milk and cream.

**Free Fatty Acid Levels in Non Oil (Water) Fractions**

The free fatty acid levels found in the water fraction obtained by different separation methods can be seen in Table 4.

<table>
<thead>
<tr>
<th>Separation Method</th>
<th>Free Fatty Acid (m mol/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing (vco)</td>
<td>0.08</td>
</tr>
<tr>
<td>Salting</td>
<td>0.08</td>
</tr>
<tr>
<td>Papain enzyme</td>
<td>0.13</td>
</tr>
<tr>
<td>Heating</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 4 shows that the highest levels of free fatty acids in the non-oil fraction (residual fraction) are highest in the papain enzyme method. In the separation by heating method, there is no free fatty acid because in the method there is no residual water fraction. Residues in the form lumps of solid material in coconut milk such as protein, carbohydrates and others. The rest is in the form of solids known as blondo.

The separation method using the papain enzyme produces the highest free fatty acids in the water fraction because the method in the oil fraction also produces the highest free fatty acids. In the papain enzyme method, incubation was carried out for 24 hours after the papain enzyme was added so that the oil hydrolysis by lipase enzyme which caused free fatty acids produced also increased.

The free fatty acids contained in the non-oil fraction are short chain fatty acid compounds such as butyric acid. These fatty acids are free fatty acids which are relatively soluble in water.

### 3.3 Free Fatty Acid Separation

**Free Fatty Acids in Each Faction**
Separation of free fatty acids was carried out using the enzyme papain method. This is because this method produces the highest free fatty acids compared to other methods. The results of the separation obtained three fractions namely oil fraction, water fraction (non oil) and cream fraction. Each fraction was tested for free fatty acid levels and hydrolyzed coconut milk before separation. The number of each fraction and free fatty acid levels after separation can be seen in Table 5.

The highest amount of free fatty acids in coconut milk. This is because coconut milk is a combination of three fractions namely oil, water and cream fractions. After separation, the water fraction contains the most free fatty acids. This may be organic acid and short chain fatty acid (SCFA) in the coconut milk which are contained in the water fraction soluble in water.

Table 5. Free Fatty Acid Levels In Each Section After Separation With The Enzyme Papain Method.

<table>
<thead>
<tr>
<th>Before Separation</th>
<th>After Separation</th>
<th>Amount (ml)</th>
<th>FFA(m mol/ml)</th>
<th>Total FFA (m mol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut milk</td>
<td></td>
<td>200.00</td>
<td>0.20</td>
<td>40.50</td>
</tr>
<tr>
<td>Oil fraction</td>
<td></td>
<td>34.25</td>
<td>0.14</td>
<td>4.74</td>
</tr>
<tr>
<td>Water fraction</td>
<td></td>
<td>131.50</td>
<td>0.23</td>
<td>29.92</td>
</tr>
<tr>
<td>Cream fraction</td>
<td></td>
<td>30.00</td>
<td>0.21</td>
<td>6.15</td>
</tr>
</tbody>
</table>

Results of Free Fatty Acid Separation in Each Section

At this stage, the separation of free fatty acids is carried out in three ways: using different ingredients (1) a mixture of all fractions (hydrolyzed coconut milk), (2) oil fraction and (3) water or residual fraction. The number of free fatty acids from each fraction can be seen in Table 6.

Table 6. The Number of Free Fatty Acids in Each Fraction

<table>
<thead>
<tr>
<th>Sample</th>
<th>Amount (ml)</th>
<th>Free fatty acid fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Volume (ml)</td>
<td>(%)</td>
</tr>
<tr>
<td>Hydrolyzed coconut</td>
<td>200</td>
<td>9.27</td>
</tr>
<tr>
<td>milk</td>
<td></td>
<td>5.32</td>
</tr>
<tr>
<td>Oil Fraction</td>
<td>33.15</td>
<td>1.40</td>
</tr>
<tr>
<td>Water Fraction</td>
<td>129.5</td>
<td>0.03</td>
</tr>
</tbody>
</table>

After through the fractionation process, the highest free fatty acids were obtained from hydrolyzed coconut milk as much as 9.27 ml in 200 ml coconut milk. Then followed by the oil fraction and the lowest water fraction. This is because free fatty acids in coconut milk are a combination of free fatty acids in the oil fraction and water fraction.

The water fraction contains the lowest free fatty acids. When compared to the results of free fatty acid testing (Table 5), the water fraction contains the most free fatty acids. This is because free fatty acids measured in Table 4 are a mixture of free fatty acids and organic acids present in coconut meat. When fractionating with organic solvents, these organic acids cannot
be separated because they cannot dissolve in organic solvents. So that only free fatty acids derived from coconut oil are obtained.

**Free Fatty Acid Composition in Each Faction**

Free fatty acids obtained from fractionation were tested for fatty acid composition using gas chromatography (GC). The composition of fatty acids from coconut milk, oil fraction and water fraction can be seen in Table 7. Chromatogram of free fatty acids from coconut milk, oil fraction and water fraction can be seen in Figure 1, 2 and 3.

**Table 7. Composition of Free Fatty Acids In Each Part After Separation With The Enzyme Papain Method**

<table>
<thead>
<tr>
<th>Types of Fatty Acids</th>
<th>Hydrolyzed Coconut Milk (%)</th>
<th>Oil Fraction (%)</th>
<th>Water Fraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caproic Acid</td>
<td>2.4290</td>
<td>0.4441</td>
<td>9.9847</td>
</tr>
<tr>
<td>Caprilic Acid</td>
<td>15.4224</td>
<td>12.6556</td>
<td>17.4949</td>
</tr>
<tr>
<td>Capric Acid</td>
<td>8.4623</td>
<td>8.4777</td>
<td>7.3451</td>
</tr>
<tr>
<td>Lauric Acid</td>
<td>40.6499</td>
<td>40.2471</td>
<td>35.4205</td>
</tr>
<tr>
<td>Mirtistic Acid</td>
<td>15.8958</td>
<td>17.1438</td>
<td>12.8041</td>
</tr>
<tr>
<td>Palmitic Acid</td>
<td>6.2366</td>
<td>6.8868</td>
<td>5.0365</td>
</tr>
<tr>
<td>Linoleic Acid</td>
<td>0.2097</td>
<td>0.1468</td>
<td>0.3370</td>
</tr>
<tr>
<td>Oleic Acid</td>
<td>5.7104</td>
<td>5.6310</td>
<td>4.6364</td>
</tr>
<tr>
<td>Stearic Acid</td>
<td>1.6226</td>
<td>1.8123</td>
<td>1.5155</td>
</tr>
</tbody>
</table>

The composition of free fatty acids from coconut milk and oil fraction is not much significant difference. But in the water fraction, the composition of free fatty acids is somewhat different. The difference is seen in caproic acid and caprylate which is higher than the coconut fraction and oil fraction. Caproic acid and caprylate acid have shorter carbon chains than other fatty acids. This fatty acid is more soluble in water than fatty acids with long carbon atoms. This shows that free fatty acids in many water fractions contain free fatty acids which are easily soluble in water.

**4 Conclusions and Recommendations**

**4.1 Conclusions**

The highest levels of free fatty acids were 0,13 mmol/ml obtained by papain enzyme fractination method. The highest amount of free fatty acid fraction was obtained from hydrolyzed coconut milk, followed by oil fraction and the lowest water fraction.

**4.2 Recommendations**

Further research is needed on the separation of monoglycerides and diglycerides from hydrolyzed coconut milk.
Acknowledgements. This paper is in conjunction with the 9th International Conference on Green Technology (ICGT) 2018.

References

[1] Su'i, M., (2009), Lipase from Coconut and Its Application to Hydrolysis Coconut Oil, Dissertations of Doctorate Program, Brawijaya University, Malang
[9] Su'i, Harijono, Yunianta and Aulani'am, 2010, Lipase Enzyme Hydrolysis Activity From Coconut Kentos Against Coconut Oil, Agritech Journal of Agricultural Technology Gajah Mada University Yogyakarta, 2 (2) : 164 – 167
Science and Technology to Change Human Being's Behaviour According to Quran as Counselling Approach

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Abstract. The purpose of this study is to analyse the behavioral science and technology as a reference for counseling clients. It concerns with the discovery of methods of changing human behavior in order to be one of the approaches to improve human happiness. When human conducts deviant behavior, he has been hurt even though in reality he seems to hurt others, so in fact he hurt himself. So by finding the pattern of technological change of behavior in the Quran then it shows the real practice of successful behavior change. When a person has succeeded in turning into a good behavior, he can keep the goodness and he will grow as well as make himself beneficial for himself and others. Behavioral changes must be properly spoken and practiced by the client as an indicator of behavioral change. Changing behavior does not only happen for a moment but the client should make his or her behavior a new style in his life. Thus the success of changing behavior in the context of counseling belongs to technology for human improvement, which is as good as the technology of other fields that are also born for the benefit of human beings.

Keywords: behavior change; counseling approach; science and technology; Quran

1 Introduction

There are several studies on science and technology and according to the discipline of each expert. There are expert exact and social experts in the development of science. All discoveries in the field found by the researchers is appropriate discipline [1] science is expected to provide benefits for the development of science. Here are some topics of research conducted by experts in their respective fields. In technological developments, research has been conducted on physics by scientists with the discovery of certain chemical formations. In recent advances in high-pressure science and technology, about the boom of high-pressure science and technology from a small niche field to become a major dimension in physical sciences. One of the most important technological advances is the integration of synchrotron nanotechnology with the minute samples at ultrahigh pressures.

Likewise, research in the development of this technology processing focuses on several risk management issues in coal science and technology and risk management companies applying methods comprehensively to provide scientific theoretical foundations and methods that can operate for risk management [2]. This research focuses on several risk management
issues in coal science and technology firms and risk management that apply the method comprehensively to provide a scientific and operational theoretical basis for risk management.

Similarly, there are also scientists who examine the exact scientist printing institutions [3] where he examined the single sex school enhancing students STEM (Science, technology, engineering and mathematics) outcomes and found male sex just better results than the female sex itself is school science and technology. Male gender factors for science, technology, engineering and mathematic majors in educational institutions affect the choice of school majors and the results of graduates of this science-printing school. While [4] research in science and engineering and engineering institute enhanced cooperation to produce students who can build network post-school work. Subsequent research related to green science as a high-level building design technology to reduce energy and the environment research results is a simple engineering application of high energy physics reactions and produces clean energy and is a leading edge technology [5].

Research related to science and technology park is a productive activity done by collaborating government, academia, community and business [6]. That it is important to create stakeholder excellence that generates innovation by optimizing human resources, the power and goodness of public policy. Scientific research on the status of the awards of science and technology of Chinese nursing associations and the analysis of the development trends of nursing research in which scientific research is predicted to contribute to human health given the current state of human aging [7].

Scientific research highlighting science and technology institutions as a form of management participation in a sustainable practice that can be replicated in society and off campus with this study is expected to use IMS as an evaluation framework as needed. Scientific and technological research in Japan as the first country to establish the regulation of health system security in the world by involving trained neutral academic researchers and experts in the field of consumer and functional food science regulation as trends in food science and technology [8]. Undertook carbon storage research to advance science and technology to support commercial deployment [9]. Similarly, science research for development as well as the step and convergence of science technology development with political policy and adapted to economic development respond the need for more sophisticated techniques in research in science [10]. It also promotes scientists to take special follow-up to detect important variables in environments that may be significant for future success of the area analyzed in this study [10].

Subsequent research related to open innovation is known as the use of purposive inflows and outflows with the aim of accelerating the company's internal innovation and expanding markets through the use of external innovation is a vital window of opportunity for all companies to compete with technology and survive. Companies that face many things to engage in open disclosure may be a closed-door intent and are reluctant to use open innovation in open innovation to understand the factors, which are disincentives to open innovation appropriately. Corporate secrecy and confidentiality, human resources, brand and image, resources and costs, organizational management, market equity, technology and administration resources are carried out [11]. An important study of a model for investigating stability factors in collaborative networks of formal science and technology is a case study on Iran [12] as research in a network of collaboration in the realm of science and technology, organization, long-term stability in one of the main expectations on the founding of a network of developing countries such as Iran where government and public institutions are major contributors in the investment network.
The next research conducted [13] on defense investment and the transformation of national science and technology, the perspective of high-tech exploitation, the dollar of national defense positively correlates with national-scale productivity in the article but does not correlate with the national defense dollar patent positively moderates patent technology but negatively softening the application of scientific articles for the development of economic products. In the analysis of US dollar defense moderation seems to be in a relatively favorable position compared to the most advanced OECD economies. Similarly, research conducted [14] and devised a national science and technology evaluation system based on a new international practice typology. The gap analysis of the optimistic and optimistic situation of the Iranian S & T evaluation system shows that primarily on key system functions, interaction framework and financing dimension models, significant changes must occur through the application of evaluations. So is the research of public involvement models employed by science communicator firms that focus on the dissemination of engineering and mathematical engineering (STEM) knowledge with learner subjects. It examines the potential of science shows to foster the interest and imagination of young learners in STEM discussions that focus on conversations with members of science and science education based in the UK and universities and the conditions necessary for the success [14].

Figure 1. Research Science Technology

The above research (figure 1) is very useful both in the context of natural resource empowerment, maintaining nature, especially human life and goodness in general. The author looks at how the human condition itself in which in his life he behaves experiencing barriers to gain happiness and achieve advancement in technology and science that he should be able to master and enjoy. It is necessary to find the technology of behavior change that prevents the attainment of happiness in one's own life, especially also for the utilization of others. The authors argue that there is a science of technology that works specifically for human happiness associated with itself as a connoisseur of the times. Previous research is related to exact science research. It needs more exploration on the science of knowledge and technology related to the change of behavior.

Counseling is a science and technology altering behavior itself is a separate discipline study is also an important existence in order to provide help to someone who hampered to get happiness himself and also others. Counseling is a technology that concentrates on changing behavior. The result can make a person can improve the knowledge on his respective disciplines. If technology and science in the exact, health, and social fields were created by human beings, what about the technology created by the human creator, God. In Islam there is a technology of behavior change written in the Word of God as a source of knowledge.
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Considering all of the above suggestions stating that Islam has an important effect on most Muslims, some Muslim counselors will have their wish to use their belief system to get over their issues [15]. How the two Muslims clients held a strong belief and were tried to put it into practice in their daily life and also in the counseling sessions.

Through the Quran any behavior that can prevent people from doing good for themselves as well as others. The implications of this study are predicted to provide examples of how such behaviorally altered systemic behavioral technology can be a scenario for other behaviors, in which humans are the object of the technology of behavior change itself.

2 Literature Review

In behavioral change technology or called counseling there are several studies that show that with certain technologies one can be helped to improve the quality of life through cognitive-behavioral approach as did [16] and successfully changed his behavior to more positive. Counseling can help a person with interpersonal sensitivity issues, such as [17] through a behavioral cognitive approach. Similarly, there is providing weight management counseling is cited as a reason for limited treatment through cognitive behavioral counseling as the [18]. Behavior modification technology is also addressed to someone who is an alcoholic and a sex offender in the opinion of [19] becomes a descendant of alcohol and sex addiction. Next research of [20] enhances women's courage ability to give birth to the risk of childbirth through an Internet-based behavioral cognitive approach. To clients who experience behavioral disorders can also be changed through the cognitive approach of behavioral counseling and therapy as research [21]. In addition there are studies related to behavioral cognitive counseling to reduce anxiety by [22] through practice to students. A behavioral cognitive counseling approach to reduce depressed childhood parental divorce as [23]. There is also [24] conducted research to change the behavior or counseling of clients who fear the risk of cancer becomes bold against the risk of disease.

![Figure 2. Position Technology: Counseling as Changing Behaviour on Reasearch Studies](image)

On the role of psychology and social science in effective spiritual and religious medicine, Muslim scholars emphasize "holistic medicine" that involves psychological, physical and moral aspects [25]. The theological and philosophical debates of spiritual and health problems within the Quran encourage Muslim scientists and spiritual nurses to think of the existence,
the nature, the quality of the afterlife and their influence on human nature. Likewise, taking the Quran as an example of knowledge in human life can be used as a model of positive behavior in the life of an individual. This research is directed to bridge the latest technology today. Figure 2 shows the current research position is technology behavioral reproduction taken from the main source of Islamic teachings that is Quran.

3 Methods

Constant comparative method by constructing the ground theory from collecting and analyzing empirical data, comparing the whole process with the first stages comparing the prevailing events of each category, secondly integrating the categories and their properties, the third limiting theory and the fourth writing theory of Jupp V [26]. Potter explains that constant comparative is done by catagery entitlement stage, stake inoculation, corroboration & consesus, and active voicing [26].

The steps of historical research are done by determining the problem, declaring the purpose, hypotetesis and research question, collecting data, evaluating the data of both external and internal carbon dating of artefacts, reporting the results of Sukardi's research [27] especially the history of the story in the Qur'an. Category entitlement is done by categorizing discourse in Quran texts related to technology of behavior change, stake inoculation is done by studying the contradiction and diction of words in Quran, corroboration & consensus in common of all new behaviors expressed nature of Qur an word discourse, and active voicing collecting words in Quran with quote verses, showing indications in the Quran to corroborate research findings.

![Figure 3. Research Stages](image)

Conversation analysis, also carried out in this study of any verbal and non verbal expression as well as behaviors that appear in the word Quranic verses related to behavior change technology [26]. In addition, the research also uses a heruistic approach. In applying heuristics ignores the completeness or perfection of the text or grammatical conditions. So that researchers can mean and conditions when the Quran is derived also the culture, inner experience, culture or imagination through Quranic verses by researchers [27] The work of
heuristics produces a literal understanding of meaning, explicit meaning, actual meaning contained in the Quran.

Heuristics, is a step to interpretation by reference through linguistic signs. In this case researchers are expected to give meaning to linguistic forms that may not be grammatical (ungrammaticalities). Researchers assume that language is referential, in the sense that language must be related to the real thing. The realization of a heuristic reading can be either the Quranic verses used or the messages put forward in the context of counseling. The indication of the verse that characterizes counseling follows the following guidelines in accordance with the completeness of science and technology counseling.

Table 1. Instruments of Heuristic Study QS Yusuf Counseling: Adaptation

<table>
<thead>
<tr>
<th>No</th>
<th>The dynamics of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Who changes (input): the process of behavior</td>
</tr>
<tr>
<td>2</td>
<td>Circumstances before changing</td>
</tr>
<tr>
<td>3</td>
<td>Behavior change technology: counseling (process)</td>
</tr>
<tr>
<td>4</td>
<td>Product (Change of behavior)</td>
</tr>
<tr>
<td>5</td>
<td>The process of changing ways and atmosphere</td>
</tr>
<tr>
<td>6</td>
<td>Who conducts and stimulates behavioral changes</td>
</tr>
</tbody>
</table>

Microethnography is used because this study studies what is heard and bound to the details of human interaction and its activities are told in the Quran. Document analysis used in this research there is a history of asbabun nuzul in the Quran shaped word written in the Quran including social functions, interpretation, effects and use penafsran associated with the Quran context [27]. In addition, this study also conducts discourse analysis contained in the Quran. As well as discourse analysis is done by revealing knowledge in the Quran and then designed in theory and practice of certain behavior discourse is occasioned, action oriented, and constructed.

Furthermore, this study also undertaken the study of individual and group behaviors that perform extreme behavior and result in life-threatening others contained in the story in the Quran [27]. Data archives are conducted by acquiring, storing and disseminating data in the Quran for secondary analysis of research and preserving the long term that can be guided as well as cultural studies conducted in this research as a cross-disciplinary effort in expressing the world's place and cultural significance in all forms of "culture in the Quran" Clear and concise elaboration of the method applied and the steps taken to ensure the reliability and validity of used methodology. Explain the sample and target population with justifications in the form of Quranic verses containing the chronology of an event thoroughly and completed in the letter of Joseph using the instruments of Table 1.

Hypotheses of this research is that there is technology in the Quran letter, especially the letter of Joseph, there are inputs in the form of deviant behavior and behavioral change technology in the form of behavioral cognitive counseling as well as technology products that change behavior in the form of new behavior that becomes better than the previous behaviour.

4 Results and Discussion
The discovery of behavior change technology is found by researchers in the Epistle of Joseph, where it is narrated in the Quran that there is a conflict of siblings of the Prophet Yusuf. A family conflicted and formed two groups, the first group of Prophet Yusuf and Benjamin, the second group of 10 brothers Joseph. Facing the risk of conflict has many siblings with family members. What behaviors need to be changed, how does the behavior change system in Joseph's letter. What guidance and counseling needs to be strengthened during a behavior change system. Here is a picture found by related researchers.

The feelings of someone who wants something to happen to him and it does not happen to him is a problem. In the above event it seems that the problem triggered by the client's desire to get the affection of his father was not given to him but given to others who did not want. Client feels entitled to affection because they feel superior to others ...

\[
\text{ Yellowstone, 8) From this incident if the client can control his main emotions, thoughts (QS12:10 – QS 14:17) and deeds (QS 12:16, 18) and his actions will behave healthfully, otherwise he will behave deviate. The results of behavior change based on QS 12 technology of behavior are}
\]

Acknowledging the strengths of others and acknowledging God who has favored Yusuf of them from hating others to wanting to kill through QS 12 science and technology is changing behavior. The step science and technology QS 12 is below.

Figure 4. Step Technology to Change Behaviour/Counseling

Technology to change behavior in surah Yusuf is a story directly told by God as an example to design new behavior. In accordance with Beck counseling theory that deviant behavior can be restructured back into good behavior or not deviate. Given the positive behavior change in surah Yusuf marks the indication of the success of the counseling process which also requires several stages to be able to change one's behavior. The process of cognitive awareness as a technology of behavior change seems to be predicted by researchers as a key to encourage affection client to transform himself into a good person. The habit of
doing negative actions in problem and by client in such a way through this behavioral change technology has become a new person through the stages deliberately changed the behavior of client by "counselor" so that the behavior is consistent and become a new "style" for the client make his new behavior becomes character him.

Client perform deviant behavior has a purpose to seize parental love. So the client does everything that anyone who he thinks obstructs his desire to get his parents' affection should be eliminated. The process of "counselor" is to analyze what behaviors a client needs to promptly modify behavior [17].

The implementation of QS Yusuf for changing behavior through proposive sampling of children who have negative behavior stealing the age of 11 years.

4.1 Diagnosis

There are 11-year-olds, trapped in stealing behavior, he lived only with a single parent because of divorce with his wife, the client stole more than 5 HP of cellphone. the economic condition of the parents of this child is very poor. The school's condition for the child did not pass grade 6 and was forced to change schools because they had to repeat grade 6.

4.2 Prognosis

The main behaviors that need to be changed for clients are stealing habits, how to change the habit of stealing to not stealing. The main behaviors that need to be changed for clients are stealing habits, how to change the habit of stealing to not stealing.

4.3 Treatment

<table>
<thead>
<tr>
<th>Tabel 2. Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify deviations that are observable and measurable</td>
</tr>
<tr>
<td>2. Scenario / creating new behavior is the same as when the previous</td>
</tr>
<tr>
<td>3. Using objects in the form of events, people, nature in the same condition when behavior deviations</td>
</tr>
<tr>
<td>3. Arouse cognitive, affective and action</td>
</tr>
</tbody>
</table>
4.4 Follow Up

Every week or month the client is given homework to control the desire, and adjust according to his needs as a child. When mocked by a friend as a thief he responds "yes I was a thief but now I want to be a pious child". It is supported by his father to return to the way of Allah by exemplifying kindness and orderly worship for this child.

5 Conclusion

Although client has sense and sense is one way his body learn about the word, [29], it needs changing the behavior through the use of all five senses to gain knowledge in learning science including learning new behaviors. And all the sensory capacities should also be considered by the counselor whether the client has truly functioned all these senses in order to receive all the messages of change in himself. A company needs to invoke the most fundamental bases of action: the attitude and behavior of its people [30]. It is also necessary to apply to the client so that he or she can maintain a commitment to be good at maintaining well-behaved behavior. All of the element affecting the bottom-line performance, the importance of the leader's mood and behavior are most surprising. The leader of moods and behaviors drives the moods and behaviors of everyone else, it does not inspire counselors to keep the spirit of helping the client in whatever condition he is in.

If the counselor wants the client like most succesful leaders, the counselors are in the early stages of their plan career, given plenty of guidance and support [31]. Psychologist mentions that there are two processes of thinking algorithmic linear thinking process and convergent straight toward a certain target [32]. Both think heuristic thinking diverges toward multiple targets at once.

In visual search procedure of research, it ideally begins with identification, general description, mathematical description, historical testing, if accept appropriate identification continue research to answer, if not appropriate proceed to discard and repeat modify mathematical description [33]. The strengths and contribution of research to theory that the counseling in Quran Yusuf verses can be used as a counseling model to handle the behavior of the counselor as well as build the commitment of counselor to defend himself not to give punishment to the client. When the counselor identifies deviant behavior and the counselor remains positive thinking to all the client's efforts, it is showing the desire to change for the better. Contribution in counseling practice is done using behavioral modification model which should follow the behavior change scenario gradually to increase the result of changing. The limitation of this study is on behavioral forms that can be observed and measured so that for hidden behavior may not be altered in this process. Future research directions with the conclusion that the model of behavioral change technology can be extended to other Quranic verses or sources of Islamic teachings or other religious teachings.

Acknowledgement. This paper in conjuction with The 1st International Conference on Islam, Science and Technology (ICONIST 2018) in Malang, East Java.
References


Dynamics Analysis of Two-Dimensional Systems of the 
Hodgkin-Huxley Model on Propagatsion of Nerve Cell 
Impulse

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Abstract. This research aims to assess the environmental quality of Jodipan, Malang 
through the Comprehensive Assessment System for Built Environment Efficiency 
(CASBEE) Tools. Jodipan is one of the urban villages in Malang city which stands along 
in the Brantas riverbanks. It is a high-density settlement with the majority of the 
population work as a merchant. At 2016, the settlement in Jodipan riverbanks painted 
colorfully, and it made Jodipan called “Kampung Warna Warni” or Colourful Kampong. 
Jodipan now became one of the new community-based tourism destinations in Malang 
and succeeded to attract domestic and international tourist. The existence of this 
kampong gave a big impact on environmental quality especially river since their 
communities’ activities are very depending on the river. The method based on the triple-
bottom-line approach that adopts three classifications of sustainable development which 
are the environment, society, and economy. The result of environmental quality in 
Jodipan kampong riverbank was 2.1. This score indicates a low value and below the 
average of the environmental quality standards.

Keywords: integrated, assessment, quality, riverbank

1 Introduction

Much progress has been made in the study of spike generation since the work of Hodgkin 
and Huxley. Working without the knowledge of the membrane structure, scientists tried to 
build models of a neuron by adjusting parameters that were measured and not necessarily 
from the same neuron. The study of dynamical systems today asks and tries to answer the 
questions of why two seemingly similar neurons can behave so differently under the same 
conditions. A dynamical system consists of a set of variables that describe its state and a law 
that describes the evolution of the state variables with time [1].

The Hodgkin-Huxley model is a dynamical system consisting of the state variables 
\(V, n, m, h\) with a four-dimensional system of ordinary differential equations governing the 
evolution of the state variables [2]. We will see that the Hodgkin-Huxley model can be 
reduced to a two-dimensional model and still produce the same action potentials. Then we will 
perform analysis on the reduced model to explain some of the dynamics of the squid giant 
axons. We begin by seeing how other models are analyzed.

Most concepts will be illustrated using the \(I_{Na} + I_K\) model in eq. 3.1 having leak 
current \(I_L\), persistent \(Na^+\) current \(I_{Na_p}\) with instantaneous activation kinetic and a relatively
slower persistent $K^+$ current $i_K$ with either high or low threshold. The two choices of $K^+$ current result in fundamentally different dynamics of the model. This model is equivalent in many respects to the well-known and widely used $i_{Ca} + i_K$-model proposed by [3] to describe voltage oscillations in the barnacle giant muscle fiber.

Since persistent $K^+$ current has only one gating variable $n$, the state of this system is a two-dimensional vector $(V, n) \in \mathbb{R}^2$ on the phase plane $\mathbb{R}^2$. New types of equilibria, orbits, and bifurcations can exist on the phase plane that cannot exist on the phase line $\mathbb{R}$. Many interesting features of single neuron dynamics can be illustrated or explained using two-dimensional systems. Even neuronal bursting, which occurs in multi-dimensional systems, can be understood via bifurcation analysis of two-dimensional systems [4].

Previous research has been conducted by [5]. They studied the four-variable Hodgkin-Huxley cables model by looking at the axon geometry side and the Neuron membrane capacitance.

The problem raised in this research is how to know the dynamics analysis of two-dimensional systems of the Hodgkin-Huxley model to describe the model when there is a change in electric current impulse $I_{ext}$ received by the membrane potential from outside the Neuron membrane or in other words, when the value of $I_{ext}$ value is fickle. By observing this change of $I_{ext}$ value is expected to control the magnitude of Neuron membrane potential and the ionic population of Neuron membrane. The numerical simulation conducted in this research is by using ODE45. So the dynamics obtained from changes in the ionic population is controlled by the magnitude of the membrane potential. Thus, the depth of this research is to see how far two-dimensional systems of the Hodgkin-Huxley model analysis of the external current changes. Therefore, it can be concluded how the condition of an ionic population of Neuron membranes to remain balanced.

2 Literature Review

2.1 Two-Dimensional Systems of the Hodgkin-Huxley Model

This research will use systems of nonlinear ordinary differential equations formulated by Izhikevich, (2004). It is consist of two equations, such as membrane potentials and probability of the activation gate to be in the open state for $K^+$ channels. Let us consider the 2-dimensional leak + persistent sodium + potassium model denoted as: $I_L + I_{Na,p} + I_K$. This model having leak current $I_L$, persistent $Na^+$ current $I_{Na,p}$ with instantaneous activation kinetic and a relatively slower persistent $K^+$ current $I_K$ with either high or low threshold. The state of this systems is a 2-dimensional vector $(V, n)$ on the phase plane $\mathbb{R}^2$ since the $Na^+$ current has instantaneous activation kinetics, such that its conductance may be considered to be maximal, $n_{max}$, over most all of the time interval. The activation kinetics for $n$ are much slower and so it must be defined by its derivative [6].

2.2 Differential Equations, Vector Fields, and Linear Algebra

Natural, social and artificial systems change hour by hour. Dynamical system is a mathematics for the modeling and the analysis of such systems’ behavior. Dynamical systems incorporate the state and its time change in a system. Consider a difference equation or continuous-time dynamical system [7].
The solution $x(t)$ which satisfies this differential equation is called an orbit or trajectory of the system (2.1). The state $x(0)$ is referred as the initial state again. The special state point $x^*$ such that $f(x^*) = 0$ is called a fixed point, an equilibrium point or a steady state. The right-hand side (r.h.s.) $f(x(t)) \in \mathbb{R}^N$ of the differential equation (2.1) is a vector and is called a vector field. The vector field assigns the vector $f(x)$ to each point $x$ of the state space $\mathbb{R}^N$. The simplest example of the continuous dynamical system (2.1) is also the case that the map $f$ is a linear matrix $A$ [8]:

$$
\frac{dx}{dt} = Ax(t), \quad x(t) \in \mathbb{R}^N, \quad t \in \mathbb{R}
$$

where $A$ is an invertible $N \times N$ matrix. Note that only the origin $x = (0, ..., 0)^T$ is the fixed point or an equilibrium point since this system is linear and $A$ is invertible. The general solutions can be obtained by [9].

$$
x(t) = \exp(At)x(0)
$$

### 2.3 Linearization and Stabilities

In the case of the continuous-time dynamical system (2.1), the equilibrium point at the origin is stable if the real parts of all eigenvalues of $A$ are less than zero (negative). Next, consider nonlinear dynamical systems. Let $x^*$ be an equilibrium point of the continuous-time dynamical system (2.1), then $f(x^*) = 0$ in (2.1). The Taylor expansion of the function $f(x)$ near the equilibrium point $x^*$ are obtained as follows [10]:

$$
f(x) = f(x^*) + Df(x^*)(x - x^*) + \mathcal{O}(||x - x^*||)
$$

where $\left(||x - x^*||\right)$ denotes the higher-order terms (second-order terms and higher terms) and $Df(x^*)$ is the Jacobian matrix:

$$
Df(x^*) = \begin{pmatrix}
\frac{\partial f_1(x^*)}{\partial x_1} & \frac{\partial f_1(x^*)}{\partial x_2} & \cdots & \frac{\partial f_1(x^*)}{\partial x_N} \\
\frac{\partial f_2(x^*)}{\partial x_1} & \frac{\partial f_2(x^*)}{\partial x_2} & \cdots & \frac{\partial f_2(x^*)}{\partial x_N} \\
\vdots & \vdots & \ddots & \vdots \\
\frac{\partial f_N(x^*)}{\partial x_1} & \frac{\partial f_N(x^*)}{\partial x_2} & \cdots & \frac{\partial f_N(x^*)}{\partial x_N}
\end{pmatrix}_{x = x^*}
$$

$$
x = (x_1, x_2, ...,)^T, \quad f(x) = (f_1(x_1, x_2, ...), f_2(x_1, x_2, ...), ...,)^T
$$
Near the equilibrium point \( x^* \), we can neglect (under some conditions) the higher-order terms \( O \left( \| x - x^* \|^3 \right) \) since \( O \left( \| x - x^* \|^2 \right) \) becomes small when \( \| x - x^* \|^2 \) is small. Then, we can obtain a linearized system or linearization of (2.1), respectively as follows:

\[
\vartheta \frac{d}{dt} \varphi(t) = A \varphi(t), \quad A = Df(x^*)
\]

where we have made use of the change of a variable \( \varphi(t) = x(t) - x^* \) [11].

### 3 Results and Discussion

The model that used in this research is a system of two variables of the Hodgkin-Huxley model that formulated by Izhikevich. The equations is as follows [12]:

\[
C \frac{dV(t)}{dt} = I_{\text{ext}} - I_L(V(t)) - I_{\text{step}}(V(t)) - I_K(V)
\]

\[
\frac{d}{dt} n(t) = \frac{n_{\text{step}}(V(t)) - n(t)}{\tau(V)}
\]

where

\[
I_L(V(t)) = g_L(V(t) - E_L)
\]

\[
I_{\text{step}}(V(t)) = g_{\text{step}} m_{\infty}(V(t))(V(t) - E_{\text{step}})
\]

\[
I_K(V(t), n(t)) = g_K n(t)(V(t) - E_K)
\]

\[
m_{\infty}(V(t)) = \frac{1}{1 + e^{-\frac{V(t) - V_{\text{th}}}{k_m}}}
\]

\[
n_{\infty}(V(t)) = \frac{1}{1 + e^{-\frac{V(t) - V_{\text{th}}}{k_n}}}
\]

The description initial value of variables and parameters that used in the system of two-dimensional systems of the Hodgkin-Huxley model (3.1) can be seen in the appendix. The equilibrium point of the system (3.1) is obtained if \( V = 0 \) and \( \theta = 0 \). From the system of equations (3.1) is sought the equilibrium point value with the help of Maple to obtain the equilibrium point, is \( V^* = -65.95295125 \) mV and \( \theta^* = 2.77173422 \times 10^{-5} \). We first need to establish the equilibrium points by studying the nullclines of the state variables. A nullcline is all of the locations in the phase plane where a state variable is at rest. In this system, that would be when \( V = 0 \) and \( \theta = 0 \). The equation for the \( V \) nullcline is:

\[
I_{\text{ext}} - I_L(V(t)) - I_{\text{step}}(V(t)) - I_K(V(t), n(t) = 0)
\]

\[
n(t) = \frac{I_{\text{ext}} - g_L(V(t) - E_L) - g_{\text{step}} m_{\infty}(V(t))(V(t) - E_{\text{step}})}{g_K n(t)(V(t) - E_K)}
\]
The $n$ nullcline is:

$$n_{\infty} (V(t)) = \frac{1}{1 + e^{-V(t)/\theta_n}}$$

The intersections of these nullclines will be the points where neither of the state variables is changing, so the membrane is at equilibrium [13]. In Figure 3.1, we see the cubic-shaped nullcline for $V$ in purple and the sigmoid-shaped nullcline for $n$ in orange. Their intersection is the equilibrium for this model.

This figure also is demonstrating when $I = 0 \, \text{A cm}^{-2}$ that some models fail to have “all or nothing spikes”. We can see trajectories of the phase plane which have varying initial values for membrane potential but the same initial value for the potassium activation variable, “$n$”. It is apparent that some trajectories follow a subthreshold path to the equilibrium and others take a longer excursion with greater values of membrane potential. So, there are varying amplitudes of action potentials, not “all or nothing” spikes.

In Figure 3.2, we observe the $I_{\text{Ksp}} + I_{\text{K}}$ low threshold system when $I = 50 \, \text{A cm}^{-2}$ has trajectories all starting with the same initial membrane potential of $-45 \, \text{mV}$, but varying values of initial $K^+$ activation variable “$n$”. Some trajectories depict full action potentials and some make small excursions and return to equilibrium with subthreshold spikes. We can see that this model has no fixed threshold of membrane potential. All of the action potentials exhibited in Figures 3.1 and 3.2 are transient; they all return to equilibrium values.
In Fig. 3.2. It is easy to see how $V$ and $n$ nullclines partition the phase plane into four regions having different direction of the vector field: (a) Both $V$ and $n$ increase: Both $\text{Na}^+$ and $\text{K}^+$ currents activate and lead to the upstroke of the action potential. (b) $V$ decreases but $n$ still increases: $\text{Na}^+$ current deactivates but slower $\text{K}^+$ current still activates and lead to the down stroke of the action potential. (c) Both $V$ and $n$ decrease: Both $\text{Na}^+$ and $\text{K}^+$ currents deactivate while $V$ is small leading to a refractory period. (d) $V$ increases but $n$ still decreases: Partial activation of $\text{Na}^+$ current combined with further deactivation of residual $\text{K}^+$ current lead to an excitable period, and possible to another action potential.

The intersection of $V$ and $n$ nullclines in Fig. 3.3 is an equilibrium corresponding to the rest state. The number and location of equilibriums might be difficult to infer via analysis of equations (3.1, 3.2), but it is a trivial geometrical exercise once the nullclines are determined. Because nullclines are so useful and important in geometrical analysis of dynamical systems, few scientists bother to plot vector fields. Following this tradition, we will not show vector
fields in the rest of the book (except this chapter). Instead, we plot nullclines and representative trajectories.

In Fig. 3.4 we illustrate another dramatic aspect of threshold behavior, which can be explained only by considering joint evolution of $V$ and $\mathbf{n}$. We apply a long pre-pulse current $I$ of various strength to keep the membrane potential of the $I_{\text{NaP}} + I_K$ model at various subthreshold values, and then a strong but brief pulse to reset the membrane potential to exactly -48 mV, which is a superthreshold voltage value. As one can see, -48 mV becomes a subthreshold value for positive pre-pulses but remains to be superthreshold for negative and zero pre-pulses.

![Graph of $V$ with Respect to $t$](image1)

**Figure 4.** Graph of $V$ with respect to $t$ when given $I_{\text{ext}} = 0.1 \text{ A cm}^{-2}$

In Fig. 3.5 we inject $I_{\text{ext}} = 4.52 \text{ A cm}^{-2}$ pulse of current into a brainstem mesencephalon neuron of a rat. When the inhibitory current is removed, the neuron generates rebound action potentials called post-inhibitory spikes. Such spikes are ubiquitous in many neurons, and they are often attributed to the existence of cation inward current with low-threshold $K^+$ current to generate a post-inhibitory spike in Fig. 3.5. Since the model has neither of the currents, it can produce such a strange phenomenon.

![Graph of $V, \mathbf{n}$ with Respect to $t$](image2)

**Figure 5.** Graph of $V, \mathbf{n}$ with respect to $t$ when given $I_{\text{ext}} = 4.52 \text{ A cm}^{-2}$

To explain the mechanism of post-inhibitory spikes, we need to consider joint evolution of the state variables $V$ and $\mathbf{n}$. When the membrane potential is hyperpolarized, the $K^+$ current, which is partially activated at rest, starts to deactivate, i.e., variable $\mathbf{n}$ starts to decrease. When we suddenly remove the inhibitory current, there is a deficit of outward $K^+$ current ($\mathbf{n}$ is too small) and the net membrane current drives $V$ over the threshold. From the dynamical system point of view such post-inhibitory spikes are closely related to the existence of fast damped oscillatory potentials seen in Fig. 3.5.
The approach of the linear system around the equilibrium point $V'$ and $n'$ using the Taylor series and cut to first order. After a long process obtained the following linear equations:

$$\frac{dV}{dt} = -1.733914807V - 240.4704$$
$$\frac{dn}{dt} = \frac{5.541930352 \times 10^{-5}}{V - n}$$

The Eigen value is obtained by completing $\det(I - \lambda J) = 0$. With the help of Matlab program obtained Eigen values $\lambda_1 = -1.71520344199109$ and $\lambda_2 = -1.018636505691$.

At the state of equilibrium point $V' = -65.95295125$ mV and $n' = 2.771733422 \times 10^{-4}$ the two-dimensional systems of the Hodgkin-Huxley model is expressed nodes with asymptotically stable because $\lambda_1 \lambda_2 < 0$.

The result of numerical simulation using ODE45 obtained that the two-dimensional systems of the Hodgkin-Huxley model becomes unstable when the external current at the interval of $4.52 \text{ A cm}^{-2} < I_{\text{ext}} < 210 \text{ A cm}^{-2}$. While at the interval $I_{\text{ext}} \geq 210 \text{ A cm}^{-2}$ the graph is stable and goes in the direction of the equilibrium point.

4 Conclusion

Based on the result and discussion analysis of two-dimensional systems of the Hodgkin-Huxley model on the transmission of nerve cell impulse action potential, it can be concluded that: two-dimensional systems of the Hodgkin-Huxley model is expressed nodes with asymptotically stable because $\lambda_1 \lambda_2 < 0$. In the phase-phase analysis, it is understood that the process of transmitting the nerve cell impulse action potential in the $V(t) - n(t)$ sub-system of Hodgkin-Huxley model runs as follows: the resting state $\rightarrow$ depolarization $\rightarrow$ decrease of $V(t)$ $\rightarrow$ increase of $n(t)$ $\rightarrow$ repolarization.

The result of numerical simulation using ODE45 obtained that two-dimensional systems of the Hodgkin-Huxley model becomes unstable when the external current at the interval of $4.52 \text{ A cm}^{-2} < I_{\text{ext}} < 210 \text{ A cm}^{-2}$. While at the interval $I_{\text{ext}} \geq 210 \text{ A cm}^{-2}$ the graph is stable and goes in the direction of the equilibrium point.

For further research, it is advisable to the reader to examine an analytical solution from two-dimensional systems of the Hodgkin-Huxley model and then compare the results with a numerical solution to see how much approximation error of the numerical method.

Acknowledgements. We would like to thank Prof. Agus Suryanto for fruitful discussions, valuable suggestions, and contribution throughout the first stages of the work. This work was supported in part by the LP2M UIN Malang Indonesia. This paper in conjunction with the 1st International Conference On Islam, Science, And Technology (ICONIST) 2018, Malang, East Java.
References


Appendix

Table 1. Initial Value of Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable Description</th>
<th>Initial Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V(t)</td>
<td>The magnitude of the Neuron membrane potential</td>
<td>-48</td>
<td>mV</td>
</tr>
<tr>
<td>m(t)</td>
<td>The probability of the activation gate to be in the open state for ( \mathcal{K} ) channels.</td>
<td>0</td>
<td>0 &lt; m(t) &lt; 1</td>
</tr>
</tbody>
</table>

Table 2. Initial Value of Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Description</th>
<th>Initial Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{\text{ext}} )</td>
<td>Eksternal membrane current density</td>
<td>0</td>
<td>( \text{pA cm}^{-2} )</td>
</tr>
<tr>
<td>( C_m )</td>
<td>Membrane capacitance</td>
<td>1</td>
<td>( \mu\text{F cm}^{-2} )</td>
</tr>
<tr>
<td>( g_k )</td>
<td>Conductance for Potassium</td>
<td>10</td>
<td>mS</td>
</tr>
<tr>
<td>( E_k )</td>
<td>Equilibrium potential of Potassium</td>
<td>-90</td>
<td>mV</td>
</tr>
<tr>
<td>( g_Na )</td>
<td>Conductance for Sodium</td>
<td>20</td>
<td>mS</td>
</tr>
</tbody>
</table>
### Table 3. Functions of Systems

<table>
<thead>
<tr>
<th>Function</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$i_{\text{plug}}$</td>
<td>Persistent sodium (applied current inward of $m(t)$ gating activation)</td>
</tr>
<tr>
<td>$I_{k}$</td>
<td>Potassium (applied current outward of $n(t)$ gating activation)</td>
</tr>
<tr>
<td>$m_{\text{eq}}(V(t))$</td>
<td>The probability of opening for Sodium</td>
</tr>
<tr>
<td>$n_{\text{eq}}(V(t))$</td>
<td>The probability of opening for Potassium</td>
</tr>
</tbody>
</table>
Abstract. This research aims to assess the environmental quality of Jodipan, Malang through the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) Tools. Jodipan is one of the urban villages in Malang city which stands along in the Brantas riverbanks. It is a high-density settlement with the majority of the population work as a merchant. At 2016, the settlement in Jodipan riverbanks painted colorfully, and it made Jodipan called “Kampung Warna Warni” or Colourful Kampong. Jodipan now became one of the new community-based tourism destinations in Malang and succeeded to attract domestic and international tourist. The existence of this kampong gave a big impact on environmental quality especially river since their communities’ activities are very depending on the river. The method based on the triple-bottom-line approach that adopts three classifications of sustainable development which are the environment, society, and economy. The result of environmental quality in Jodipan kampong riverbank was 2.1. This score indicates a low value and below the average of the environmental quality standards

Keywords: integrated, assessment, quality, riverbank

1 Introduction

The Qur’an in the letter of Ar-Ruum verse 41 says, “corruption has appeared on land and in the sea as an outcome of what men’s hands have wrought: and so He will let them.” According to the narrations of Ibn Abbas and Ikrimah, al-Bahr means lands and cities situated on the banks of rivers. Based on the history, known that the development of the city usually largely started from the river area because the river is a source of human life [1]. Further, the imbalance of ecosystems becomes a global issue which keeps getting attention by several researcher such as by Dean [2], Deudney [3], Al-Mulali [4], and Duong [5], because the negative consequences of the imbalances have spread and increased, both qualitatively and quantitatively. United Nations Environment Programme (UNEP) in its exposition shows some common result that occurs because of the imbalance of nature. Including the data in 2007 that shows that CO2 emissions have risen by one-third since 1987; other is degradation of the quality of ground, decline in quantity and quality of water, biodiversity reduction and human ecological footprint that indicates the increase in consumption compared to bio-capacity [6]
In line with that, World Commission on Environment and Development (WCED) through “Brundtland Report” in 1987 sparked conception called Sustainable Development. The concept of sustainable development has three focuses which had to move and developed together in the economic, social and environmental field. Sustainable development is aimed to reach economic development for a current generation without harming future generations through the use of local resources and environmental protection to prevent the ecological damage. [7-10] The promotion of sustainable development is a big issue for a human being. Assessment of the sustainability of a city is necessary as a process of evaluation of the development that has occurred to create a better environment in the future. In the construction field, there has been a growing movement towards sustainable construction since the second half of the 1980s, leading to the development of various methods for evaluating the environmental performance of buildings such as BREEAM (Building Research Establishment Environmental Assessment Method) in the UK and LEEDTM (Leadership in Energy & Environmental Design) in North America [11-12]. These methods have attracted interest around the world.

Indonesia itself already has sustainable assessment namely GReenShip published by Green Building Council Indonesia, but it only assesses in building scope [13]. Japan Sustainability Building Consortium published a comprehensive sustainability assessment system namely CASBEE. Research about CASBEE in Indonesia has done by some researchers such as Hiromi who do comparison index calculation using CASBEE and LEED-ND model to evaluate the development of universities in Indonesia in 2015 [14]. Other is Dzarrilarham who use CASBEE model to evaluating the Building at one of the universities in Indonesia in 2014 [15] and Roychansyah who research related to the evaluation of villages in Indonesia [16]. Based on the results of the above studies it is known that the CASBEE method is a comprehensive method for evaluating sustainable development. CASBEE uses data in the form of numbers and non-numbers that produce values that indicate the comprehensive performance of an environment. This research aims to assess the environmental quality of Jodipan urban village, one of the riverbank area in Malang City. Malang city has been experiencing development from year to year, the population increase up to 1,58% every year. The increasing of the population has also lead ecosystem degradation caused human interventions towards nature, as well as resulting declining of health standard, decreasing of human comfort and reduction of natural resources [17]. Research on environmental quality assessment in Jodipan has never been done before. Further assessment using CASBEE has also not been found to assess riverbanks, as an area that has a major contribution to decreasing environmental quality. Therefore, this study tries to fill the existing gap. This research will be the first research which assesses the environmental quality comprehensively by CASBEE held in Malang especially Jodipan.

2 Methods

This research used the quantitative and qualitative approach. Observation has done on several aspects of environmental quality (Q) according CASBEE Tools. The specific type of CASBEE tools that used in this research is CASBEE-UDe for urban development area. This tools is developed based on the triple bottom lines concept, which is one of the important frameworks for assessment and identification of sustainability, this tool adopts the three classifications of the environment, society, and economy as major items of Q. Triple bottom
line concept emphasizes the balance between economic growth and social while maintaining environmental balance. Location of research is Jodipan especially in the radius observation 150 m from the river.

3 Result and Discussion

3.1 An Overview of Jodipan, Malang

Jodipan is an urban village located in Klojen District. This kampong stands along on the riverbanks with an altitude between 440 - 667 meters above sea level. Because of a high location, the average air temperature recorded in ranges from 23.2°C to 24.4°C. While the maximum temperature reaches 29.2°C and the minimum temperature is 19.8°C. The average air humidity ranges from 78% - 86%, with maximum humidity of 99% and a minimum of 45% and the highest rainfall of 526 millimeters.

![Figure 1. Bird View of Jodipan](image)

Jodipan consists of 8 hamlets and 86 neighborhoods. Regarding the land use, the people in Jodipan urban village still occupy the land with the status of the government of Malang. The local community is very familiar with the existence of the river in their daily activities. Despite that, still found that many people still easily dispose of garbage and waste in the river.

3.2 An Overview of CASBEE Tools

Over the past two decades, research has been conducted in several countries to produce a measure of sustainability index measurement in a city such as the UK's Environmental Research Establishment's Environmental Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED) in America, Green Mark (Singapore), Green Star (Australia), and Green Building Index (Malaysia). Criterion Planners have mapped out institutions in the world that have conducted assessments related to sustainable development. The assessment divided into areas from wide to small scopes. The wider is such as the Comp Plans for Sustainable Places in America, MEP Eco-City in China, and CASBEE for City in Japan. While the smaller scope is the scope of settlements such as BREEAM Communities in the UK, BEAM Plus Hongkong, GreenMark Singapore, or within the scope buildings such as Green Building Index in Malaysia, and, Green Mark for District in Singapore.
Figure 2. Indicators and Parameters in Urban Sustainability Rating Tools

The tools which use in this research provided by CASBEE. CASBEE is a comprehensive assessment delivered by the Institute for Building Environmental and Energy Conservation (IBEC), Japan. Through CASBEE, the quality of the building assessed by evaluating the building features such as interior comfort and scenic aesthetics, in consideration of environmental practices that include using materials and equipment to create sustainability in using energy or minimize environmental loads. The parameters which used to assess environmental quality in this research described in the table below:
Table 1. QUD Assessment Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Middle Item</th>
<th>Small Item</th>
<th>Minor Item</th>
</tr>
</thead>
</table>
| 1. Environmental quality of the assessment object evaluated with the three middle items of resource, nature, and artifact. The first middle item, "resource," contains an actual assessment of efforts for lowering of the environmental load rather than efforts for environmental quality Q. Despite the above, this item is positioned on the Q side because its aspect of "improvement in environmental quality" resulted from efforts, such as water source preservation and establishment of sound recycling-oriented society, being focused. The next item, "nature," evaluates abundance of the natural environment and space in the block/district through matters related to greeneries and biodiversity. The last item, "artifact," uses the environmental performance of buildings in the block as a representative index. Specifically, assessment is performed based on the application level of the building/real estate system of CASBEE tools and their assessment results.

Social quality of assessment object consists of three middle items. The first middle item, "impartiality/fairness," evaluate fulfillment of management that covers not only legal suitability related to the development of the block/district but also harmonization with peripheral local society. The next middle item, "security/safety," evaluate disaster and crime prevention performance of the block/district that directly connected to a sense of safety for residents and visitors and strength and robustness that support the sustainability of the local society. The last middle item, "amenity," evaluates accessibility to various service facilities that contribute to improvement inconvenience, and also evaluates utilization and creation of cultural and historical assets and consideration for the formation of an improved landscape regarding enhancing the value of the area. Last, the assessment of consists of three middle items similar to the classifications of environment and society. The first middle item,
"traffic/urban structure," evaluate fulfillment of traffic systems that support economic activities and the utilization level of location and site potential regarding urban planning. The next middle item, "growth potential," evaluates the population as a basis for the economic capabilities of the project, and the fulfillment of mechanisms aiming at the revitalization of economic activities. The last middle item, "efficiency/rationality," evaluates fulfillment of services for block users and management related to information and energy.

3.3 The Environment-Socio-Economics Condition of Jodipan, Malang

An explanation of the environmental, social and economic aspects of this section will explain based on the parameters specified in the CASBEE assessment which are Q1-Environment, Q2-Society, and Q3-Economic.

Q1 Environment

1. Resource
   Water Resources
   The source of the resident’s water comes from wells and wells drill. In this urban village, some communities also use Municipal waterworks for the supply of clean water. There is no water treatment system from rainwater and gray water in Jodipan. The location of the observation does not yet have a rainwater utilization system and other water treatment systems. In the case of a reduction in the amount of waste disposal has also not been undertaken either by the construction of a detention pond and rainwater permeable surface and equipment.

A sample test of river water conducted at the observation site. From the sample test results are known that pollution in the water is very high, it had reached 19.83 mg / L for BOD and 78.20 mg / L for COD, as described in table 1. below:

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Unit</th>
<th>Result</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BOD</td>
<td>mg/L</td>
<td>19.83</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>COD</td>
<td>mg/L</td>
<td>78.20</td>
<td>0.00</td>
</tr>
</tbody>
</table>

This table shows that BOD and COD content exceed clean water standards. It might because residents in Jodipan are uses a liquid waste disposal system conducted on-site through the direct disposal of the septic tank, and most of them are still discharged directly to the Brantas River.
Resources Recycling

The use of recycled materials or resources indicates an adequate level. In general, no use of wood material from the sustainable forest. Some roof truss residents use bamboo. Recycled materials such as used tires, used wood also used by residents.

Figure 2. Bamboo as one of material building

Figure 3. Bamboo as one of material building

Jodipan already available the sort of waste sorting but not functioning yet optimally. No recycling waste processing has found yet.

2. Nature
   Greenery

In the area of observation, most of the land use dominated by settlements with densely populated residential conditions. Meanwhile, the percentage of public open space and green open space is less than 20% compared to the percentage of land built. In Jodipan many settlements of residents are stand on the land owned by Irrigation Agency Malang City. Land use conditions in this area are almost 90% dominated by settlements with public open space and green open space conditions dominated by massive pavement. Rooftop greening cover less than 15% of all residents housing and no wall is greened.

Biodiversity

Natural resources to be preserved are understood by the community, despite that there are no natural resources preserved. Meanwhile, the questionnaire also had spread to know the awareness of the community about sustainable city. Based on the questionnaire result know that the local community is aware of the importance of the concept of sustainability and the role of the river for its survival, but the local community does not evenly share the awareness. Hence, more intensive socialization and education are strongly needed to further increase public awareness of the importance of the concept of sustainable development.

Regeneration and Creation

Score regeneration and creation divided into two aspects; one is from the patch (planar) quality and corridor (network) quality. In the research area, there is no habitat of various species is also established no greening plan being conscious of plant species that originally
lived in the area (native species) is carried out. The network of species not taken into consideration.

3. Artifact (Building)
Environmentally consideration building

As mentioned before, this research is first research which assesses the sustainability of Jodipan through CASBEE tools, so there is no single building evaluated with CASBEE.

Q2 Society

1. Impartiality /Fairness
   Compliance
   Based on observation of applicable laws and regulation and verification known that there are many buildings based on a lower standard than the current laws and regulations. Rules on Building Border Lines, River Border Lines and Coefficients of Floor and Height of Buildings are less applied by the residents.
   Area Management
   In Jodipan there are already local communities that work together with residents that promote residential areas of tourism and river banks. However, promotion related to sustainability and environmental sustainability has not done significantly. A promotion entity and fund for continuous operation of the organization are planned and secured by residents.

2. Security and Safety
   Communities know basic disaster prevention, but no hazard map had checked. No item had worked on disaster prevention of various infrastructures. No availability of communication infrastructure about measuring for flood damage prevention, earthquakes, and power disruption for equipment and piping. No water supply or treatment infrastructures like portable water or common facilities for storing water. No energy supply infrastructure likes availability of medium pressure gas supply and connection of electric power and heat supply with the outside area. Regarding disaster prevention vacant space and evacuation route, in the research are there is no appropriate plan regarding the scale and location of vacant space established, the area also not firmed with firebreak belts and no evacuation site in the area.
   Traffic Safety
   There is no consideration of separating pedestrian and vehicles in the research area.

![Figure 4. Circulation Condition in Jodipan](image)

**Crime Prevention**

The level of security in the research area is moderate. It can be known by there is no blind spot in the Jodipan, and the area is almost monitorable from the periphery. Night lighting
sufficiently installed in Jodipan. Meanwhile, the resident had established a manual patrol system to the security guard.

3. Amenity

Convenience/welfare

The distance to district facilities and services such as medical and health/welfare facilities (hospital/ clinic, child welfare institution), education facilities (kindergarten, elementary school, and junior high school) and cultural facilities (library, museum, sports facilities) is about 1500 m or more.

Culture

Jodipan as a densely populated residential area adjacent to historic areas of Malang City and has made cultural preservation efforts. These efforts, among others, together with the community and the government helped preserve the historic buildings both by maintaining and conserving. The Jodipan residents also involved in preservation effort Malang culture by displaying cultural attributes in Jodipan tourist areas. Many cultural attributes installed in there such as the installation of Malangan mask, Caping (farmer hat) on the corridor of the housing.

![Malangan Mask in Jodipan Corridor](image)

**Figure 5.** Malangan Mask in Jodipan Corridor

Like an urban village which stands along on the river banks located in the city center, Jodipan by itself creates an interesting view and can be enjoyed directly from the main street of the City. In the development of the area, although there are no particular rules, Jodipan consider its development into the visual city aesthetic, such as the arrangement of wall positions that should not cover each other neighbors, the arrangement of color harmonization between housing, and consideration of appropriate home construction with a human scale.

![Jodipan and city surrounding](image)

**Figure 6.** Jodipan and city surrounding

The composition and physical integration of every house in the region ultimately produces a communal identity that does not drown one house's identity with one another.
Q3 Economy

1. Traffic and Urban Structure

Traffic

The traffic system in the observation area poorly planned because this area still disputes. Regarding proximity to transportation facilities, the distance to the station is 1 km or more or to bus stop is 500 m or more. There is no special circulation path for the loading and unloading activities of large quantities such as for the transportation of garbage from within the area. Usually, the garbage in the settlements of the residents is first collected independently by a special officer from the community themselves to collected in a temporary garbage dump.

Urban Structure

In the research area, consistency with and complementing the upper level not considered. The district designated as an “area for which notification is required upon a change to form or nature.” For development, a plan for prevention of diffusion notified, and a measurement based on that take.

2. Growth Potential

Population

Planned population or actual population is equivalent or higher in comparison to the past state, while the average number of persons staying in each building type is middle between level 1 and level 3

Economic Development

There is some revitalization activity in this research area such as there is an organization that attracts company advancement and investment to the area exist and cooperative activities with the area are implemented. The company that invests in this village is a paint company that sponsors the coloring of people's homes. The company also participates in financing some activities and other village development such as the construction of a glass bridge connecting Jodipan with the area across the river to another.

3. Efficiency/Rationality

Information System

Regarding information service performance, still, there is no equipment installed in this research area.

Energy System

There is none of the smart technology which applicants in this research area regarding the possibility to make demand/supply smart.

3.4 CASBEE Assessment of Jodipan, Malang

An assessment conducted based on observation, interviews and water testing in Jodipan urban villages, Malang. This assessment considers three aspects, i.e., Q1 (environmental quality), Q2 (social condition of society) and Q3 (Economic condition), are described in the table III.

Table 3. Scoring Of Environmental Quality
<table>
<thead>
<tr>
<th>Major Item</th>
<th>Middle Item</th>
<th>Small Item</th>
<th>Minor Item</th>
<th>Parameter score</th>
<th>Score</th>
<th>Weighting coefficient</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>1.1 Resources</td>
<td>1.1.1 Water Resource</td>
<td>1.1.1.1 Water works</td>
<td>0.5</td>
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<td></td>
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<td>1.1.1.2 Irrigated area</td>
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<td>1.1.1.3 Soils</td>
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<tr>
<td></td>
<td>1.1.2 Waste Management</td>
<td>1.1.2.1 Waste Collection</td>
<td>1.1.2.1.1 Waste Collection</td>
<td>0.5</td>
<td>1.0</td>
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<td>1.1.2.1.2 Waste Disposal</td>
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<td>1.1.2.2 Pollution</td>
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<td></td>
<td>1.2 Nature (greenery and biodiversity)</td>
<td>1.2.1 Greenery</td>
<td>1.2.1.1 Ground greenery</td>
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<td></td>
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<td>1.2.1.1.1 Building greening</td>
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<td>1.2.1.2 Ground greening</td>
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<td>1.2.1.3 Forests</td>
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<td>1.2.2 Biodiversity</td>
<td>1.2.2.1 Biodiversity Protection</td>
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<td>1.3 Health and safety</td>
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<td>1.3.1.1.2 Health and safety</td>
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</table>

... (Table continues with similar entries)
Based on the results of scoring obtained the value of Q1 (environment) total score is 1.8 with detailed aspects of water resource and recycling resources is 2.1, natural greenery and biodiversity is 1.8, Artifact building environmental friendly is 1.0. Meanwhile, the value of Q2 (society) is 2.4 with details compliance area management is 2.6, security/safety (disaster prevention, traffic safety, and crime prevention is 2.0, while aspects amenity which includes welfare, health and education scored are 2.8. Most recently, the economic aspect obtained the value of Q3 (economy) total score is 2.2 with detailed aspect structure the city and traffic flow is 1.4, growth potential (the population and economic development) is 3.7 and efficiency/rationalizing is 1.6. The total score of Q (the quality of the environment) is 2.1. This score indicates a low value and below the average of the environmental quality standards. There are several parameters in sustainable development that have not been or not met in Jodipan. In the environmental aspects, items that cannot fulfill include absence rainwater utilization and treated water, also no effort on the reduction of sewerage discharge amount. Regarding society aspect, Jodipan does not have a strong business regarding basic disaster prevention and disaster respond ability, traffic safety, and crime prevention. While in economic aspects, unfulfilled items are flexibility and usability of information environment of the block, Block infrastructure system management utilizing ICT, and Flexibility to change in energy demand and price.

![Figure 7. Result of Environmental Quality Assessments of Jodipan](image)

4 Conclusion

The total score of Q (the quality of the environment) in Jodipan is 2.1. This score indicates a low value and below the average of the environmental quality standards. To increase environmental quality need stakeholders involving from the variously related institution. Based on the parameters of CASBEE the urgent items prioritized to improve the quality of the environment in Jodipan are aspects of resource management and management, waste and waste management, community protection and security, understanding and prevention of natural disasters. Further research on environmental load calculation is needed to find out the Jodipan area sustainability index.
Acknowledgements. This paper in conjunction with the International Conference On Green Technology (ICGT) 2018

References


Synthesis and Characterization of Biofilm from Jatropha Curcas L., Chitosan, and Gelatin by Blending Method

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Abstract. Based on the rapid development of science, it is known that the Jatropha Curcas L., Chitosan, and Gelatin are natural materials which have various benefits. The aim of this research is to determine the characteristic of blend of Jatropha Curcas L., Chitosan, and Gelatin as a biomedical application. The blending material is obtained in the form of film / layer as a preliminary review of the research. This research is experimental and the process in this research consists of 2 steps i.e. variation of gelatin composition and variation of chitosan composition. The samples obtained were characterized by tensile test to determine the value of tensile strength, strain, and Young's modulus. The best result of it was tested by FTIR, then it's solubility also was tested. Based on the tensile strenght test, gelatin which can improve the chitosan properties are rigid and brittle. The composition of 2: 8: 12 which has a value of tensile strength, strain, and Young's modulus is low while the composition of 2:12:10 is high. Based on the FTIR test, there are extension and shift of OH group at wave number 3428,4; 3447.2; and 3447.2 cm$^{-1}$. In the solubility test was found that the composition of 2: 8: 12 has the highest solubility while the composition of 2:12:10 has the lowest solubility.

Keywords: Jatropha Curcas; Chitosan; Gelatin; Film; Tensile Strenght

1 Introduction

Chitosan has a antifungal and antimicrobial activities, the activities are believed to originate from its polycationic nature [1], [2]. Despite its attractive properties, the film made only from chitosan has poor mechanical properties so that has bad printability [3], [4]. Forming films from chitosan mixed with other hydrocolloids and hydrophilic is an alternative to improve its mechanical properties [2], [5]–[7].

Gelatin is one of the important macromolecule material. It has many benefits which used in medicine, food, and chemical industry. It is good properties as a plasticizer, such as: the gel property, water holding capacity, film-formation, emulsification and foaming ability [8]. despite its attractive properties, the film made only from gelatin show brittleness, extremely fast degradation, and less flexibility [8]–[10]. Polymer blending is a method commonly used to obtain the benefits of each materials [11].
The natural material derived from plants which have been used as medicine [12]. The antimicrobial activities on the jatropha curcas which is extracted with etyl acetate showed the highest efficacy [13]. The development of science and technology provide an innovative opportunity to maximize the properties of medicinal plants. This research is innovating to maximize the jatropha curcas by adding chitosan, and gelatin to improve its mechanical properties.

Saraswathy does a mixture of chitosan-gelatin materials. The report of that study is combination of material (chitosan-gelatin) that has been used does not occur chemical reactions, meaning that the original characteristics of each component is not lost [14]. The other studies concern to the chitosan mechanical properties reported by Judawisastra et al. is obtained the value of tensile strenght (TS) 38.4 Mpa and the value of elongation at break (EAB) 16.2% [15]. The research combination of chitosan and gelatin reported that the optimum of variation obtained was chitosan 60:40 gelatin with tensile strenght (TS) value of 16,60 MPa and elongation at break (EAB) 25,3% [16].

This study focuses on determining the effect of the composition variation of chitosan and gelatin added to the jatropha curcas. This research was conducted as an early stage to find out some integrated materials with their respective functions that complement each other as candidates of biomedical applications especially absorbable surgical suture. The integrated material in this research is obtained in the form of film / layer as a preliminary review of the research. The results obtained from this study are characterization of functional groups using FTIR, tensile strenght and elongation break, and solubility of the sample in pbs solution.

2 Materials and Methods

This research is experimental and the process in this research consists of 2 steps i.e. variation of gelatin composition and variation of chitosan composition. Variation of gelatin composition is the first step done to seek the best composition based on its mechanical properties. The second step is a variation of chitosan composition with the best sample reference in the first step.

2.1 Materials

The material used in this research is Jatropha Curcas obtained from Balai Penelitian Tanaman Pemanis dan Serat (BALITAS) Karangploso Malang, chitosan 7% w/v, gelatin 10% w/v, aquabides, acetic acid 1% v/v and phosphat buffer saline (PBS) solution.

2.2 Stem Sap Removal of Jatropha Curcas

Stem sap removal of jatropha curcas was planned to do at 08.00-10.00. Stem sap of jatropha curcas were taken, done by cutting the skin of stem.

2.3 Preparation of Gelatin Solution 3%

Gelatin solution 3% was prepared by adding gelatin powder 0,15 gram, and then dissolved with acetic acid 1% until 50 ml in beaker glass (60 °C).

2.4 Preparation of Chitosan Solution 5%

Chitosan solution 5% was prepared by adding chitosan powder 0.4 gram, then dissolved with acetic acid 1% until ml in a beaker glass and then with magnetic stirred.
2.5 Film/Layer Formation

Films were prepared by blending method. They were prepared with formula given, jatropha curcas L.: chitosan: gelatin 2:8:8, 2:8:9, 2:8:10, 2:8:11, 2:8:12 (v/v) and then stirred homogeneously with a magnetic stirrer at 60 °C for 10 minutes. The homogeneous solution is poured into some petri dish. Then shake each petri dish until the solution establishes a layer that is almost the even. Next dry the sample at room temperature for 3 days until completely dried and film/coating formed.

Based on the variation of gelatin composition, was selected the best value of tensile strength and elongation at break for chitosan variation. Making a film in chitosan variation was performed by using the same method as gelatin variation. The variation of chitosan composition was done with Jatropha Curcas L.: Chitosan: Gelatin as follows 2:8:10; 2:10:10; 2:11:10; 2:12:10 (v/v) [16].

2.6 Mechanical Properties

The tensile strength test was done at UB's agricultural technology faculty by using IMADA's Tensile Strength tool.

2.7 Functional Groups Analysis

The functional group analysis was performed in the science and technology faculty of Chemistry Department of Maulana Malik Ibrahim Malang State University using Fourier Transform Infrared (FTIR) merc. scimitar series

2.8 Solubility Test

Solubility test of this research is used to find out the time required by sample for perfect degradation in phosphate buffer solution (PBS). In this study, PBS solution was used as a substitute for body fluids. Each of the samples was cut with the size of 1x1 cm size then it was immersed in PBS solution inside the test tubes. The samples solubility time was performed in 28 days. The degradation rate of each sample was stated with the percentage (W/W), as calculated with the following formula [17].

\[ \eta \% = \frac{\omega_i - \omega_f}{\omega_i} \times 100\% \]

(1)

3 Result and Discussion

3.1 The Mechanical Properties of The Variation of Gelatin Composition

The first step from mechanical properties is the variations of gelatin composition. Based on the data obtained, the increasing of gelatin composition can decrease the TS value and increase the sample EAB value. This is proved by the diagrams obtained in Fig 1 (a) and 1 (b).
Figure 1. Graph of relation of mechanical properties to variation of gelatin composition (a) tensile strength (TS) (b) elongation at break (EAB) *Composition of Jatropha curcas L.: chitosan: gelatin (A1=2:8:8, A2=2:8:9, A3=2:8:10, A4=2:8:11, A5=2:8:12).

The highest TS and EAB values of Jatropha Curcas L.: Chitosan: Gelatin were obtained on sample A3. The film has strong and elastic mechanical properties. This is also supported by data obtained on Young's modulus of A3 sample. The composition of the jatropha curcas, chitosan, and gelatin in the A3 sample is in the optimum composition. The result of optimum mechanical properties can be linked from higher interactions between biopolymers so it generate the better mechanical properties. Pranoto et al. reported an optimum level for the interaction between polysaccharides-protein in which gelatin as a protein presents the main and the dominant phases in the used film system the increased mechanical properties with increased gelatin proportions may be an important advantage in some applications [18].

The result of measurement on each variation of gelatin composition for Young’s modulus (E) is depicted in diagram form shown in Figure 2. The presence of an increasing gelatin composition can decrease the sample's stiffness, the greater gelatin composition makes the sample more elastic. The highest E values are obtained in A1 so it can be said that A1 is the most rigid sample among the other samples. The presence of gelatin as plasticizer in this study can improve the elasticity of material on sample A3 and A5.
3.2 The Mechanical Properties of The Variation of Chitosan Composition

Based on the variation of gelatin composition, the maximum yield was obtained at 2:8:10 (A3), so it is composition was considered as reference (B1) for the variation of chitosan composition. The second step is a variation of chitosan composition that is 2:10:10 (B2), 2:11:10 (B3), and 2:12:10 (B4) (v / v) by using the procedure as in the first step. This is to know the best composition of chitosan because basically chitosan as a material has quite high rigid properties. Figures 3 (a) and (b) show the diagram of TS and EAB values obtained on the variation of chitosan composition. Based on the variation of chitosan composition that has been done can be said that the sample B4 has the highest TS value but not with its EAB value which shows B4 has a strong properties but not elastic.

Figure 4 show the diagram of Young’s modulus (E). the increasing chitosan composition produces more rigid samples, and obtain plastic sample properties. The highest E value is obtained on B3 so it can be said that B3 is the most brittle sample among others. This is likely due to the difference in TS and EAB values of B3 films higher than B4. Overall, the mechanical properties of the film depend on several parameters, one of them is the material composition.
Judawisastra et al. (2012) in his research by extending the process of demineralization of chitosan, it's obtained TS value of 38.4 Mpa and EAB value of 16.2% [15]. Another study conducted by Hosseini et al. with variation of chitosan:gelatin reported that the optimum variation obtained was chitosan 60:40 gelatin with TS value of 16,60 MPa and EAB 25.3% [16]. The results obtained in this study almost closer to TS and EAB value by Hosseini et al. on some variations. The mechanical properties are required for sewing operation thread i.e., tensile strength that is not too high and elongation at break that is sufficient [16]. It is intended that the material obtained is more easily degraded in the body (in vivo), resulting in an end product that is biocompatible to the human body.

### Figure 3. Graph of relation of mechanical properties to variation of chitosan composition (a) tensile strenght (TS) (b) elongation at break (EAB) *Composition of Jatropha curcas L.: chitosan: gelatin (B1=2:8:10, B2=2:10:10, B3=2:11:10, B4=2:12:10).

![Graph of relation of mechanical properties to variation of chitosan composition](image)

### Figure 4. Graph of relation of mechanical properties to variation of chitosan composition Young’s modulus (E) *Composition of Jatropha curcas L.: chitosan: gelatin (B1=2:8:10, B2=2:10:10, B3=2:11:10, B4=2:12:10).

![Graph of relation of mechanical properties to variation of chitosan composition](image)

### 3.3 Functional Group Analysis

Functional group analysis is performed to identify the functional groups of the compounds contained in the sample. The analysis was performed for samples A3, A5, and B4.
because they have the TS value of respectively i.e., low, medium, and high based on the test of its mechanical properties. FTIR spectral data is shown at figure 5. Spectra A₁, A₅, and B₄ don’t show significant difference. In the three samples happened the extension and shift of the OH group in the wave numbers 3428.4, 3447.2; and 3447.2 cm⁻¹. It indicates the formation of intermolecular hydrogen bonds between gelatin and chitosan. The aromatic compounds in the film appear at the wave numbers 3734.7; 3745.6; and 3744.6 cm⁻¹ which are typical spectra of C-H sp² Aromatic group and 1453.1; 1458.4; and 1457.7 cm⁻¹ which are the aromatic C = C group. The presence of such compounds is due to the inclusion of hydrophobic aromatic groups. The aromatic compounds may be derived from active compounds of jatropha curcas.

The spectra of amide compound I, amide compound II and amide compound III on A₁, A₅, and B₃ obtained decreased intensity. The decrease in amide I shows that the presence of chitosan causes the decrease in the helix content in the sample [19]. The decrease in the intensity of amide II confirms the presence of electrostatic interactions between carboxyl group of gelatin and amino group of chitosan, but also indicates the formation of hydrogen bonds in which the -NH gelatin groups are involved [20]. The intensity change in amide III shows the interaction of the amino group of chitosan with the carboxyl group of gelatin through the electrostatic interaction [19].

![Figure 5. FTIR spectra (a) jatropha curcas L., (b) chitosan, (c) gelatin, (d) A₃ film, (e) A₅ film, dan (f) B₄ film *Composition of jatropha curcas L.:chitosan:gelatin (A₃=2:8:10, A₅=2:8:12, B₄=2:12:10).](image)

According to Qiao et al. gelatin as a protein is a polyampholyte type in which the carboxyl group (-COO⁻) can interact ionically with the amine group (-NH₃⁺) present in the chitosan chain in acetic acid solutions [21]. A number of gelatin groups such as -NH and OH is able to form hydrogen bonds with the -OH and -NH₂ groups in the chitosan chain. Thus interaction between gelatin and chitosan is produced by electrostatic interaction and based on its hydrogen bond as described by Sionkowska (2004) [22].

### 3.4 Solubility Test
The solubility test was performed by immersing the sample in phosphate buffered saline (PBS) solution. In this study used PBS solution was used because the solution has the same properties as liquid in the human body. The samples were immersed in a PBS solution within 28 days and controlled every week to determine the weight loss in the solution. The results of the solubility test in this study are shown in Figure 6 for variation of gelatin composition and figure 7 for variation of chitosan composition.

Based on these data it indicates that A1 has the largest mass loss value. This is possibly because the TS value is not too large and the EAB value is too small in the sample based on its mechanical properties. Based on figure 6 the low solubility in the variation of gelatin is available at the sample A2 and A3 but sample A5 and A2 have the different case because the sample A5 has high solution firstly in the second week then becomes stable in the fourth week. So it can be said that the sample A2 has low solution in the variation of gelatin composition, this is possible because the sample A2 has the high value of TS and the quite low value of EAB.

![Figure 6](image.png)

**Figure 6.** Solubility test of gelatin composition variation.

Based on variation of chitosan composition, the highest solubility is found in the films of B1 and B2. This is because the film has a low TS value and a fairly high EAB value. In the B1 sample at week III the solubility tends to be high. This is because sample B1 has the lowest TS value the variation of chitosan composition. The lowest solubility is B3 film because it has a high TS value and has a fairly low EAB value, so the B3 sample is more difficult to be degraded by PBS solution.
4 Conclusion

Based on the variation of gelatin composition, the presence of gelatin can increase the elongation of chitosan but can not decrease stiffness in chitosan significantly. Composition A3 (2: 8:10) has the highest TS and EAB values. Based on the variation of chitosan composition it is known that the highest TS value is obtained at B4 (2:12:10). The higher chitosan composition produces an increasing TS value. The curves show typical behavior of strong and hard chitosan.

Spectra A3, A5, and B4 don’t show any significant difference. In the three samples the extension and shift of the OH group in the wave number are 3428.4; 3447.2; and 3447.2 cm⁻¹. The spectra of amide compound I, amide compound II and amide compound III on A3, A5, and B4 have decreased intensity.

In the solubility test of PBS solution it’s found that, composition A1 has the highest solubility whereas composition B4 has the lowest solubility.

Acknowledgements. This paper in conjunction with the 1st International Conference On Islam, Science, And Technology (ICONIST) 2018, Malang, East Java

References


Metabolomic Compound of *Calotropis Gigantea* Root Extract and the Inhibition Effect on Fibrosarcoma Growth and Caspase 3 Expression on Balb/c *Mus musculus*

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**Abstract.** The root of *Calotropis gigantea* (thistle) is an Indonesian herb to treat cancer based on empirical and scientific evidences. The study aims to find out the influence of ethanol extract of thistle root in inhibiting cancer cell growth of *Mus musculus* fibrosarcoma in vivo and to find out metabolite compounds in the thistle root extract. The effect of cancer cell growth inhibition was tested on *Mus musculus* inducted with 7,12-dimethylbenzene (α) antrasena (DMBA) and dose treatment of 50, 100 and 150 mg/Kg body weight. The metabolomic analysis on the root employs UPLC-QToF-MS/MS as a positive ESI ion source, the movement phase of water/acid mixture is 99.9/0.1 [v/v] and acetonitrile/formic acid was 99.9/0.1 [v/v] with gradient elution system and stationary phase of C18. The chromatogram was analyzed using masslynx 4.1. The component identification was based on the m/z ratio measured in masslynx and m/z counted in chemdraw. The result of the study showed that the thistle root extract use dose of 50, 100 and 150 mg/Kg body weight were able to increase the weight of fibrosarcoma mice and have a significant influence on caspase-3 expression with cell apoptosis index 24.3 %; 13.3 % and 12.3 % respectively. The result of metabolomic analysis showed 14 compounds found in the root extract. Two major compounds were found out: 4-Chlorobenzethiol with the area 32.51% and N-[1-(Adamantan-1-yl) ethyl]-2-(1-piperidinyl)-4-quinazolinamine with the area 37.20%. It was indicated responsible for the anticancer activity of thistle root extract.

**Keywords:** *Calotropis gigantea*; caspase-3; fibrosarcoma; metabolomic; UPLC-QToF-MS/MS

1 Introduction

Cancer becomes one of the health problems in the world nowadays. It is a second killer illness in the world after cardiovascular diseases. In Indonesia, it is a fifth killer after cardiovascular, infection, digestion and respiratory diseases. Increasing number of population growth and life expectancy leads to a prediction that in 2030 there will be 27 million cancer cases, 17 millions death per year due to cancer and 75 millions people living with cancer [1].
Fibro sarcoma is a cancer on soft tissues. It’s usually occurs on 35-55 years old people. It is commonly found on men rather than women. Many people living with this disease end with death. In 2013 US had 11,410 soft tissue cancer cases and they claimed the lives of 4,390 patients [2].

Herbs become an alternative in fibro sarcoma treatment. One of them is *Calotropis gigantea* (thistle) which can be used for treating several illnesses. Previous research reported that a 95% alcohol extract of thistle root tested on albino mice indicated an analgesic activity [3]. It also served as contraceptive pill [4]. Some evidences show that it is able to inhibit the growth of gastric cancer cells SGC-7901 in vitro [5]. Methanol extract (ME) and chloroform fraction of thistle root have the ability to inhibit the growth of ascites carcinoma [6]. It is also reported the cytotoxic potency of cardenolide compound of leaves extract on breast cancer cell MCF-7, skin cancer cell KB, lung cancer cell NCL-H18 [7], the cytotoxic potency of dichloromethane extract of the leaves on breast cancer cell MCF-7 and MDA-MB-231, Hela cell, colon cancer cell HT-29, ovarian cancer cell SKOV-3, hepar cancer cell Hep-G2 [8].

It is also reported that acetate ethyl fraction of thistle root is able to inhibit the growth of colon cancer cell WiDr cell line through apoptosis induction and inhibition phase G2/M (9). Some active compounds isolated from *C.gigantea* root are calotropin (1), frugoside (2), afroside (3), 15b-hydroxycalotropin (4), 15b-hydroxycalactin (5), calactin (6), calotoxin (7), 16a-hydroxy calactin (8), uscharin (9), coroglaucigenin (10), 4'b,15b-dihydroxycalactin (11), 15b-hydroxyuscharin (12), 5b-hydroxycalac-tinic acid methyl ester (13), calactinic acid ethyl Ester (14), 15b-hydroxy calactinic acid ethyl ester (15) [10].

The study aims to find out the influence of adding ethanol extract of thistle root on the growth inhibition of *Mus musculus* cancer cell in vivo and find out the content of active compounds influencing anticancer activities.

2 Experimental

2.1 Materials

Thistle root was determined in LIPI Purwodadi, East Java, Indonesia. Mice (*Mus musculus*) balb/c, ethanol 70 %, aquades, 7,12-Dimetilbenzene(α)antrasena (DMBA), aseton, CMC-Na (*carboxymethylcellulose natrium*), monoclonal antibody anti-caspase 3 (ABM1C12), methotrexate, alcohol 70 %, aquades, wood powder, mice food and water, Chloroform.

2.2 Ethical Agreement

The study has been approved by The Ethical Committee of Faculty of Medicine, Brawijaya University, certificate number: 225-KEP-UB, April 24, 2014.

2.3 Maceration Extraction

100 gr of thistle root powder is soaked in 500 ml ethanol solvent 70 % for 24 hours and put into shaker for 3 hours in the beginning of maceration process, and then filtered. The treatment is repeated on the waste to get a clear filtrate. The filtrate extract is concentrated using rotary evaporator and put into oven with 37°C temperature to eliminate the solvent residue. Then the concentrated extract is scaled and its rendement is counted.

2.4 Experimental Animal Treatment
The experimental animals, 30 male *Mus musculus* Balb/C 20-30 gr were acclimatized for ± 5 days, and ad libitum feed. They are put into 5 groups [11]:

a. Negative control group consists of inducted DMBA mice and they are given CMC Na 0.5% 0.5 mL without ethanol extract of thistle root treatment.

b. Positive control group is a group of DMBA-induced mice, which is also injected with cancer drugs, ie methotrexate with a dose of 2.5 mg / kg body weight (BW).

c. Dose 1 group is a group of DMBA-induced mice, which also received therapy of ethanol extract of thistle root with the dose of 50 mg/Kg BW.

d. Dose 2 group is a group of DMBA-induced mice, which also received therapy of ethanol extract of thistle root with the dose of 100 mg/Kg BW.

e. Group Dose 3 is a group of DMBA-induced mice, which also received therapy of ethanol extract of thistle root with the dose of 150 mg/Kg BW.

0.5 mL ethanol extract of thistle root was administered orally using naso gastric tube for 14 days.

2.5 Induction 7.12-dimethylbenz (α) anthracene

DMBA solution with a concentration of 25 μg/0.1 mL of acetone was injected subcutaneously at the nape of the mice using 1 ml syringe twice a week, on Tuesday and Friday for 6 weeks. Before induction, each mouse was weighed [12].

2.6 Taking Out Cancer Tissue [13]

After the treatment period, the mice was killed through euthanasia method, by inhalation of chloroform. Mice were put into the chamber containing the cotton, which is previously filled with chloroform. Dead mice were placed on the surgical board and their cancer tissue (nodules) were carefully removed. The nodules taken out are white gray pearl tissues like typical fresh fish meat [14]. Nodules were washed with PBS until they are clean from the blood, and they are dried over on a filter paper to prepare a caspase-3 immunohistochemical preparation.

2.6 Immunohistochemistry caspase 3

Paraffin slides were undergoing deparaffination, performed in 3x xylene for 3 minutes. Then were rehydrated using ethanol (100%, 95% and 70%) and water. Endogenous peroxidase activity was blocked by soaking the sections in peroxidase blocking solution at room temperature for 10 minutes. After incubation in prediluted blocking serum at 25°C for 10 minutes, slides then were soaked (25°C, 10 minutes) in monoclonal antibody anti-caspase 3 (ABM1C12) and were washed using Phospate Buffer Saline (PBS) for 5 minutes. The slides were incubated with secondary antibody, conjugated to horse radish peroxidase, followed by the next incubation using peroxidase. Both incubation were performed at 25°C, 10 minutes) and washed using PBS for 5 minutes. The slides were then incubated with Hematoxylin Eosin (3 minutes) and washed using running water. After mounting media dropping, the slide were covered by coverslip.

2.7 Measurement of apoptosis index and Allerd scoring

Expression of Caspase 3 (brown color) were observed using under 400x light microscope. The pictures are captured using a microtome of 10 fields of vision.

The apoptosis index was then determined as a measurement of cell apoptosis level using the equation [15]:

\[
\text{Apoptosis Index} = \frac{\text{Number of Apoptotic Cells}}{\text{Total Number of Cells}} \times 100
\]
Apoptosis index (IA) = \( \frac{\text{apoptosis cell}}{\text{total cell}} \times 100\% \) (1)

In addition, semi quantitative analysis using the Allred scoring method was performed with an assessment on two categories, namely the number or percentage of positive expressed cells and the intensity of the color. The IS score shows an intensity score of 0 (negative or no brown color), 1 (weak brown color), 2 (medium brown) and 3 (strong brown). The IP value indicates the percentage of brown color, which is 0 (no color), 1 (≤1/100 colorless cell), 2 (≤1/10 colored cell), 3 (≤1/3 colored cell), 4 (≤2 / 3 colored cells) and 5 (all cells are colored). The sum of IS and IP is the total CPI score [15].

2.8 Ultra Performance Liquid Chromatography–Quadrupole Time of Flight-Mass Spectrometry (UPLC-QToF-MS) Analysis

The analysis of UPLC-QToF-MS employed UPLC-MS systems with QToF as the analyser and positive ESI as the ionization source with the Acquity C18 column 1,8 µm; 2,1 \( \times \) 150 mm. The applied eluent was the mixture between (A) water (HPLC grade)/formic acid 99,9/0,1 [v/v]; (B) Acetonitril/formic acid 99,9/0,1 [v/v] and the system of gradient elution. The comparison is presented as in Table 1.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>% Eluent A</th>
<th>% Eluent B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,00</td>
<td>95,0</td>
<td>5,0</td>
</tr>
<tr>
<td>2,00</td>
<td>75,0</td>
<td>25,0</td>
</tr>
<tr>
<td>3,00</td>
<td>75,0</td>
<td>25,0</td>
</tr>
<tr>
<td>14,00</td>
<td>0,0</td>
<td>100,0</td>
</tr>
<tr>
<td>15,00</td>
<td>0,0</td>
<td>100,0</td>
</tr>
<tr>
<td>19,00</td>
<td>95,0</td>
<td>5,0</td>
</tr>
<tr>
<td>23,00</td>
<td>95,0</td>
<td>5,0</td>
</tr>
</tbody>
</table>

The source temperature was 100°C and the desolvation temperature was 350°C. A 10 mg extract sample was solved in 10 ml volumetric flask with absolute methanol then it was injected into UPLC-MS system. From chromatogram data, the area was in percentage. The chromatogram was processed using masslynx version 4.1 software. The component identification was based on the ratio of measured m/z in masslynx and chemdraw.

2.8 Data analysis

Anticancer test data analysis using SPSS program of One Way ANOVA method to determine the significance of the average treatment effect on body weight of mice and caspase-3 CPI score.

3 Result and Discussion

The objective of this research was to determine the effect of ethanol extract of the roots of thistle on the inhibition of the growth of fibro sarcoma of animal model of balb/c mice
induced by DMBA. In addition, this study aimed to analyze the content of metabolites contained in the ethanol extract of the roots of thistle. Fibro sarcoma animal model was used in this study since it has higher percentage of fibro sarcoma incidence and easier induction of in vivo fibro sarcoma in balb/c mice with DMBA carcinogen comparing to other types of cancer animal models. The anticancer inhibitory effect is seen from the growth parameters of mice body weight after undergoing therapy and caspase-3 expression. Metabolite content was analyzed using UPLCMS method. The ion source used in the UPLCMS is ESI (+) positive with MS Q-TOF analysis.

3.1 Mice Weight Changes

Increased body weight of fibro sarcoma mice compared to the control after treatment is one of the indicators of the development of cancer healing. Mice weight change during treatment is shown in Figure 1 and table 2.

Table 2. Effect Of 70% Ethanol Extract Of Thistle Root On The Changes In Body Weight Of Fibro Sarcoma Model Mice

<table>
<thead>
<tr>
<th>Group</th>
<th>% Increase Weight ± SD</th>
<th>Significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative controls</td>
<td>1.13 ± 5.32</td>
<td>-</td>
</tr>
<tr>
<td>Positive Control</td>
<td>13.63 ± 4.05</td>
<td>0.000</td>
</tr>
<tr>
<td>A dose of 50 mg/kg BW</td>
<td>14.68 ± 2.98</td>
<td>0.000</td>
</tr>
<tr>
<td>A dose of 100 mg/kg BW</td>
<td>7.39 ± 2.77</td>
<td>0.109</td>
</tr>
<tr>
<td>A dose of 150 mg/kg BW</td>
<td>5.60 ± 3.39</td>
<td>0.371</td>
</tr>
</tbody>
</table>

*Average weight gain ± Standard Deviation (SD), repetition is done 3 times on different experiments.

The largest weight gain rate is owned by the 50 mg/ Kg BW dose therapy group with an increase of 14.68%. This shows that thistle root extract therapy with dose of 50 mg/Kg BW
has a higher effectiveness to inhibit the growth of cancer cells than other treatments. This number was followed by a positive control group, then a dose of 100 mg/Kg BW and 150 mg/Kg BW therapy group.

Tukey test results indicated that treatment group that had significant difference of weight gain (p <0.05) with negative control were treatment group of dose of 50 mg/Kg BW and positive control group. Meanwhile, the therapy group and the positive control group did not have a significant difference in weight gain because the treatment groups had similar effects on weight gain in mice.

3.2 Caspase-3 Immunohistochemistry (CPI)

The observation on the tissue slide was done using a compound light microscope with 400 times magnification as much as 10 fields of visual. Positive cells expressing caspase-3 will have a brown cytoplasm due to anticaspase-3 antibody reactions visualized by DAB chromogen. The result of microscopic observation of caspase-3 immunohistochemistry in the treatment group can be seen in Figure 2.

![Figure 2. Results of caspase-3 immunohistochemistry through microscopic observations at 400 × magnification.](image)

a) The expression of *caspase-3* (arrow) in the negative control treatment,
b) The expression of *caspase-3* (arrow) in the positive control treatment with methotrexate treatment
c) The expression of *caspase-3* (arrow) on dose of 50 mg/Kg BW treatment
d) The expression of *caspase-3* (arrow) on dose of 100 mg/Kg BW treatment
e) The expression of *caspase-3* (arrow) on dose of 150 mg/Kg BW treatment

The cell measurement results that express caspase 3 showed that bigger index apoptosis was shown by mouse from dosage group of 50 mg/Kg BW that is 24.3 % followed by positive control group, the group of dosage therapy 100mg/Kg BW and dosage 150mg/Kg BW. This result shows that giving extract of thistle root can decrease the growth of cancer cell that is shown with the bigger apoptosis index from mouse of negative control. It is caused by cytotoxic activity from thistle root that can resist cancer cell growth through apoptosis induction [9]. Semi quantitative analysis results that uses Allerd scoring method also shows the higher scores in the therapy group. The result from measurement of apoptosis index and Allerd scoring are presented in Figure 3 and table 3.
Figure 3. The treatment effect of 70% ethanol extract of thistle root on apoptosis index of fibro sarcoma model mice

The result of Tukey test shows the experimental group has significant different CPI score of caspase-3 with negative control is experimental group with dosage of 50 mg/Kg BW, dosage 100 mg/Kg BW and positive control (score p<0.05). It shows that extract of thistle root can increase expression of caspase-3 for mice inducted with DMBA. Caspase-3 (cysteine-aspartic acid protease) is a protein in code CAPS3 that has important role for the cell apoptosis. In the cell apoptosis process, the activity of caspase-3 is inducted by caspase-8, caspase-9 and caspase 10 [16].

Table 3. The Result Of Apoptosis Index Analysis And Cpi Score Of Caspase-3

<table>
<thead>
<tr>
<th>Groups</th>
<th>Index apoptosis (IA) (%)</th>
<th>CPI Score of caspase-3 ±SD*</th>
<th>Significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Negative Control</td>
<td>Positive Control</td>
</tr>
<tr>
<td>Dosage 50 mg/Kg BW</td>
<td>24.3 6.00 ± 0.82</td>
<td>± 0.000</td>
<td>0.138</td>
</tr>
<tr>
<td>Dosage 100 mg/Kg BW</td>
<td>13.3 4.90 ± 0.74</td>
<td>± 0.003</td>
<td>0.897</td>
</tr>
<tr>
<td>Dosage 150 mg/Kg BW</td>
<td>12.3 4.40 ± 0.69</td>
<td>± 0.138</td>
<td>0.138</td>
</tr>
<tr>
<td>Positive Control</td>
<td>18.5 5.20 ± 0.79</td>
<td>± 0.000</td>
<td>-</td>
</tr>
<tr>
<td>Negative Control</td>
<td>6.8 3.60 ± 0.69</td>
<td>± -</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*average caspase-3 expression ± Standard Deviation (SD), repetitions are done three times in the different experiment.

The result of caspase-3 score is equal with the apoptosis index and mice’s weight gain where the higher the score of caspase-3 and apoptosis index, the higher the mice’s weight gain during therapy. From the three therapy groups, the group of dosage 50mg/Kg BW has capability in gaining highest expression of caspase-3 followed by positive control group. It shows that the giving of extract of thistle root in that dosage has higher cytotoxic effectiveness compared to that is given by Methotrexate medicine. Meanwhile, mice of therapy group of dosage 100 and 150 mg/Kg BW also have higher CPI score than negative control group even the score is lower than positive control group’s. It is caused by mice’s immunity in the certain dosage.
3.3 The Analysis of Metabolomics using UPLCMS/MS Method

The objective of metabolomics analysis is to determine the secondary metabolic compound in ethanol extract of thistle root. UPLC-MS is a method in analyzing metabolic profile that offers resolution, speed, and high sensitivity, even widely able to be used in pharmaceutical analysis, such as fatty acid long chain, underivatized amino acid and opiates in many kinds of matrix [17]. MS Detector with ESI ion source (+) and MS analyzer in Q-ToF UPLC-MS is specification of UPLCMS/MS tool that is used in this research. UPLCMS/MS chromatogram of ethanol extract of thistle root is presented in figure 5.

Obtained chromatogram is then processed using masslynx software version 4.1. The program of this software will help to obtain m/z spectra data and molecular formula. Prediction of this molecular formula will find the name of the compound by assistant of Chemsider website. When writing the molecular formula in this website, the number of H molecule will be decreased by 1. It is caused by positive ESI ion source will add H content to the intended compound, so that the number of its m/z must also be decreased from H atom’s real mass, that is 1.0078. After obtaining the name of the compound and its structure from that website, then compare the m/z measured to m/z calculated by drawing related compound structure in the Chemdraw Ultra 12.0 application [18] [19]. If the difference of them is ≤0.0005, then it can be said that this tip has predicted compound [20]. Component identification is based on the comparison of m/z measured in Masslynx and m/z calculated in chemdraw. The analysis using UPLCMS/MS obtains 14 chemical compounds consist of two compounds with widest area (width of 37.20% and 32.52%), five compounds’ structures are not yet found, and seven compounds with width of (0.15%-3.19%). Spectra m/z of mayor compound is presented in figure 4 and 5.

Figure 4. Spectra of m/z mass first mayor compound N-[1-(Adamantan-1-yl) ethyl]-2-(1-piperidinyl)-4-quinazolinamine
Figure 5. Spectra of m/z mass second mayor compound 4-Chlorobenzenethiol

4 Conclusion

The giving of ethanol extract 70 % root of Calotropis gigantea (thistle) in doses of 50, 100 and 150 mg/Kg BW for the fibro sarcoma model mice causes apoptosis induction for cancer cell through the increasing of caspase-3 expression with cell apoptosis index of 24.3 %; 13.3 % and 12.3 %. The analysis using UPLCMS/MS obtains 14 chemical compounds with two mayor compounds, they are 4-Chlorobenzenethiol with area percentage of 32.51 % and N-[1-(Adamantan-1-yl) ethyl]-2-(1-piperidinyl)-4-quinazolinamine compound with area percentage of 37.20 %.

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References

Text Mining Approach for Topic Modeling of Corpus Al Qur'an in Indonesian Translation

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Abstract. Qur'an is a religious text for Moslem that is revealed to humanity as a guide to solve any problems in all aspects of life. Therefore Quranic text is widely translated in various countries around the world, including in Indonesia which is predominantly inhabited by Moslem. Difficulties in understanding the Arabic Quranic text as well as still limited research on the Indonesian translated Quran in accordance to science and technology, have opened a broad challenge to contribute to this realm. This paper proposed topic modelling of corpus in Indonesian Translated Quran by generating four main topics that were closely/firmly related to human life: 1) heaven (surga) and hell (neraka), 2) World (dunia) and Afterlife (akhirat), 3) Science (ilmu), charity (amal) and jihad, 4) Day (siang), night (malam), life (hidup), and death (matti). The research method was divided into two stages, the text mining stage and the topic modeling stage. The moderator variables for this research were defined as Makki and Madani, as terms referring to the revelation location of Quranic verses. Of all the 4 modeling topics tested by word count, Makki's Surahs contribute above 50% compared to Madani's Surahs. In conclusion, the study results hopefully can be benefited as a convincing contribution from science's point of view that Makki's verses are indeed emphasizing the faith as the foundation of Islam. This can be seen from number frequencies of the words "hidup" (161), "neraka" (157), "surga" (105), "dunia" (127), "amal" which are closely related to human faith in life were mentioned, discussed and elaborated more in Makki's verses than in Madani's.

Keywords: component; Indonesian Translation Quran, Makki, Madani, topic modeling, corpus

1 Introduction

The Quran is a significant religious text written in Quranic Arabic which is followed and used as guidance by the Islamic faith believers. The Quran in the sense of language means "perfect reading" that is revealed to the human as a guide to solve any problems in all aspects of life. Indonesia as the largest Muslim country in the world has great potential in grounding the Quran thus the Quran can be more easily learned, understood and practiced. The Indonesian Quran translation has been circulated widely in the broader community both in print and digital. However, the Indonesian translation of the Quran still has not represented the convenience in searching of particular topic required for a specific purpose. Meanings and ideas are overlapping from ayah to ayah and from surah to surah, therefore drawing out an implied connections would need more in-depth study and time for discovering the hidden thematic structures [1]. As Quran’s function as a guide for humans, research on the Qur'an continues to grow in various fields. Research by Zakariah et al. have studied the future trends,
review, and analysis for the development of research on Quran, ranging from security for
digital Quran, e-learning and the implementation of Natural Language Processing (NLP), etc.
[2]. Topic modeling is a hot field of study in both machine learning and NLP. Topic models
are generative models that based on probability distributions of multiple topics in a document
over a set of words [3].

This research present topic modeling of corpus Quran in Indonesian translation. We
considered Makki and Madanisurahs as the variable for topic modeling categorization. The
reason for taking the subject theme of Makki and Madani in this research is because there is
still limited study examine such subject, and the implementation of Makki and Madani are
erly only for Surah’s categorization and Surah’s content verification. Details of the
previous researches are described in section 2. Hopefully, this study could contribute well to
the science community and for future research as well.

2 State of The Art

2.1 Literature Review

Text Mining

The most common text mining approach involves a representation of text that based on
keywords. A keyword-based methodology can be combined with other statistical elements
(machine learning and pattern recognition techniques, for example) to discover relationships
between different aspects in the text by recognizing repetitive patterns which are presented in
the content. Text Mining is also known as Intelligent Text Analysis or Knowledge Discovery
in Text or Text Data Mining which incorporates areas such as information retrieval,
information extraction, data mining, computational linguistics and natural language processing
[4]. In general, the text processing in text mining has:

(i) Text pre-processing, in this stage we conducted tokenization, stop-word removal and
stemming process.
(ii) Text transformation, in this stage text document represented by the words it contains
and their occurrences. Two approaches used for document representation are (i) bag
of words (ii) vector spaces.
(iii) Feature Selection, which eliminates redundant and irrelevant features.
(iv) Clustering and Classification text

Quranic Resource

The Quran was revealed through the Prophet Muhammad (PBUH) within 22 years two
months and 22 days [5] in the city of Mecca and Medina. The Mecca revelation period lasted
for 12 years of Prophet Muhammad's prophetic period and the revealed Surahs that descend
on this time belong to Makkah's Chapter, whilst the Madinah revelation period which was
began since the Hijrah event, lasted for ten years and all the revealed Surahs during this period
is called Madani’s Chapter. The original Arabic Quran has been distributed in online digital
form for some time, but only few books elaborate vocabulary complexity of the Quran. The
Quran contained 6,236 verses (ayahs) and divided into 114 chapters. Each of ayahs is in form
of a string of words. The total Quranic text comprises of about 77,000 words in the Arabic
language [1]. Whilst the complete Indonesian translation Quranic text before stemming are
ranges from 151,236 words to 37,857 words after derivation.
**Topic Modeling**

Topic models are computer algorithms that identify potential patterns of word occurrence using the distribution of words in a collection of documents [6]. Topic modeling is an unsupervised learning method based on the idea that a large group of records may accurately be classified into a small number of topics. Topic models generate interpretable, semantically coherent issues, which can be examined by enumerating the most likely words for each subject [7]. The output of topic modeling is a set of topics consisting of clusters of words that co-occur in these documents according to specific patterns. Topic models are useful for a variety of tasks such as organization, classification, collaborative filtering, and information retrieval [8]. There are several approaches to implement topic modeling. The following are some of the most popular topic modeling related to approaches addressed in information retrieval and machine learning literature [9]:

(i) Latent Semantic Indexing (LSI)
(ii) The unigrams mixture model,
(iii) Probabilistic Latent Semantic Indexing (PLSI)
(iv) Latent Dirichlet Allocation (LDA)

**2.2 Previous Research**

Many research on text mining and topic modeling applied to Quran have been conducted during these recent two years, and apparently would still going to be trending topic up to years ahead. Text mining implementation on Quran by Shara'f in his research has produced a semantic annotation of the Quran by using N-Gram from the original language of the Qur'an [10]. This research also created two files of the raw Qur'an, one which contains only makki chapters, and another only madani chapters. And the result showed that Makki’s chapters contains 47,643 words (61.2%) of them 6,358 hapax legomena (13.3%) whilst Madani’s chapters contains 30,161 words (38.8%) of them 4,621 hapax legomena (15.3%). Another research study that had used the Quran Indonesian translation was merely a literature review on the SQA System applications of text mining to ITQ (Indonesian Quran Translation) [11]. Alhawarat et al. in his research on the Al-Quran text processing implementation, when it was viewed from Most Frequent Words which is visualized in form of a word cloud using TF-IDF weighting, still used the original language without going through the stemming process [12].

As related to the Quran modeling topic, research by Panju had also used TF-IDF and factorization in topics visualization [13], while Alhawarat in his research has used the LDA method (The Latent Dirichlet Allocation) to extract the modeling topic based on the Yusuf's Surah datasets only [3]. Still, on the LDA method, a similar study was carried out by Siddiqui et al. that described 15 most frequent terms from Quran after normalization and corpus specific stopwords removal[1]. Through probabilistic methods, the Surahs were classified and mapped into Makki or Madani and came to the conclusion that MakkiSurahs emphasized more on the basic tenets of the religion including oneness of Allah, the prophet-hood of Muhammad PBUH and the coming of Judgment Day. Whilst the Madanisurahs laid down on Islamic law and jurisprudence, outlining ritualistic aspects, moral and ethical codes, laws of governance, etc. The above-mentioned previous researches, mostly still used the original Arabic text as its corpus for the text mining management. As for the use of Indonesia, Quran translation was limited only to the word searching [14][15] and the utilization of its
architecture for question answering (QA) system development on relevant documents of Indonesian Quran translation[16].

3 Research Methods

In general, the research method was divided into two stages, the text mining stage and the topic modeling stage. The final result of the text mining stage was word-count (which was later being modeled with word cloud), whilst the final outcome of topic modeling stage was the visualization of topics intended to model. Overall, the two steps of the study were summarized below in Figure 1:

![Figure 1. Research Method](image)

3.1 Text Mining

As mentioned earlier, we use the dataset obtained from the qurandatabase.org site in the form of *.csv file extension. Before the Quran corpus was processed and visualized, it was necessary to conduct a preprocessing to obtain a clean dataset. One of the steps in preprocessing was data clearance from stop-word. Stop-word list considered as common words that did not provide any vital information, such as the words "yang," "di," "kemudian," and so forth. The stop-word used in this research came from a literary stop word [17]. Until this phase, the corpus results can resume at the topic modeling stage.

To view the text mining processing result from the Quran corpus content can be seen in the following table (Table 1).

| Table 1. Corpus in Indonesian Quran Translation |
From the table above, when the modeling applied is in the word cloud format, the result is as shown in Figure 2 below:

Figure 2. Topic modeling word cloud
3.2 Topic Modeling Process

The topic modeling process was started with selecting the topics to be modeled, then selecting the moderator variable and finally calculating and visualizing the chosen model. There were four topic modeling conducted in this research, which were as follow:

(i) Heaven (surga) and hell (neraka)
(ii) World and hereafter (duniadanakhirah)
(iii) Science, charity, and jihad (ilmu, amal, jihad)
(iv) Day, night, life, and death (siang, malam, hidup dan mati)

The above four topics used similar moderator variable, both Makki and Madani verses. The range of verses as the object of this research study is defined as the first verse up to verse 6236 of the Qu'ran. The visualization result and the elaboration of four types of topic modeling were discussed in the following section.

4 Result

4.1 Topic modeling on heaven and hell

We intended to do the modeling into verses in Quran containing words "surga" and "neraka". In Figure 3 we tried visualized the first verse up to verse 6236 of the Quran, where the red dots indicate verses containing the word "neraka," and the blue dots indicate verses containing the word "surga." The results showed that the "surga" and "neraka" topic were more likely discussed in Makki verses compared to Madani verses.

In detail, the word "surga" in the Quranic corpus mentioned 160 times and 223 times for the word "neraka." As for the proportion, the word "surga" was mentioned 105 times in Makki verses and 55 times in Madani verses, while the word "neraka" was mentioned 157 times in Makki verses and 66 times in Madani verses.

Such topic modeling generated from this research shall interesting to be elaborated further particularly in relation to the verses origin "why and wherefores" (asbabunnuzul), as to examines the fact that Makki verses explain more the “surga” and “neraka” topic than Madani verses.
Figure 3. Distribution of heaven and hell topic
4.2 Topic modeling on the world and the hereafter

On this topic modeling, we found that the word "dunia" was 182 times mentioned, and the word "akhirat" was 54 times mentioned. As shown in Fig. 4, the red dots indicate verses containing the word "dunia," and the blue dots indicate verses containing the word "akhirah." At further examination with moderator variables in both verses, turning out that the word "dunia" 55 times mentioned in Madani's verses while in Makki's verses was 127 times mentioned. Then for the word "akhirah" was mentioned as much as 54 times in the Quran corpus, with the distribution as much as 40 times mentioned in Makki verses and 14 times in Madani. Again, further investigation on asbabunnuzul regarding this topic modeling is necessarily substantial.

Figure 4. Distribution of world and hereafter
4.3 Topic modeling on science, charity, and jihad

We were making attempt to count and visualize verses in Quran that contain the words "ilmu," "amal", and "jihad." From the entire verses examined the word "ilmu" was 50 times appeared, with 34 of them were found in Makki's verses, and the other 16 founded on Madani’s verses. In searching of the word "amal," we found that the word has appeared 141 times, of which 92 of them were found in Makki's verse, while the other 49 were in Madani’s verses. As for the word "Jihad," the word was found in 31 verses, with 27 of them were included in Madani's verses and the rest of 4 belongs to Makki's verses. Figure 5 below is a visualization of topic modeling on “ilmu”, “amal”, and jihad, where the red dots indicates Makki's verses and the blue dots shows the verses of Madani.

Figure 5. Distribution of science, charity, and jihad
4.4 Topic modeling on the day, night, life, and death

In this topic, we found the word "siang" as much as 53 words, 45 on Makki verses and the others 8 were in Madani verses. For the word "malam," as many as 51 words successfully detected with 45 of them found in Makki verses and 6 on the Madani’s verses. As for the word "hidup," we have successfully detected 204 words on the Quranic corpus, with 161 of them were found in Makki verses, while the rest 43 words were found in Madani verses. And for the last, for the word "mati" we have detected 107 words in the Quranic corpus, with 61 of them were found in Makki’s verses, while the 46 others were found in Madani verses. It appeared that the terms "siang" and "malam" were relatively balanced, but the words "hidup" and "mati" mentioned in ratio 2 to 1.

Figure 6 below is a visualization of topic modeling on "siang," "malam," "hidup," and "mati," where the red dots indicate Makki's verses and the blue dots shows the verses of Madani.

![Figure 6. Distribution of day, night, life, and death](image)

Based the four main topics that had been modeled, we can see that the words "hidup", "neraka", "surga", "dunia", and "amal" that are closely related to human faith in life were much more elaborated and discussed (see Table II). The analysis results also had shown that Makki's verse were more dominating in all the words tested (see Table III).

### Table 2. Topic Modeling Result Based on Word Count

<table>
<thead>
<tr>
<th>Variable</th>
<th>Topic 1</th>
<th>Topic 2</th>
<th>Topic 3</th>
<th>Topic 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makki</td>
<td>108</td>
<td>117</td>
<td>117</td>
<td>40</td>
</tr>
<tr>
<td>Madani</td>
<td>57</td>
<td>66</td>
<td>66</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>165</td>
<td>283</td>
<td>183</td>
<td>56</td>
</tr>
</tbody>
</table>

### Table 3. Topic Modeling Result Percentages View

<table>
<thead>
<tr>
<th>Variable</th>
<th>Topic 1</th>
<th>Topic 2</th>
<th>Topic 3</th>
<th>Topic 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makki</td>
<td>66.00%</td>
<td>49.48%</td>
<td>54.00%</td>
<td>60.00%</td>
</tr>
<tr>
<td>Madani</td>
<td>54.00%</td>
<td>50.52%</td>
<td>46.00%</td>
<td>54.00%</td>
</tr>
<tr>
<td>Total</td>
<td>60.00%</td>
<td>52.22%</td>
<td>50.00%</td>
<td>57.00%</td>
</tr>
</tbody>
</table>
These research findings prove empirically that Makk i's verse give more emphasis to the topic of faith, whereas in the Madani's verses the words "hell", "heaven", "world", "charity" and "life" respectively have been discussed more than the other words. However, the result was less empirically able to prove that the verse Madani's did give emphasis on the law, *muamalah* and so forth. A further study need to be conducted to develop and obtain more scientific proof.

References


Application of Amine Modified Silica Adsorbenes on CO₂ Adsorption in Biogas

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Abstract. The adsorption process is a technology that is more efficient in CO₂ adsorption. The adsorbent used must have adsorption capacity and high selectivity to CO₂ adsorption. In this study, silica is used because it has sufficient surface area and pore size. In addition, the presence of silanol group on the surface of silica allows silica to be modified with other functional groups for certain applications. One of the interesting points is the modification of silanol groups with amine group, where the amine group is selective towards CO₂. The success of the adsorbent depends on the successful modification of the amine group to the surface of the silica through the reaction of the hydroxyl group on the surface of the substrate and silane compounds. Amine compounds used as modifying agents are APTS (aminopropytriethoxysilane). The method used to modify silica gel is post grafting. Biogas to be purified is made by mixing vegetable waste with cow dung as a starter source of methanogen. The methane gas content can be increased by reducing the amount of CO₂ gas in biogas. Methane gas content in biogas made from vegetable waste is 78.5% while CO₂ gas is 16%. The process of CO₂ gas adsorption is done by passing the biogas on the silica adsorbent which has been modified with amine. This process lasts for 30 minutes. The results of the analysis with TGDTA and FTIR showed that the adsorption has been proceed. CO₂ gas which is successfully adsorbed from biogas is 80% and this increase the level of CO₂ gas which rises from 16% to 12.76%

Keywords: silica-amine; adsorption CO₂; biogas

1 Introduction

During the current global energy crisis, renewable energy sources such as biogas have enormous potential in meeting energy needs in the future. Biogas is a very important renewable source of methane produced through anaerobic biomass biodegradation. The biogas content in general is 55- 70% CH₄, 30-45% CO₂ and the rest is water and hydrogen sulfide (H₂S) [1]. Very large carbon dioxide content can reduce the heating value of the biogas and affect the performance of the engine. In addition H₂S gas is very corrosive and harmful to the environment. Energy conversion from biogas to heat or electricity is possible through combustion. Biogas can be transferred through piping or by compression in a tube. This is possible only if the content of CO₂, H₂S and moisture is removed. Reduction of CO₂ and H₂S content will significantly increase the quality of biogas.
Various techniques have been developed for acid gas separation, including chemical absorption, physical absorption, physical adsorption and membrane separation. Among these techniques, chemical absorption using alkanolamines as monoethanolamine and diethanolamine is the most popular in large-scale industries such as the sweetening of natural gas and the separation of CO2 from the exhaust gas of power plants. Although the absorption method is a relatively low-cost process, the regeneration of these absorbents requires large costs and energy. In addition this technique provides many problems including high corrosion rates, degradation of absorbents and foam formation in the gas-liquid interface.

The application of this technology is not widely used in small-scale processes such as biogas purification. This is because the use of liquid for the separation of CO2 gas has many obstacles including the need for large energy for the regeneration process, the stability and selectivity of the chemicals used, the environmental impacts caused by liquid waste, the need for large-sized equipment and the high rate of corrosion of the equipment.

To overcome this problem, an alternative is used through physical adsorption with solid adsorbent. One of them is using nanoporous and mesoporous silica gel which is grafted with amine groups. The development of silica that has been grafted with amine groups has been developed as an absorbent due to its efficiency and selectivity to CO2. Mesoporous silica is known to have a high amount of silanol groups which can be grafted with organic amine compounds. Therefore, Mesoporous silica is a potential substrate for amines that can be used for the purpose of CO2 adsorption [2-4].

Based on the studies that have been carried out so far, the raw material used as a source of silica is usually in the form of tetraethyl orthosilicate (TEOS) or tetramethyl orthosilicate (TMOS) because of its large silica content. However, TEOS and TMOS are expensive, difficult to obtain and toxic raw materials. Therefore, it is necessary to develop silica which is cheap and non-toxic as ash bagasse.

Bagasse ash which has a high silica content (above 50%) is a very potential raw material due to its low price, abundant amount and amorphous silicie properties which can be easily modified with a relatively cheaper and low energy sol-gel process to obtain desired particle structure. Affandi et al 2009 [5] succeeded in synthesizing high purity mesopore silica (above 99%) from bagasse ash by caustic digestion method. This method does not require large energy and uses environmentally friendly raw materials.

From the description above, in this study the problem is focused on making baggase ash-based silica gel adsorbents that will be grafted with amine as an adsorbent for carbon dioxide (CO2). The source of silica used is baggase ash and the amine source used is 3-Aminopropyltriethoxysilane (APTS). The purpose of this study are: Develop a method of grafting amine groups on the surface of bagasse ash-based silica gel to capture of carbon
dioxide (CO2) gas in biogas. So, the purposes of this study was to test the performance of silica amine as adsorbent of carbon dioxide gas in biogas.

2 Experiment

To obtain mesoporous silica particles which are capable of being grafted with amine groups in large quantities so that they have high acid gas adsorption capacity, it is obtained by regulating the process conditions. To achieve this goal required mesoporous-sized pore silica structure. Particles with this structure, pores with a certain volume and diameter are obtained by controlling pH on gel formation and can also be done by adding a template for more directed pore formation [6][7], and adding organic acids to control gel formation [8].

2.1 Extraction of silica from bagasse ash.

The extraction process of silica from ash bagasse adopts from a procedure that has been developed by Affandi [5]. The details are carried out in the following way: 10 grams of bagasse ash (PT. Kebon Agung Sugar Factory, Malang) was extracted using 60 ml NaOH 2N (Sigma Aldrich) to produce sodium silicate. Silica from bagasse ash was extracted for 1 hour with constant stirring at its boiling point. The solution is then filtered using ash filter Whatman No. 41 to separate the carbon residue. Filtrates (sodium silicate) are then cooled to room temperature.

2.2 Synthesis of silica-amine hybrid

Synthesis silica-amine hybrid with controlled pores using PEG (Polyethylene glycol) adopts procedures that have been developed previously [6]. The complete process is carried out in the following way as shown in Figure. 1. From Figure 1, it can be seen that the amine silica synthesis process from bagasse ash uses the post grafting method. To form pores and network amplifiers, PEG 1000 is used.
3 Result and Discussion

Silica-amine synthesis that has been produced with the process conditions as in Fig. 1, obtained surface area and pores that fall into the mesopore category. The formation of the characteristics of silica-amine used as an adsorbent of carbon dioxide gas has met the requirements as an adsorbent. Pore size greatly affects the success of the adsorption process,
where the appropriate pore size can avoid obstruction of the carbon dioxide gas diffusion process into silica-amine adsorbents. As reported by Rahman [8], where the template used as a pore forming is PEG and the method used to remove templates is the calcination process carried out at 350 °C for 8 hours. Based on the results of BET (Brunauer-Emmet-Teller) analysis, silica-amine were obtained with a pore volume size of 1.25 cc / g, pore diameter of 7.75 nm and a surface area of 650.2 m² / g.

This silica-amine is used to adsorb carbon dioxide gas in biogas. In this study, biogas was obtained from the biogas production process using vegetable waste with cow dung as a starter. Analysis of the biogas produced showed that the content of CH₄, H₂S and CO₂ were 78.5% respectively; 0.2% and 16%, and the rest is a mixture of N₂, H₂ and O₂ gases of 5.3%. Heating value is 11980 kcal / kg. When it will be applied as fuel in the combustion chamber, the presence of large amounts of CO₂ will have a negative impact because it will cause crust and long-term use can cause damage to the combustion chamber. For this reason, it is necessary to reduce CO₂ gas in biogas. In addition, as it is known that the presence of carbon dioxide gas in the atmosphere which is increasing in number each year will have an impact on global warming.

Adsorption of CO₂ gas with silica-amine was chosen as a method to reduce CO₂ levels because this process does not require energy and can be carried out under fairly safe operating conditions. In addition, the desorption process as an adsorbent regeneration is also easier to do. APTS compounds as amine sources provide high reactivity to CO₂ gas so that the CO₂ gas adsorption process can take place quickly.

The advantages of amine compounds as adsorbents of CO₂ gas when compared to other adsorbents such as zeolite or activated carbon are their tolerance to moisture. The results of the study stated that the absorption of CO₂ in the amine solution formed the following reaction:

\[
\text{CO}_2 + 2 \text{R-NH}_2 \rightarrow \text{R-NHC(O)}_2 \text{H}
\]

The reaction between CO₂ and amine compounds in water-free environmental conditions will produce carbamate compounds where this reaction requires 2 amine molecules to bind one molecule of CO₂. Whereas in a humid environment, CO₂ is adsorbed with bicarbonate formation. Adsorption capacity in a humid environment is doubled compared to dry environments because it requires one amine molecule to bind one molecule of CO₂. [9]

Adsorption is carried out at 40 °C and atmospheric pressure. Biogas is passed through the silica-amine adsorbent in the adsorber column. The adsorbent that has absorbed carbon dioxide gas was analyzed by TGDTA (Thermo Gravimetric and Differential Thermal Analysis), as seen in Fig. 2.
Figure 2. TGDTA Analysis (a) thermal gravimetry analysis and (b) differential thermal analysis

Thermal gravimetry-differential thermal analysis analysis is used to estimate the amount of CO2 adsorbed by silica particles (Fig. 2). The results of the analysis can be divided into 2 regions with a temperature limit of 280 °C which is where there is an energy release which is indicated by an increase in the DTA curve (Fig. 2b) which indicates the occurrence of a chemical reaction.

At temperatures less than 280 °C the evaporated component is the solvent used, in this case water is at 100 °C and physically adsorbed CO2 gas and other volatile components. Whereas at temperatures above 280 °C there is a release of carbamate bonds which are chemically bound CO2 with amines which are grafted on the surface of silica. The amount of
chemically bound CO₂ is estimated to be 0.07 g / g silica or 1.61 mmol / g silica.

The amount of amine successfully grafted onto the silica surface is 2.37 mmol / g silica, in this number silica-amine is able to adsorb carbon dioxide gas as much as 1,185 mmol CO₂ / g silica. The amount of CO₂ absorbed also provides CO₂ concentration information that has been successfully removed from biogas. Analysis with GC-MS showed that there was a decrease in CO₂ levels in biogas. In the initial conditions, before the adsorption process occurred, CO₂ levels in biogas were 16%. After the adsorption process, the CO₂ content in the biogas becomes 12.76%. GC-MS analysis shows the amount of methane gas in biogas after the adsorption process is 98%. This also means that methane gas was successfully purified 80% of the initial methane rate (78.5%).

4 Conclusions

Biogas as a renewable alternative fuel has been widely applied, both as fuel for household needs such as stoves, lighting, currently biogas is also applied to meet energy needs in energy installations in industry. To meet the needs as fuel, the presence of carbon dioxide gas in biogas must be minimized. Carbon dioxide gas which is included in the category of acid gas will cause problems if the acid gas is in sufficient quantities. Carbon dioxide gas is also known as the biggest contributor to the cause of global warming. Adsorption by adsorbent silica-amine provides a solution for handling carbon dioxide gas. In addition to the easy process, the energy consumption needed to reduce the amount of carbon dioxide gas by the adsorption process is much cheaper because it is operated at room temperature and atmospheric pressure.

Silica-based carbon dioxide gas adsorbent from bagasse ash, provides an alternative choice of adsorbent that is cheap, easy to produce and most importantly environmentally friendly and can solve the problem of solid waste generated from the sugar production process.

From the results of the analysis, both with TGDTA and GC-MS, it can be concluded that biogas produced from vegetable waste can be used to meet energy needs, both for combustion chambers in motorized vehicles and energy installations in industries and households. CO₂ levels were reduced by 80%, and methane gas content was increased from 78.5% to 98%.

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References

The Readiness for Successful Implementation The Accurate Accounting Information System Based on User Perception

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Abstract. The effects of the Success Information System (SIS) is Readiness of system user. The Accurate System is one of the Accounting Information Systems (IS) that assist in company bookkeeping. However, the lack of user readiness in utilizing the system resulted in the operational performance of the company is not running optimally. In addition, there is not much research related to the success information system from the user readiness side. The purpose of this research is to determine how far user readiness to the successful implementation of the Accurate system and to find out what factors influence the successful implementation of SIA Accurate using the readiness model of Technology Readiness Index (TRI) and the success of IS. Analysis techniques are PLS-SEM with application tools SmartPLS 3.0. The result is 23 hypotheses tested 14 accepted or influential hypotheses and 9 hypotheses rejected.

Keywords: Accounting Information System, Accurate system, Technology Readiness Index, The Successful Information System Model, PLS SEM.

1 Introduction

IS are no longer viewed only as a compliment but are already a major support in the existing business processes of an organization[1]. Therefore, the role of Information and Communication Technology (ICTs) can contribute to changes in the way people work and interact in their fields[2].

Accounting Information System is a system that collects, records, stores, and processes data to generate information for decision-makers[2]. Using IS is proven to reduce costs, create faster and more efficient work processes, and offer a high level of flexibility[3].

Anyone can be an IT (information technology) or SI user, but how to implement it depends on the degree of user readiness in accepting the technology or the system[4]. And the first step in the implementation of technology is knowing the user readiness to accept the technology or system[5].

The result, the implementation of Accurate System found several problems from the user side and also the weaknesses of AccurateSystem itself. The example is the search engine of Accurate System, it cannot detect a keyword as a whole, the sentence can only detect the first word in a sentence. Another example is the output or the resulting report sometimes does not match the filter that has been set by the user. Therefore, some user difficulties in learning other new cases.
Some users who are lazy to learn cannot use the system properly, thus causing the user to suspend his work by using the old system or method then ask for the help from other users who understand to move it to Accurate System. Therefore, the degree of user readiness to use Accurate System affects success of the implementation a new technology or systems in the company.

2 Literature Review

2.1 Technology Readiness

Technology Readiness is defined as a tendency to embrace and use new technology to accomplish the goals of various jobs both at home and in the workplace[4]. The success of the implementation and the adoption of new technologies especially at an institution largely determined by factors of readiness and ability of the users[6]. The Research [7] which involving 50 organizations as objects of the research stated that the low readiness levels became the cause of the failure of IS project, in particular the readiness of the user is the most dominant influence on the success of the implementation of the IS[6]. Research by Sheu & Kim showed that user readiness factors have stronger influence than user engagement to the success of IS project.

Technology Readiness Index was developed by [4] to measure and find out the extent to which an individual or organisation is ready to adopt an information technology. TRI is a multi-item scale which consists of 36 questions for measuring technology readiness. Scale of 36 items consists of four dimensions of beliefs component those related with technology affecting individuals in Technology Readiness. Model of TRI 2.0 consists of four dimensions, two of them are contributor and the others are inhibitor for technology adoption. The contributors are Optimism, Innovativeness, Discomfort, and Insecurity.

2.2 Success Information System

The success of information system is determined by how the system can be run by the users effectively, and the users feel satisfied using the system as well as how companies can take advantage of a system that they use. In 1992, Delone dan McLean developed an information system success model which consists of six element such system quality, information quality, use/usage, user satisfaction, individual impact, and organization impact. Information System Success Model [8] is based on the process and the causal relationships of the dimensions in the model. This model does not measure to the six dimensions of measuring the success of information systems independently instead of measuring it one affects the other.

2.3 Accurate System

Accounting Information System is a system that collects, records, keeps, and processes data to generate information for decision makers[9]. AIS of Accurate is an accounting program made by the nations. The developer system of AIS of Accurate is CPSSoft (PT. Cipta Piranti Sejahtera), and CPSSoft does not serve sales, instead of focusing in developing the program and the administration.

3 Research Method
In General, this research was done by applying a quantitative approach [10] and the successive research structure in accordance with its objectives is to examine the influence of the readiness against the success of the implementation Accurate System, and to test the hypothesis that deals between the influence of readiness towards the information system success.

The technique of data collection is done through the procurement survey distributed to respondents in some companies particularly VAIN Accurate users of Jakarta, with questionnaire instrument, data was analyzed statistically by using appropriate computer software. The research instrument is a questionnaire consists of 40 questions intended as a statistical data inferensial. Specifically, the researchers use a likert scale of five points from the level of "strongly disagree" (1) to "strongly agree" (5) for measurements in the questionnaire.

Population and sample in this research is the users of AIS of Accurate particularly company in Jakarta. Purposive sampling technique is deducted in this research to select parts of the population, the selected criteria are users who have experience in using AIS of Accurate. Then, the researchers determine the 125 respondents to the number of respondents based on theory with consideration of number of population, time limitations, and thus researchers pursing research area in South, East, and West Jakarta. The proposed model in this research is the one that developed by Subiyakto[11]. The model combines Technology Readiness Index (TRI) [5] and Information System Success model[8] with Input-Proces-Output model[12][13], [14]. Readiness influence measurement model to the success of the implementation of the system consists of 9 variables (TABLE III) and 44 indicators (TABLE IV). The variables are Optimism (OPT), Innovativeness (INN), Discomfort (DIS), Insecure (INS), Information Quality (INQ), System Quality (SYQ), Service Quality (SVQ), User Satisfaction (USF), and Success Information System (SIS).

Figure 1. Purposed model

Table 1. List of The Variables [11]
<table>
<thead>
<tr>
<th>Var.</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPT</td>
<td>The degree to trust that the IS will probably happen</td>
</tr>
<tr>
<td>INN</td>
<td>The degree to perceive that the IS is the advanced degree of the system</td>
</tr>
<tr>
<td>DIS</td>
<td>The degree to see that the IS is not a comfortable thing</td>
</tr>
<tr>
<td>INS</td>
<td>The degree of unbelief that an IS integration is able to be implemented properly and concerns about its potential harmful consequences</td>
</tr>
<tr>
<td>INQ</td>
<td>The degree to released information of the IS consistently met the requirements and expectations of the users</td>
</tr>
<tr>
<td>SYQ</td>
<td>The degree to explain the quality of the IS</td>
</tr>
<tr>
<td>SVQ</td>
<td>The degree of the quality of the IS services into its users</td>
</tr>
<tr>
<td>USF</td>
<td>The degree of the pleasure level of users during applying the IS</td>
</tr>
<tr>
<td>SIS</td>
<td>The achievement of the IS based on its execution planning</td>
</tr>
</tbody>
</table>

Table 2. List of The Indicators [5],[8],[15],[11]

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easiness (OPT1)</td>
<td>The degree associated with the ability of the system for providing a freedom from interruption, hardship, and troubles</td>
</tr>
<tr>
<td>Connectivity (OPT2)</td>
<td>The degree associated with the ability of a system to connect successfully with other systems</td>
</tr>
<tr>
<td>Efficiency (OPT3)</td>
<td>The degree associated with the system achievement to release the result compared to the resources needed to get the result</td>
</tr>
<tr>
<td>Effectiveness (OPT4)</td>
<td>The degree associated with the system ability to achieve its implementation goals</td>
</tr>
<tr>
<td>Productivity (OPT5)</td>
<td>The degree associated with the system support for producing the result compared to the resources needed to produce the result</td>
</tr>
<tr>
<td>Problem Solving (INN1)</td>
<td>The degree associated with the system support for discovery solutions to problems</td>
</tr>
<tr>
<td>Independence (INN2)</td>
<td>The degree associated with the system ability to support its users free from the controls or influences</td>
</tr>
<tr>
<td>Challenge (INN3)</td>
<td>The degree associated with the system support to successfully handle or get something within a difficult situation or trouble</td>
</tr>
<tr>
<td>Stimulation (INN4)</td>
<td>The degree associated with the system support to propose something to happen, expand, or improve</td>
</tr>
<tr>
<td>Competitiveness (INN5)</td>
<td>The degree associated with the capability of a system to support the users to be more successful than their rival</td>
</tr>
<tr>
<td>Complexity (DIS1)</td>
<td>The degree associated with the system features that confusing or difficult to be accepted</td>
</tr>
<tr>
<td>Difficulty (DIS2)</td>
<td>The degree associated with the condition of a system which is unable to be operated easily</td>
</tr>
<tr>
<td>Dependence (DIS3)</td>
<td>The degree associated with the condition of a system which needs the other parties to perform it</td>
</tr>
<tr>
<td>Lack of Support (DIS4)</td>
<td>The degree associated with a system which it does not have any, or enough, of the support in its implementation</td>
</tr>
<tr>
<td>Inappropriateness (DIS5)</td>
<td>The degree associated with the state of being unsuitable</td>
</tr>
<tr>
<td><strong>Failure (INS1)</strong></td>
<td>The degree associated with the IS service scope proper to the functional requirements</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Threat (INS2)</strong></td>
<td>The degree associated with the system condition that could cause harm or dangerous</td>
</tr>
<tr>
<td><strong>Reducing Interaction (INS3)</strong></td>
<td>The degree associated with the system execution which makes human interactions become less in size, amount, and importance</td>
</tr>
<tr>
<td><strong>Distraction (INS4)</strong></td>
<td>The degree associated with the system utilization gets concern and avoid people from concentrating on something else</td>
</tr>
<tr>
<td><strong>Incredulity (INS5)</strong></td>
<td>The degree associated with hesitation of the system utilization</td>
</tr>
<tr>
<td><strong>Accuracy (INQ1)</strong></td>
<td>The feasibility degree of the result of information by the system with its real standard</td>
</tr>
<tr>
<td><strong>Timeliness (INQ2)</strong></td>
<td>The accuracy degree of the information processing of the IS at the planned time duration</td>
</tr>
<tr>
<td><strong>Completeness (INQ3)</strong></td>
<td>The degree of the resulted information by the IS to be with or without nothing missing part</td>
</tr>
<tr>
<td><strong>Consistency (INQ4)</strong></td>
<td>The IS trends still demonstrate the same produced information within operations, services, maintenance, or qualities</td>
</tr>
<tr>
<td><strong>Relevance (INQ5)</strong></td>
<td>The relation degree of the generated information by the IS with its subject matters</td>
</tr>
<tr>
<td><strong>Ease-of-use (SYQ1)</strong></td>
<td>The degree of a freedom by the IS from constraints, difficulties, and troubles during its usage</td>
</tr>
<tr>
<td><strong>Maintainability (SYQ2)</strong></td>
<td>The degree associated with the easiness of the IS in its maintenance</td>
</tr>
<tr>
<td><strong>Response time (SYQ3)</strong></td>
<td>The degree associated with the amount of time it takes for the IS responding its user commands</td>
</tr>
<tr>
<td><strong>Functionality (SYQ4)</strong></td>
<td>The degree associated with the IS can be executed appropriate to the planned requirements</td>
</tr>
<tr>
<td><strong>Safety (SYQ5)</strong></td>
<td>The IS invulnerability degree from the unexpected attacks, harms, or damages</td>
</tr>
<tr>
<td><strong>Responsiveness (SVQ1)</strong></td>
<td>The IS reaction degree to serve its users within the suitable way, time and situation</td>
</tr>
<tr>
<td><strong>Flexibility (SVQ2)</strong></td>
<td>The IS adaptation degree to serve its users proper to the required demands</td>
</tr>
<tr>
<td><strong>Security (SVQ3)</strong></td>
<td>The safety degree from an integrated system to serve users safely from attack, harm, or damage that unexpected</td>
</tr>
<tr>
<td><strong>Functionality (SVQ4)</strong></td>
<td>The degree associated with the service scope of the IS appropriate to the functional requirements</td>
</tr>
<tr>
<td><strong>Extension (SVQ5)</strong></td>
<td>The degree associated with the IS additional service scope which is more than the functional requirements</td>
</tr>
<tr>
<td><strong>Efficiency (USF1)</strong></td>
<td>The IS user satisfaction degree based on the system achievement to produce the result compared to the resources needed to achieve the result</td>
</tr>
<tr>
<td><strong>Effectiveness (USF2)</strong></td>
<td>The IS user satisfaction degree based on the system ability to fulfill the user needs for achieving their goals</td>
</tr>
<tr>
<td><strong>Flexibility (USF3)</strong></td>
<td>The IS user satisfaction degree associated with the adaptability of the system proper to the required demands</td>
</tr>
<tr>
<td><strong>Overall satisfaction (USF4)</strong></td>
<td>The IS user satisfaction degree associated with the sufficiency of the overall aspect of the system</td>
</tr>
</tbody>
</table>
| **IS Efficiency (SIS1)** | The degree associated with a comparison of the IS result value and the resources needed to achieve the
<table>
<thead>
<tr>
<th>IS Effectiveness (SIS2)</th>
<th>The degree associated with the capability of the system sufficiency to fulfil the user needs for achieving their goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Satisfaction (SIS3)</td>
<td>The extent to which the IS helps users create value for their business</td>
</tr>
<tr>
<td>Productivity improvement (SIS4)</td>
<td>The degree associated with the system support for improving result compared to the resources needed to produce the result</td>
</tr>
<tr>
<td>Competitive advantage (SIS5)</td>
<td>The degree associated with the advantaging position of the integrated IS users to compete in the business competitions</td>
</tr>
</tbody>
</table>

4 The Result

4.1 The Results of Measurement Model Analysis

Measurement model analysis through four stages of testing as already done by several previous researchers. The four tests are individual item reliability, internal consistency reliability, average variance extracted, and discriminant validity[16]–[21]. Following an explanation, this is the results of the four tests:

a. Individual Item Reliability Test

The standardized loading factor describes the magnitude of the correlation between each measurement item (indicator) and its construct by looking at the value of the outer loading. The value of outer loading above 0.7 can be said to be good, meaning that the indicator is said to be valid as an indicator that measures the construct.

![Figure 2](image.png)

Figure 2. The result of outer loading (before some indicators deleted)

Referring to the standard value of outer loading, after going through testing on SmartPLS 3.0, with the results deletion of the three indicators that have outer loading below 0.7 are INN1, INQ1, and INQ2. After the removal of the three indicators after being tested again using SmartPLS 3.0, the entire outer loading has fulfilled the requirements > 0.7 individual item reliability.
b. Internal Consistency Reliability Test

This test is done by looking at the results of composite reliability (CR) with a threshold above 0.7. The results can be seen in Table 4.3 that the CR value of all variables is above 0.7 so that it is eligible and valid for use in this research model.

Table 3. The Result of The Composite Reliability

<table>
<thead>
<tr>
<th>Composite Reliability</th>
<th>DIS</th>
<th>INN</th>
<th>INQ</th>
<th>INS</th>
<th>OPT</th>
<th>SIS</th>
<th>SVQ</th>
<th>SYQ</th>
<th>USF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIS</td>
<td>0.960</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INN</td>
<td>0.917</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INQ</td>
<td>0.852</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INS</td>
<td>0.948</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPT</td>
<td>0.921</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIS</td>
<td>0.953</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVQ</td>
<td>0.953</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYQ</td>
<td>0.933</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USF</td>
<td>0.894</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c. Average Variance Extracted Test

Convergent validity testing is then performed by looking at the average variance extracted (AVE) value. This value describes the amount of variance or the diversity of manifest variables (indicators) that can be contained by latent variables (constructs). A minimum AVE value of 0.5 indicates a good convergent validity size. That is, the latent variable (construct) can explain an average of more than half the variance of the indicators. The results can be seen in Table 4.4 which shows that the AVE value of all variables is above 0.5 so that it meets the requirements for use.

Table 4.4. Average Variance Extracted (AVE)

<table>
<thead>
<tr>
<th>Average Variance Extracted (AVE)</th>
<th>DIS</th>
<th>INN</th>
<th>INQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIS</td>
<td>0.829</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INN</td>
<td>0.735</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INQ</td>
<td>0.658</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
d. Discriminant Validity Test
This test can be done in two ways, namely by checking cross loading, first done by comparing the correlation of indicators with their constructs and other block constructs. If the correlation between indicators and their construct is higher than the correlation with other block constructs, this indicates that the construct predicts the size of their block better than the other blocks. Next, by checking the cross loading of Fornell-Lacker's, it is by comparing it with the root value of AVE, where the root value of AVE must be higher than the correlation between constructs and other constructs. The results can be seen in table 4.5 and the indicators given a yellow block on each variable have a value higher than the correlation with the other block construct.

The result shows that the root value of AVE is higher than the correlation between constructs and other constructs. So based on the results of the examination of two cross loading stages it is known that there is no problem with the discriminant validity test.

4.2 The Results of Structure Model Analysis
Model structure analysis is carried out through six stages of testing, namely path coefficient (β), coefficient of determination (R2), t-test using bootstrapping method, effect size (f2), predictive relevance (Q^2) and relative impact (q^2)[16], [17], [20], [21]. The following is an explanation of the six testing stages:

a. Path Coefficient (β)
This test is done by looking at the threshold value that is above 0.1, where the path can be stated to have an influence on the model if the result of the path coefficient test value is above 0.1. The results of the 23 hypothesis paths in this research model, 8 have insignificant influence, the results of the path coefficient test values all have values above 0.1.

<table>
<thead>
<tr>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIS -&gt; INQ</td>
</tr>
<tr>
<td>DIS -&gt; SVQ</td>
</tr>
<tr>
<td>DIS -&gt; SYQ</td>
</tr>
<tr>
<td>DIS -&gt; USF</td>
</tr>
<tr>
<td>INN -&gt; INQ</td>
</tr>
<tr>
<td>INN -&gt; SVQ</td>
</tr>
<tr>
<td>INN -&gt; SYQ</td>
</tr>
<tr>
<td>INN -&gt; USF</td>
</tr>
<tr>
<td>INQ -&gt; SIS</td>
</tr>
<tr>
<td>INQ -&gt; USF</td>
</tr>
<tr>
<td>INS -&gt; INQ</td>
</tr>
<tr>
<td>INS -&gt; SVQ</td>
</tr>
<tr>
<td>INS -&gt; SYQ</td>
</tr>
<tr>
<td>INS -&gt; USF</td>
</tr>
</tbody>
</table>
**b. The coefficient of Determination (R²)**

This test is carried out to explain variants of each endogenous target variable (variables considered to be influenced by other variables in the model) with a measurement standard of about 0.670 as strong, about 0.333 moderate, and 0.190 or below indicating a weak variant level [16]–[18], [20]. The result shows that R² of Information Quality (INQ) has a value of 0.332, R² of Success Information S (SIS) has a value of 0.708, R² of Service Quality (SVQ) has a value of 0.658, R² of System Quality (SYQ) has a value of 0.575 and R² from User Satisfaction (USF) has a value of 0.536. It can be interpreted that Optimism (OPT), Innovativeness (INN), Discomfort (DIS), Insecurity (INS) explained in a moderate (33.2%) variant of INQ, then explained strongly (70.8%) variants of SIS, then explained moderately (65.8%) variants of SVQ, then explained moderately (57.5%) variants of SYQ. On the other hand, INQ, SVQ, and SYQ explained moderately (53.6%) variants of USF.

**Table 5. The Result of Coefficient of Determination**

<table>
<thead>
<tr>
<th>Endogenous Variable</th>
<th>R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>INQ</td>
<td>0.332</td>
</tr>
<tr>
<td>SIS</td>
<td>0.708</td>
</tr>
<tr>
<td>SVQ</td>
<td>0.658</td>
</tr>
<tr>
<td>SYQ</td>
<td>0.575</td>
</tr>
<tr>
<td>USF</td>
<td>0.536</td>
</tr>
</tbody>
</table>

**c. T-test**

This test is carried out using a bootstrapping method, using a two-tailed test with a significance level of 5% (0.05) to test the research hypotheses. This hypothesis will be accepted if it has a t-test greater than 1.96 [16]–[18], [20]. The other level of significance is 10% will be accepted if it has a t-test of 1.65 [22].
above shows that there are 14 of the 23 hypotheses received and the rest are rejected. Following an explanation this is the results of the t-test:

Table 6. The Result of T-test

<table>
<thead>
<tr>
<th>Dependen → Independent</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIS → INQ</td>
<td>1.929</td>
</tr>
<tr>
<td>DIS → SVQ</td>
<td>1.626</td>
</tr>
<tr>
<td>DIS → SYQ</td>
<td>2.181</td>
</tr>
<tr>
<td>DIS → USF</td>
<td>1.518</td>
</tr>
<tr>
<td>INN → INQ</td>
<td>0.254</td>
</tr>
<tr>
<td>INN → SVQ</td>
<td>1.792</td>
</tr>
<tr>
<td>INN → SYQ</td>
<td>1.811</td>
</tr>
<tr>
<td>INN → USF</td>
<td>1.450</td>
</tr>
<tr>
<td>INQ → SIS</td>
<td>2.123</td>
</tr>
<tr>
<td>INQ → USF</td>
<td>1.254</td>
</tr>
<tr>
<td>INS → INQ</td>
<td>2.547</td>
</tr>
<tr>
<td>INS → SVQ</td>
<td>2.527</td>
</tr>
<tr>
<td>INS → SYQ</td>
<td>2.668</td>
</tr>
<tr>
<td>INS → USF</td>
<td>1.433</td>
</tr>
<tr>
<td>OPT → INQ</td>
<td>7.128</td>
</tr>
<tr>
<td>OPT → SVQ</td>
<td>16.486</td>
</tr>
<tr>
<td>OPT → SYQ</td>
<td>14.434</td>
</tr>
<tr>
<td>OPT → USF</td>
<td>0.993</td>
</tr>
<tr>
<td>SVQ → SIS</td>
<td>3.371</td>
</tr>
<tr>
<td>SVQ → USF</td>
<td>2.412</td>
</tr>
<tr>
<td>SYQ → SIS</td>
<td>1.107</td>
</tr>
<tr>
<td>SYQ → USF</td>
<td>0.397</td>
</tr>
<tr>
<td>USF → SIS</td>
<td>7.666</td>
</tr>
</tbody>
</table>

d. Effect Size ($F$)

At this stage testing was conducted to determine the effect of certain variables on other variables in the structure of the model with a threshold value of about 0.02 for small influences, 0.15 for medium, and 0.35 for large influences. Calculated using the following formula.
Note:
- $R^2_{included}$: The value obtained when the exogenous construct is entered into the model.
- $R^2_{excluded}$: The value obtained when the exogenous construct is removed from the model.

The results of testing are the 23 pathways in this study. 4 lanes have a big influence and 19 other lanes have little effect.

c. Predictive Relevance ($Q^2$)

This test is carried out by the blindfolding method to provide evidence that certain variables used in the model have predictive relevance with other variables in the model with a measurement threshold above zero[16], [17], [20].

<table>
<thead>
<tr>
<th>Table 7. The Result of Q-Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endogen Variable</td>
</tr>
<tr>
<td>INQ</td>
</tr>
<tr>
<td>SIS</td>
</tr>
<tr>
<td>SVQ</td>
</tr>
<tr>
<td>SYQ</td>
</tr>
<tr>
<td>USF</td>
</tr>
</tbody>
</table>

d. Relative Impact ($q^2$)

This test is carried out by the blindfolding method to measure the relative influence of a predictive linkage of a particular variable with other variables with a threshold value of about 0.02 for small influences, 0.15 for medium/medium influence, and 0.35 for large influences [17]. The formula used for calculating $q^2$ is as follows:

\[
q^2 = \frac{Q^2_{include} - Q^2_{exclude}}{1 - Q^2_{include}}
\]

The results are 3 pathways have a large value, 1 has a moderate influence and 19 other pathways have little effect.

5 Conclusion

The result has known the user readiness in the success of Accurate System implementation and what factors influence the success of Accurate System based on user perspective in several Jakarta companies. Indirectly, this research can be used as a measure of the readiness of users to use the system. so that it can be used as a reference for system development. In this study, 3 indicators were eliminated from 44 indicators. the eliminated indicators are INN1, INQ1, and INQ2. From these results, researchers assume that the removal of the indicator occurs due to the lack of precise instrument items. Unacceptable 9 of the 23 hypotheses are OPT $\rightarrow$ USF, INN $\rightarrow$ INQ, INN $\rightarrow$ USF, DIS $\rightarrow$ SVQ, DIS $\rightarrow$ USF, INS $\rightarrow$ USF, INQ $\rightarrow$ USF, SYQ $\rightarrow$ USF and SYQ $\rightarrow$ SIS. Differences findings of this study with previous research are influenced by several factors, including the
differences in the object, samples and research instruments. Received 14 hypotheses ie OPT → INQ, OPT → SYQ, OPT → SVQ, INN → SYQ, INN → SVQ, DIS → INQ, DIS → SYQ, INS → INQ, INS → SYQ, INS → SVQ, INQ → SIS, SVQ → USF, SVQ → SIS, USF → SIS. So, there are several influences that occur between the user readiness with success information systems in several Jakarta companies.

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References


Hybrid Active Learning to Develop the Science Competence of Preservice Elementary Schools Teachers

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Abstract. This paper investigates the effectiveness of a hybrid active learning through analyzing the science concept and teaching ability of elementary education. In the study which is an action research study based on Kemmis & McTaggart model, consist of planning, implementation, observing, reflection. The study was administered to 30 elementary education preservice teacher to gather data on their science concept and teaching ability. Posttest at the end of learning was used as a performance measure. We applied the online test on the Edmodo platform. Therefore, the course consists of face to face and online learning. The simple descriptive method showed that elementary education pre-service teacher’s teaching ability could be developed by hybrid active learning. Meanwhile, science concept of elementary education pre-service teacher needs further training before they do the internship.

Keywords: science competence of preservice elementary school’s teacher, active learning, hybrid learning

1 Introduction

A teacher’s professional competence is very important. Teacher competence will greatly affect emotions [1], behavior [2], and student learning outcomes [2], [3]. Teacher competence will also greatly affect the success of achieving learning goals in the classroom [4].

The results of the preliminary study using pretest of material, energy, and universe subjects showed that not every prospective science teacher was able to design and carry out learning in the form of an optimal learning scenario. The lack of optimal ability to design and carry out learning is due to the lack of understanding of students about the science materials that have been taught in the previous lecture process [5]. This is in line with research [6] which states that although prospective teachers have taken four years of college, their science concept understanding is still lacking. One of the improvement efforts made to overcome the lack of teaching ability and mastery of science concept for a preservice elementary teacher is implementing active hybrid learning in lectures.

Hybrid active learning is a combination of active learning and hybrid learning. Active learning is a learning process which involves students to be active in discussing and solving the problems [7]. Active learning is usually done offline where teacher and students meet face
to face. Meanwhile, hybrid learning is a learning process which combines face to face and online learning [7]–[9]. Thus, a learning process can run through either offline or online.

Several previous studies in various countries only examined hybrid learning or active learning, without combining the two. Hybrid learning is believed to be able to develop teacher teaching competencies [10], fun for teachers and students [11], [12], and students are satisfied with the learning [13]. Hybrid active learning is able to develop students' creative thinking in higher education [14]–[17]. This fact shows the importance that learning that combines technology in learning has a good influence on students and lecturers. Meanwhile, active learning is believed to be a model for prospective teachers in carrying out classroom learning [18]. In addition, active learning can also develop skills that are skillful [19], [20]. In this study, hybrid learning was combined with active learning.

Hybrid active learning highly influences the students’ competence. Hybrid active learning has been proven to be able to develop students’ mastery in concepts [7] and to motivate students to prepare the lesson before and to look for relevant references for the lesson which will be taught [8]. Hybrid active learning can also integrate cognitive, psychomotor, or effective [21]. Most students in the hybrid active learning feel satisfied because of the availability of online course which makes it possible for them to access the needed learning sources for 24 hours. Moreover, the students can also choose when they take the quiz [21], [22]. Hybrid active learning can also improve the communication among students in an online forum because usually, students who feel shy to give comments at class can communicate well through online forum [22]–[24]. Therefore, hybrid active learning is expected to be able to improve the competence of preservice elementary school’s teachers.

This study aims to develop the competence of science primary school teacher candidates in terms of carrying out learning and mastering science teaching materials using hybrid active learning. The result will certainly provide benefits for the development of learning using Hybrid active learning in universities.

### 2 Methods

The research design used was the Classroom Action Research (CAR) model of Kemmis & McTaggart [25], [26]. This model uses the stages of a research cycle which consists of four stages, namely planning, implementing, observing, and reflecting. This design is followed up with an implementation phase to monitor the competence of preservice teachers in microteaching activities.

Research is conducted in the even semester of 2017/2018 school year. The research sample was taken using purposive sampling technique, which is non-random sampling that has a specific purpose [27]–[29]. In this study, the sampling technique aims to select samples that take part in science courses. The research subjects used were 30 preservice teachers, students of the Materials, Energy, and Universe courses at the Maulana Malik Ibrahim Malang Islamic Elementary School Teacher Education Department.

There are two data measured in this study, namely the ability of students to carry out learning and understanding the scientific concepts of students. Collecting research data is done through observation and tests. The ability of students to carry out learning is observed using the learning implementation observation sheet in the form of a Likert scale. The ability of students to carry out learning is assessed by peer assessment techniques between lecturers and students. Students science concept understanding is measured using an online test through
Edmodo. The data obtained were analyzed using coding and data reduction then presented in the descriptive form.

Indicators of success in the study are determined using the percentage of active learning implementation ≥75%. At the end of the implementation phase, the percentage of ability to carry out student learning is ≥80%. At the end of the cycle, the average score of the student test results is ≥75. Determination of research success indicators refers to the initial observation data.

3 Result and Discussion

3.1 The Ability to Conduct a Learning Process

One of the preservice teachers' competencies developed in the course of material, energy, and the universe was the ability to conduct the learning process. The ability to conduct a learning process could be improved by skill training. The result of this study showed that preservice teachers’ ability to conduct a learning process had improved. They conducted a microteaching which then was reflected by the lecturer and their friends. The result of the reflection would be implemented in the second microteaching. After reflection, they were given chance to reflect and revise the learning process which had been conducted. After reflection, their ability to conduct the learning process was improved as visualized in Fig. 1.

Based on Fig. 1, when the first microteaching result 45% of the students had scores above 80, while students who score less than 80 by 55%. After being given treatment, the second microteaching showed that 82% of students had scores above 80 or a 37% increase between the first and second microteaching, while students who scored less than 80 were 18%. It can be concluded that the use of active learning hybrids can improve the ability to carry out the learning of students in the matter, energy, and the universe course.

The ability to conduct the learning process trained to the preservice teachers including the ability to open the lesson, to use the learning model, to master the learning material, to deliver the learning material, to manage the classroom, and to close the lesson. Preservice teachers’ ability to conduct the class was presented in Table I.

![Figure 1. The Percentage of Preservice Elementary School Teachers’ Ability to Conduct the Learning Process](image-url)
Table 1. The Ability To Conduct A Learning Process Achieved

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Microteaching 1 (%)</th>
<th>Microteaching 2 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening the Lesson</td>
<td>55.20</td>
<td>69.85</td>
</tr>
<tr>
<td>Using the Learning Model</td>
<td>77.50</td>
<td>82.40</td>
</tr>
<tr>
<td>Using the Learning Media</td>
<td>85</td>
<td>98</td>
</tr>
<tr>
<td>Mastering the Learning Materials</td>
<td>53</td>
<td>72.83</td>
</tr>
<tr>
<td>Delivering the Learning Materials</td>
<td>76.65</td>
<td>88.54</td>
</tr>
<tr>
<td>Classroom Management</td>
<td>75.30</td>
<td>82.53</td>
</tr>
<tr>
<td>Closing the Lesson</td>
<td>65.45</td>
<td>73.65</td>
</tr>
</tbody>
</table>

Table 1 shows the percentage of students who have scores above 75 in carrying out learning. In the first microteaching, students who open the lesson well or have a score above 75 as much as 55.20%, while in the second microteaching the ability of students to open learning that has values above 75 reaches 69.85% or an increase of 14.60% between first and second microteaching. This research shows that the use of active learning hybrids can develop the ability to open teacher learning, in line with research [30], [31]. The percentage of ability to open learning is still quite low, both in the first and second microteaching. Most students experience difficulties in finding events related to teaching material. This is naturally experienced by new inexperienced teachers, due to the immature mastery material [32], [33]. Thus, the ability of students to open lessons still needs to be improved.

The percentage of preservice elementary school teachers' ability in using the learning model in the first microteaching reached 77.50%, while in microteaching the second percentage reached 82.40% or an increase of 4.9%. preservice elementary school teachers are very creative in choosing learning models. This is a positive impact of active learning hybrids applied by lecturers. The percentage of preservice elementary school teachers' ability in using the learning media in the first microteaching is quite high, which is 85%, while in microteaching the second percentage reaches 95% or an increase of 10%. This shows that almost all preservice elementary school teachers have used the media in learning. preservice elementary school teachers have a variety of creativity in the use of learning media. preservice elementary school teachers not only use powerpoint in the learning process but also use simple tools that can attract students' interest in learning. It can attract students to be more enthusiastic in learning [34], [35].

The percentage of preservice teachers manage class ability when the first microteaching is 75.30%. While the percentage of students' ability in managing classes when the second microteaching is good, reach 82.53% or an increase of 7.23%. Most preservice teachers conditioned classrooms into circles so that students' attention is centered on the teacher who is practicing teaching. Students who practice teaching also encourage students to actively argue and ask questions. Students also organize interactions between students in the class. Nevertheless, there is still some preservice teacher who still have difficulties in classroom management. This shows that students also still need guidance in classroom management because the conditions when teaching practice will be different from the classroom conditions at the real school.

After the implementation, the preservice teacher has the ability to analyze their learning even though their reflection analysis has not been maximized. The ability of students to close learning when the first microteaching only reached 65.45%, while when the second microteaching reached 73.65%. Although there was an increase between the first and second microteaching of 8.2%, the percentage was still quite low. Many preservice teachers
immediately close learning with greetings without reflecting. In addition, there are also many students who provide feedback that is not in accordance with the learning objectives to be achieved discussing the issues expressed at the beginning of learning. This is because the time for learning has been completed so that students do not have time to turn and give assignments to students.

Hybrid active learning strongly supports students in developing their teaching abilities. In Hybrid active learning, more often students carry out microteaching, better the quality of learning [36]–[38]. This is because the ability to carry out learning is an ability that can be improved through skill training [39]–[42]. Skills that are skillful can be enhanced by active learning which provides opportunities for students to think and act [19], [20]. When the lecturer applies active learning in lectures, it can be a model for prospective teachers [18], so that the ability to carry out learning also increases.

The ability of preservice elementary school teachers to carry out learning increases significantly, especially in terms of opening lessons, mastery of teaching materials, and delivery of teaching materials. This is because active hybrid learning can motivate students to prepare previous material [7]. Students can also search for some references that are appropriate for the learning to be taught [8].

3.2 The Mastery of Science Learning Materials

One of the competencies which must be owned by teachers is a professional competence. Professional competence is an ability to master the learning materials broadly and in-depth [43], [44], including (a) concept, structure, and method of scientific/technology/art which cover/ coherent with the learning materials; (b) the available learning materials in schools curriculum; (c) the relationship between the related subjects; (d) the implementation of scientific concepts in daily life; and (e) the professional competition in global context by preserving national values and cultures.

Professional competence for the preservice teacher was prepared through science material course. The mastery of science concepts of preservice teachers was shown through their ability in delivering science learning materials at schools. Their ability in mastering the materials was also seen from their scores of seven online formative tests in various fields of science materials using Edmodo. Seven formative quizzes include various scientific material, including motion, style, work, energy, sound and light, electricity, and magnetism. The test results of the mastery of the science material for prospective primary school teachers are explained in Fig. 2 below.

Fig. 2 explains that the ability of prospective teacher candidates to master the concept of science has fluctuated. The most dominant mastery of science concept is about style, effort, energy. As many as 72% of students have scores above 75 in force concept, 90% of students have scores above 75 in work concept, 68% of students have a value above 75 in energy concept.

The ability to master the learning materials was related to the preservice teachers’ ability in delivering learning materials. The principals which needed to be considered in explaining the materials were the content of the materials delivered and the students who had to be ready [45]. Therefore, to deliver the learning well, preservice teachers need to get training regarding the use of good spoken language and written language to deliver the learning materials. That training has been obtained through hybrid active learning. During the hybrid active learning process, preservice teachers were demanded to give their comments or arguments in front of the class and in online discussion. Their habit of giving arguments led to the high score of
ability to deliver the learning materials during the teaching practice, in line with [23], [24], [46].

Preservice teachers found it easier to remember and to understand the learning materials using hybrid active learning. The learning materials were focused on the materials used to be the basics during the teaching practice in elementary school. They were not only asked to learn the materials but also to develop and to form their own learning characteristics. This condition was in accordance with the learning objectives of active learning, Student-Centered Learning.

The results of the research described above reinforce some of the results of previous studies in various countries [14]–[17]. Learning by integrating technology can improve students' cognitive skills that will lead to applications in higher education. The ease of receiving material information that has been delivered helps illustrate the content of the abstract material to be clear and easily captured by students.

Edmodo can also give direct feedback to the preservice teachers. When they do their formative quiz, the score obtained will directly be presented by the time they finished doing that quiz. This will support them to do self-reflection to which materials needed to learn further [14], [24]. They can also choose when they will learn and access Edmodo. Thus, this can develop their self-regulation ability [14].

![Figure 2. The Percentage of Preservice Elementary Schools Teachers’ Ability in Mastering Science Materials](image)

4 Conclusion

The effort to improve the competence of preservice elementary schools teacher through a hybrid active learning process which consisted of the ability to conduct the learning process and to master the learning material had been made in the course of material, energy, and the universe. The implementation of hybrid active learning was able to improve pre-service teachers' ability in conducting the learning process including opening the lesson, using the learning model, using the learning media, mastering the learning materials, delivering the learning materials, managing classroom, and closing the lesson. That improvement had not been in line with the improvement of pre-service teachers' in mastering Science materials. Those preservice teachers still need debriefing and training before they do the internship.
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References


Development of Recognition Qur’an Letter Foundation for Beginners on Indonesian Islamic Foundation Waqf (IIWF)

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Abstract. The lifestyle changes follower by the changing times. The use of technology, such as smart phones and computers that spread blamed the cause of the ballooning illiterate Qur’an to 54%. Indonesian Foundation for Islamic Waqf Foundation (IIWF) sees the tools of this technology can even be used as part of a literacy Qur’an. This study aims to provide the application of learning to read the Qur’an for the foundation IIWF. Development of the system used in the study is the development of methods Multimedia versions of Luther-Sutopo with the following approach: Concept, Design, Material Collecting, Assembly, Testing, and Distribution. Media development learn to read the Qur’an was created with the PHP programming language for websites and Flash Action Script applications for learning to read the Qur’an. The results of this application are the website of the foundation IIWF that allows for downloading e-books and interactive applications to read the Qur’an. Based on Black Box testing and User Acceptance User to user, IIWF foundation, showed that applications that have been created have been functioning properly, satisfy the desires of the foundation IIWF and can help the foundation in the fight against illiteracy IIWF Qur'an to Muslims in Indonesia.

Keywords: Applications, the Qur'an, Hijaiya, Flash, PHP, MySQL.

1 Introduction

The literacy rate of the Holy Qur’an in Indonesia is high. Based on data from the National Economic Social Survey of the Central Bureau of Statistics (BPS SUSENAS) in 2013 that there was about 54 percent of the total population of Muslims in Indonesia who could not read the Qur'an (CBS, 2013). The illiteracy rate is more than half of this is very worrying for Muslims in Indonesia, because the ability to read the Qur’an properly is key for Muslims to be able to understand and examine the contents of the Qur’an as a source of goodness for life the world and the hereafter.

Education in reading the Qur’an in Indonesia is quite diverse, including Taman Pendidikan Al-Qur’an (TPQ), Islamic Kindergarten (TK Islam), Raudatul Athfal (RA) and so on. However, the education of the Qur'an that already exist, in particular the previously mentioned cannot cover the entirety of Muslims in Indonesia, both the number and age. This
problem is also present in public education, which may be the solution can be used also in the teaching of reading the Qur'an in Indonesia, namely distance education.

Distance education in Indonesia is not a new thing in Indonesia. One example is the website of the Center for Information and Communication Technology Education and Culture (Pustekkom) belonging to the Ministry of Education and Culture. Website Pustekkom is a means for self-learning, with amenities such as TV-Education, School of Electronic Books that can be downloaded in the form of an e-book, Video Learning and so on. The main component of distance education facilities owned by Pustekkom is an application that is embedded on a website. However, to be able to use this educational facility, the user is required to have internet. Internet is one of example of a part of the Information and Communication Technology is growing very rapidly in Indonesia.

According to the census conducted by the Association of Indonesian Internet Service Provider (APJII), there is about 60 million internet users in Indonesia in 2012. In addition, APJII also calculates internet users in Indonesia will reach 139 million by the end of 2015. Based on these data, the authors assess that distance education using an application that is embedded on the website are suitable, considering the number of Internet users in Indonesia and its development every year. Indonesian Islamic Waqf Foundation (IIWF) was established in 2010, has many ideas to promote education and Islamic Da'wah. Among blue print activity is to provide compensation to the students or students who are specializing to memorize the Koran. The compensation during this new award is in the form of improved nutrition for children in Kampung Kramat, Setu village in East Jakarta. When the author refers to survey results released by BPS, IIWF keen to develop its web by providing educational services Qur’an is on-line, as well as the website owned by Pustekkom. The especially is for beginners, regardless of age.

To develop this application, we used interactive multimedia elements, by using Adobe Flash media application that is embedded in the foundation website IIWF. The author chose the Adobe Flash media because other than flash can be embedded on websites, flash applications can present the desired multimedia elements on recognition application letter writer Quran for beginners, such as animation, sound, pictures, and so on. For this reason, the authors developed an application letter recognition Quran with multimedia development methods Luther-Sutopo version is poured on a thesis entitled: "Making Applications Introduction Letter Quran for Beginners at the Indonesian Foundation for Islamic Waqf Foundation (IIWF)".

2 Review of Literature and Basic Theory

2.1 Multimedia Development Method

According to [9 and 12] to develop a program based applications multimedia needed six stage multimedia development, namely the concept (concept), design (design), material collecting (collecting materials), assembly (manufacture), testing (testing) and distribution (distribution). Multimedia application development cycle can be seen in the following figure1.
1. Concept

The concept phase is to determine the purpose, audience identification, applications, application purpose, common specifications, the basic rules for the design such as the size of the application, the target and others. Noteworthy at this stage is to determine the purpose of the use of multimedia as well as the audience. The purpose the audience influence on the nuances of multimedia, as reflecting the identity of organizations that want information to the audience. Multimedia is said to be communicative if it can understand the characteristics of the user.

2. Design

At this stage to make detailed specification of the project architecture, style and material needs for the project. Specifications made detailed enough so that at a later stage is not required new decision. There are three kinds of design, including:

a) Multimedia-Based Design.
   This design method is developed from design method of making a movie using story board. In the development of multimedia require interactive aspects, so that is equipped with a flowchart view. [9]

b) Structural Design Navigation.
   Navigation structure gives an overview link from one page to another page. Multimedia navigation structure used in nonlinear and adaptation of web design [12]

c) Object-Oriented Design.
   Object-oriented design methods are design methods in which multimedia components expressed as objects. Object oriented design used on many systems that consists of objects, such as geographic information systems and others.
3. Material Collecting
   The collection of material can be done in parallel with the assembly stage. At this stage of collecting material such as images, animation, audio, photo and others needed at a later stage.

4. Assembly (Making)
   Manufacture is the stage where all the multimedia objects are created. Making an application based on the story board and flowchart derived from the design stage.

5. Testing (Testing)
   Tests performed after the completion of the manufacture and all data has been entered. First performed in a modular testing to ascertain whether the results as desired. And do also test whether the application can run well in the user's environment.

6. Distribution (Distribution)
   Distribution stage is the stage where multiplication applications. Doubling can use a flash disk, a CD ROM and will be also distributed on the web which will then be displayed on the internet. This phase will be also an evaluation of a multimedia product. The evaluation was done in order to develop a better system. Maintaining the Integrity of the Specifications.

2.2 Teaching Reading the Qur'an in Indonesia

Al-Qur'an is a way of life for Muslims as individuals, families, and communities. The Qur'an was revealed to the Prophet Muhammad in Arabic. For Indonesian Muslims to understand the Qur'an double effort required to learn Arabic, at least to be able to read and understand it in translation. Teaching Quran walisongo on students, next to the scholars.

In learning the Qur'an until today (modern times) is still known several methods of reading the Qur'an, among others:

a) Sound Method
b) Method of Imitating
c) Rote Method
d) Method of Assignment
e) Libat Method (See, Read, Write)
f) Al-Jabary Method
g) Method Lu'ba (See, Change, Read, and Memorize)
h) Al-Bidayah Method
i) Method 3 hours + Iqro' practice card
j) Mixed Methods

The method is already growing mix of them: Al-Barqy method, Iqro', and Qiroaty. From each of these methods certainly has strengths and weaknesses in learning to read the Qur'an that has developed in the community we are today. However, the method has been widely used method Iqro' and there by creating a more Qiroaty education institutions Qur'an which we now know. As the TKA-TPA, TKAL-TPAL, TQA..

3 Research Methodology

3.1 Data Collecting Method

Methods of data collection is done by writer is literature study and field studies by conducting interviews to the foundation IIWF.
3.2. Systems Development Method

System development methods that I use in this study are the Multimedia Development Method version of Luther-Sutopo.

Concept
At this stage, the authors determine the purpose and the target users of the application to be made. In addition, the authors also specify the type of application to be made and the purpose of the application.

Design
After determining what is required in making this application, the authors proceed to the design stage. At this stage the author interacts with the client, in this research is the foundation IIWF, to develop a prototype of this system, including what is processed by this system and its input and output. Users performed interactively design allows clients to understand, modify and approve a system that has been in accordance with the wishes.

Material Collecting
At this stage, the authors collected the materials required in making application letter recognition this Qur’an. These materials include the key of the letter hijaiyah, voice pronunciation of each letter, and so on.

Assembly
Assembly stage is the stage of making all objects or multimedia materials. Making the applications based on the design stage, such as story boards, flow charts, and / or navigation structure.

Testing
Phase testing is performed after the assembly phase is completed, which is done by running the application / program if there is a mistake or not. Phase testing conducted by the authors, there are two phases, namely testing Black-Box and User Acceptance Test with IIWF foundation.

Distribution
At this stage, the application that has been completed is stored in a storage medium. Compression applications will be carried out if the media storage that is too small for the application, the abbreviations and the acronyms.

3.3 Framework of Thinking
To design a website of applications introduction letter of the Qur'an to be embedded in a web IIWF, the author has conducted an interview with the founder of the Indonesian two Islamic Waqf Foundation (IIWF). The interview list attached. From these interviews the author may define the concept of the application to be made. The concept of the application is as follows.

**Table 1.** Concept Application

<table>
<thead>
<tr>
<th>Title: Knowing Research Result Qur'an's Letters</th>
<th>Audience: Internet user</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image:</td>
<td>• Navigation buttons are the author created with tools in Adobe Flash Pro CC.</td>
</tr>
<tr>
<td></td>
<td>• Letter Hijaiyah the Writers Create using Adobe Illustrator CC.</td>
</tr>
</tbody>
</table>
3.5 Design

Once the process is complete concept, the authors proceed to the next step, namely the design process. At this stage, the authors determine the design of the application to be made, based on data from interviews and concepts that have been determined.

**Table 2. Design Process**

<table>
<thead>
<tr>
<th>Photographs of the foundation IIWF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio: A recording saying the letter hijaiyah</td>
</tr>
<tr>
<td>Duration: 8 minutes</td>
</tr>
<tr>
<td>Animation: Animation <em>motion tween</em> to the turn of the scene, the menu key and the letter hijaiyah.</td>
</tr>
<tr>
<td>Interactivity Next: Users can use the navigation keys to go to the material before and after, and can return to the main menu.</td>
</tr>
</tbody>
</table>

3.6. Material Collecting

Before getting into the making of the application, the authors first collecting material that will be used by the application. In this case, the letter keys hijaiyah, navigation buttons and sound of each letter hijaiyah.

3.7 Assembly

Once the material for the manufacture of finished applications are collected, the authors continue at the stage of assembly, namely the preparation of the application in accordance with pre-determined at the stage concept and design, using materials that have been collected at the stage of collecting material.

**Table 3. Design Application**
3.8 Testing

This phase is the testing phase of the program by the author. At this stage, We uses external testing (BlackBox) and User Acceptance Test. This test did check one by one by using the link table testing whether the link has been in line with expectations or not.

3.9 Distribution

At this stage, We upload the files that are ready to hosting that has been prepared by the foundation IIWF.

4 Conclusion

4.1 Conclusion

The author has made an application letter recognition Quran for beginners on the foundations Indonesian Islamic Waqf Foundation using Flash applications to be embedded on a website owned by a foundation. Based on the results of testing Black Box and User Acceptance Test has been conducted by the author with the foundation IIWF, the applications worked well, fulfilling desired by the foundation IIWF and foundations states that the application can help the foundation in the fight against level Al-Qur’an illiteracy in Indonesia.

4.2 Suggestion

The author realized in conducting research still has short comings. Therefore, we suggest developing the study, among other things:

a. The addition of the subject matter. Now, the application is limited only in the introduction letter of the Qur'an alone along with dignity, hence the importance of learning material after hijaiyah letter recognition, so that users getting benefit from these applications with more leverage.

b. The addition of support for browser-based mobile / Smartphone, so that applications can be used in Smartphone’s, is not limited to computers only.

References
Arabic Vocabulary Acquisition through Short Animation Movie

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Abstract. Vocabulary is one of the core components of a language. Its mastery is very significant to enable one’s interaction and communication within the community so that the messages conveyed can be channeled properly and the communication can be effective. Therefore, the vocabulary has always been an interesting study to learn, without exception in Arabic. This paper explores how vocabulary can be obtained through cartoons. Cartoon is a form of entertainment product attractive for various circles, including children, teenagers or adults for its fun content. Beginners of Arabic learn can acquire Arabic vocabulary naturally through cartoon. Current researches deal with the effectiveness of cartoon movies in foreign language classroom. However, how cartoon movies in short duration can affect one’s vocabulary acquisition still needs more exploration. The method used in this study is qualitative descriptive with data collection technique of observation and interview. The results show that cartoons can be an effective bridge between novelty of the vocabulary and learner’s acquisition for beginners who never had a history of previous Arabic learning. As the implication, the use of cartoon as audiovisual language stimuli is recommended for Arabic language acquisition particularly of those from elementary level.

Keywords: Arabic for beginners; short animation movie; vocabulary acquisition

1 Introduction

Language acquisition is an important part of psycholinguistic discourse in the form of speech, vocabulary, and in the form of sentences in a good and perfect way. As with other languages, Arabic also has several hierarchical language skills and components. Starting from listening skills (maharah istima’), speaking (maharah kalam), reading (maharah qira’ah) and writing (maharah kitabah). The importance of mastering the four skills then does not shift the urgency of mastering the language component which consists of utterance (aswat), language structure (qawaid) and vocabulary (mufrodat).

This study focuses on acquiring language vocabulary. Vocabulary is as a list of words that have meaning in a language [1]. Thus vocabulary is the main foundation for speakers to be able to communicate orally or in writing. This is in line with the statement that speakers of good language are those who have sufficient vocabulary wealth, so as to be able to communicate with native speakers of the language well [2]. With the vocabulary treasury that is owned, one can express the message to be conveyed.
Vocabulary is the parent of a language. The theory of vocabulary acquisition requires a complex understanding of how language is acquired. Language acquisition is the process by which a person acquires the ability to understand and use vocabulary in everyday interactions and communication.

Language acquisition is proposed by Krashen as a product of a process that occurs naturally as a child processes to obtain his first language [3]. In line with this understanding, language acquisition turns out to be a process that takes place in a child's brain when the first language is acquired [4].

Vocabulary is a set of several words that will form language [5]. The wealth of words owned by a person or several words used by a particular field is also called vocabulary. Besides that vocabulary also refers to a list of words in a dictionary accompanied by a brief and practical explanation [6]. In general, rich vocabulary is considered as an illustration of one's intelligence. This was confirmed that the quantity of vocabulary a person has reflects the quality of his language [7]. The use of vocabulary arranged in sentences is able to represent various events and experiences in one's life. Therefore, vocabulary has always been an interesting study to learn, not least in Arabic.

Understanding of first language acquisition and second language has little difference. Generally, the first language is acquired unconsciously during childhood supported by the interaction with parents and the environment. While the second language is obtained through learning, both from formal learning held in the classroom and informal learning that can be carried out wherever with the presence of educators and learners, as well as the material taught. This statement is supported by the opinion which states that language acquisition is related to the first language, while language learning is related to the second language [4].

However, in the process, the way of obtaining a second language - in this case, Arabic - can be broken down into two, namely the acquisition of a second language consciously and second language acquisition naturally or naturally. This opinion refers to Krashen and Terrell. The concept is similar to the two models described by Ellis, namely: (1) The acquisition of a second language naturalistic type (natural) without a teacher, and without intention. (2) The acquisition of the second language of the formal type (guided) is carefully prepared, in the form of material, tools, classes and professional teachers [4]. Based on the two types mentioned, the acquisition of Arabic vocabulary through cartoon films is included in the category of natural language acquisition, not designed and also not planned.

In this global era, there are various ways to obtain language vocabulary, one of them is through cartoon media. Cartoon film is a manifestation of the results of technological developments that are in demand by various groups, either children, adolescents or adults. The use of cartoon films has the opportunity to create a pleasant atmosphere for Arabic language acquisition. For beginners, it is certainly very influential because in most application of Arabic language learning, they are forced to memorize new vocabulary. If this method continues to be applied, it is feared that there will be gaps and boredom. However, cartoon films will foster the spirit of beginner learners in obtaining Arabic vocabulary.

Cartoons are one of the learning media that tend not to be monotonous and not boring because of language stimuli that are presented in the form of audio visuals and in film formats that have a storyline. Not only this, by utilizing cartoon films, one not only obtains vocabulary but can also listen to speech directly from native speakers, so they can pronounce the pronunciation correctly. Students can explore conversations between characters in cartoon films and can observe all forms of linguistic stimuli such as intonation, dialect, and gestures, making it easier for them to remember the vocabulary obtained. This information is certainly
the best target for the linguistic world so that in the future it can develop theories of language acquisition, especially Arabic.

Until now, it is still relatively few who explored studies about acquiring Arabic vocabulary, especially for beginners using cartoon media. A description of the Arabic vocabulary acquisition model from cartoon film media for beginners is needed, in the form of verbs, nouns, even simple sentences such as greetings and thanksgiving. This is the basis for the selection of the theme of this study, namely the acquisition of Arabic vocabulary through cartoon films. The implication of this study is to be an answer for beginners who want to obtain Arabic vocabulary contextually, so as to create a pleasant atmosphere and the acquisition of language vocabulary can take place effectively.

2 Literature Review

2.1 Animation Movie

Judging from its history, movie or the film that appeared the first time was a film created by Lumiere Brothers in 1850. It was not until 1899 that a film appeared that had the style of an editing by George Melies entitled “Trip to the Moon” [8]. The film comes without sound effects or is called silent film. A sound film began in America [9]. Film is a communication medium that can convey reality in everyday life and can tell a society in a particular area and at a certain time. The film as a collection of several images strung together in such a way is called 'moving picture'. Furthermore, films are categorized into several groups, namely films with story genres, documentary films, glass screen films and cartoon films [10].

Animation movie or cartoon films are also called animations which present a collection of several images that can move quickly so that the image is like having a soul and looks alive [11]. Cartoon films are included in the category of audio visual media, which can give two positive things. First, viewers who are aged students do not depend on the time of transmission, but they can watch videos freely if they feel possible; for example, they can choose to watch videos based on their preference. Second, with video media, one can control the program being watched by stopping and advancing or rewind the show according to what is desired [12]. Cartoon films can also be defined as the media used by someone to present more tangible objects. One of the benefits of cartoon films is that it can pack information and experiences in an interesting form [13].

2.2 Acquisition of Foreign Language Vocabulary

In a study modeled on a case study observing how students in South Konawe, the children get Arabic vocabulary at school from 2-7 years old. The instructors at the school still showed a lot of errors in pronunciation, so that the vocabulary received by the students was not optimal and it could be a fatal mistake for students to obtain Arabic vocabulary. Because of inadequate language acquisition with the right examples, students when reading are still heard mixing their mother tongue with the Arabic they learned through the teacher [14].

Other studies raised the acquisition of English through cartoon films. This study observes a child named Fiola who is five years old by using the cartoon film "Dora The Explorer" as an English vocabulary learning media for preschoolers. From the results of observations for six months, the vocabulary obtained is in the form of a single word, such as: play, go, jump, and others. After a few months, the vocabulary developed into a phrase like jump up please! The results of this study indicate that learning incidental English vocabulary through this cartoon is
effective for preschool children [15]. In addition, cartoon film media will minimize the emergence of errors in vocabulary pronunciation because in the film full of phonological exposures delivered in context [16].

In animated movies, in addition to audiovisual language stimuli, students are helped to connect the form of language and the sound of language with subtitles [17]. That's why it also supports student’s pronunciation to adjust with phonetic production according to the target language [18]. Through audiovisual stimuli in film, students can increase the number of English vocabulary acquisition significantly as applied to student groups in Turkey [19].

However, studies that collaborate between acquiring Arabic and using cartoons are still not widely explored. So far the cartoon film has been studied in the context of English learning in class. The use of cartoon filings in acquiring Arabic outside the context of teaching still requires an empirical foundation. For this reason, this study is done to identify whether cartoons in Arabic also have the same impact as other foreign languages.

3 Methods

This study uses a qualitative method. In this method the data is produced in the form of descriptive, in the form of writing, speech or behavior from the person who is used as the object of observation [20]. In this study the goal is to understand the objects and social context naturally so that the information and data obtained are valid and accurate regarding the acquisition of Arabic vocabulary through cartoon films. Furthermore, qualitative research has natural and human background characteristics as instruments. The data analysis process is carried out inductively. For this reason, special criteria are needed to obtain data validity [20].

As for in this study the criteria of the subjects observed were non-Arabic speakers who had never studied Arabic before. This is to see the extent to which cartoon films can influence the acquisition of vocabulary in research subjects.

Participants in this study involved Indonesian speakers who had never studied Arabic, aged 17-22 years, students or students. Female subjects were represented by ANS and AY, while male subjects were represented by AN and RZ.

Research with qualitative methods examines the condition of objects naturally [21]. For this reason, in the data collection process cartoon films are used which can be seen by research subjects without interference from researchers. The cartoon film shown is only four minutes long, with clear pronunciation and vocabulary commonly used in everyday life. This is done so that participants can easily remember the vocabulary obtained which can then be applied in their learning activities. In addition, participants are also free to play cartoons, whether to advance, rewind, repeat, or stop certain parts. This treatment is applied so that participants get a good impression and a pleasant atmosphere in acquiring Arabic vocabulary for the first time so that they can foster their enthusiasm to learn more intense Arabic.

Here, the researchers are also as key instrument. To get the desired data, observation and interview techniques are used. Observation is chosen so that researchers can observe the object of research directly to obtain factual and accurate information. Observation is a way of obtaining the information needed based on what is seen and what is heard [22]. In this study, observations were used to observe participants in the form of circumstances, behavior, facial expressions when they watched cartoons. While the interview is a data collection technique in the form of question and answer between researchers and informants to obtain information orally. Applicatively, interviews were conducted to find out what vocabulary was obtained
from the cartoon films that had been aired and asked participants' feelings while watching cartoons.

The research steps applied by researchers include: (1) finding and choosing interesting Arabic language cartoons with clear pronunciation, and the right tempo for beginners and vocabulary that is close to daily life; (2) giving participants the freedom to watch cartoons with the frequency they want, whether they are repeatedly playing, advancing, rewinding or stopping them in certain parts; (3) observing participants during cartoon watching activities; (4) after completion, the researcher asks what vocabulary can be understood by participants from the cartoon that has been watched; (5) analyzing data by classifying words obtained by word type and answering research questions; and (6) making conclusions.

4 Result & Discussion

From the observations, the vocabulary mastered by the participants is based on the type of words or phrases they get after watching cartoons, namely verbs, adjective, nouns and simple phrases.

**Table 1. Mapping Verb Acquisition**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Verbs</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANS</td>
<td>ﻗَﺎﻝَ (said) ﻛُﻞﻤَﺔٍ ﻓﻌﻞ ﺝُﻤُﻞَ (arrived) ﻻَ ﺃَﺳْﺘَﻄِﻴْﻊُ (cannot) ﺑُﺪْ (I want) ﻣُﺳَﺎﻋِﺪَ (help me)</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>AY</td>
<td>ﻗَﺎﻝَ (said) ﻳَﺤْﻤِﺪُ (praise) ﻣُﺳَﺎﻋِﺪَ (help me)</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>AN</td>
<td>ﻗَﺎﻝَ (said) ﻳَﺤْﻤِﺪُ (praise) ﻣُﺳَﺎﻋِﺪَ (help me)</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>RZ</td>
<td>ﻗَﺎﻝَ (said) ﻳَﺤْﻤِﺪُ (praise)</td>
<td>5</td>
</tr>
</tbody>
</table>

A verb is an easier acquisition especially with the support of a moving picture that explains the purpose of the verb in question. In Table 1, the number of verbs is obtained from at least two words including ﻗَﺎﻝَ (say) and words consisting of two to three syllables. Verbs obtained include words that are often spoken by characters in a cartoon film seen by participants. Verbs are predicates in sentences that often appear at the beginning of speech so that participants are easily captured. Verbs that are often heard also make it easier to acquire, for example ﺛُﺤَﻤْﺪَ (I praise).

**Table 2. Mapping Adjective Acquisition**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Adjectives</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANS</td>
<td>ﻓَﺮَﻳْﻢٍ (closed) ﻣُﺮَﺑَّ (sick) ﻣُﺳَﺎﻋِﺪَ (small)</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AY</td>
<td>ﻣُﻨِﺰِدْ (patient) ﻣُﺳَﺎﻋِﺪَ (help me)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>AN</td>
<td>ﻣُﻨِﺰِدْ (patient) ﻣُﺳَﺎﻋِﺪَ (help me)</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>RZ</td>
<td>ﺛُﺤَﻤْﺪَ (I praise)</td>
<td>2</td>
</tr>
</tbody>
</table>
The acquisition of adjectives is less than the verb because participants try to understand the explanatory word of the subject through a visual context presented in a cartoon. Even one participant did not show an acquisition. Among the adjectives obtained include loan words such as patience (sabr), sholihah and first (awwal).

Table 3. Mapping Noun Acquisition

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Nouns</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ANS</td>
<td>ﺻْمٌ (name) ﻣَوْسَم (five) ﺱَرْبٌ (father) ﻣَوْلاٌ (mother)</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>AY</td>
<td>ﻣَوْلاٌ (five) ﺱَرْبٌ (mother)</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>AN</td>
<td>ﺻْمٌ (five) ﺳَرْبٌ (father) ﺑَداً (never mind)</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>RZ</td>
<td>ﺻْمٌ (five) ﺱَرْبٌ (father) ﺑَداً (never mind)</td>
<td>7</td>
</tr>
</tbody>
</table>

The acquisition of nouns is more than verbs and adjectives because the understanding of participants is helped by the visual context presented in cartoons. Among the adjectives obtained include common words such as apostles, abi, umi, syukron, and afwan. Numerical words that are very familiar to participants, namely ﺻْمٌ (five). In addition to the above nouns, one of the participants (ANS) also called the conjunction ﻋِنْدُ (but).

Table 4. Mapping Acquisition on Simple Phrases

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Phrases</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ANS</td>
<td>ﺳَﻼِمُ (May safety be with you) ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (And hopefully safety be with you too) ﺻِدَاءِ ﻟِكُمْ (What is your name) ﺳَﻼِمُ ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (See you later)</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>AY</td>
<td>ﺳَﻼِمُ (May safety be with you) ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (And hopefully safety be with you too) ﺳَﻼِمُ ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (Praise be to Allah)</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>AN</td>
<td>ﺳَﻼِمُ (May safety be with you) ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (And hopefully safety be with you too) ﺳَﻼِمُ ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (Praise be to Allah)</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>RZ</td>
<td>ﺳَﻼِمُ (May safety be with you) ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (And hopefully safety be with you too) ﺳَﻼِمُ ﻭَﻋِيﹶﻛُمُ ﺳَﻼِمُ (Praise be to Allah)</td>
<td>7</td>
</tr>
</tbody>
</table>

The acquisition of simple phrases is supported by the understanding of participants in the visual context presented in cartoons and includes phrases commonly heard. All participants are very familiar with greetings. In addition to obtaining vocabulary in the form of simple phrases, in this case participants also obtained phonological acquisition stimuli in the form of
the right intonation when saying the greetings and answering greetings, the question sentences (what is your name) and the exclamation sentence (See you later).

The first participant, ANS represented a subject with a high school education background. This student is able to obtain eighteen vocabulary with five verbs classifications, three adjectives, five nouns, one conjunction and four simple phrases in the form of greetings and farewells. He is one of the people who get the most Arabic vocabulary because now he is in an environment based on Islam, of course this also affects the acquisition of language. As she said: "Even though I have never studied Arabic, at least I have heard, whether it's from a friend or lecturer. Anyway, a word that I understand a little familiar in my ears".

The second participant, AY represented a student with a high school education background. He was able to obtain eleven vocabulary with classifications of two verbs, three adjectives, five nouns, and three simple phrases in the form of greetings and thanksgiving. AY explained that the words he captured from cartoon films were in accordance with what he often heard so as to facilitate his understanding.

The third participant, AN represented students with a high school education background. He is also able to obtain eleven vocabulary with classifications of two verbs, seven nouns and two simple sentences in the form of greetings. As with other participants, AN explained that his Arabic vocabulary was limited to words he often heard.

The last participant, RZ represented a student with a vocational education background. He was able to obtain thirteen vocabulary with the classification of two verbs, two adjectives, seven nouns and two simple sentences in the form of greetings.

Based on the vocabulary mapping above, it can be concluded that the vocabulary obtained by many participants tends to real objects or objects accompanied by clear movements and instructions. Coordination between audio and visual stimuli presented in cartoon films facilitates the acquisition process because the Language Acquisition Device works actively to internalize each vocabulary that synergizes with the audience's understanding of the film [23]. Animated stimuli are more interesting and easier to remember learners than verbal or written stimuli. This is as tested in a group of foreign language learners in Turkey [24]. Animated films, whether they provide subtitles or not, through story lines and characters can support simple vocabulary acquisition not only for children but also for teenagers and adults [25]. Ease of remembering the vocabulary of this cartoon film is supported by the affective domain so that language acquisition occurs naturally [26].

In addition, environmental factors also influence the acquisition of Arabic vocabulary for beginners. From this it is clear that the linguistic environment provides exposure to natural foreign language acquisition [27].

From the treatment applied, the results of the study indicate that nouns are more obtained than verbs. In fact they are also able to understand simple sentences such as greetings and thanksgiving, this is inseparable from their Muslim background in which greetings and thanksgiving are often used in everyday life.

The results of this study explain that Arabic-language cartoons can be a reference in acquiring vocabulary for beginners who did not have a history of learning Arabic at all. Evidenced by the research that has been done that with the use of one short duration cartoon movie screening, someone who is just learning Arabic can get some simple vocabulary and sentences.

5 Conclusion
In this study it was found that Arabic language acquirers with beginner categories were able to obtain some vocabulary from the short duration cartoon films they saw. In subjects who had never had Arabic before, showed the acquisition of nouns, verbs and simple phrases. As for adjectives, not all subjects can mention the acquisition of vocabulary. Thus it can be concluded that novice Arabic learners are helped by their vocabulary acquisition through short duration cartoon film media. The findings of this study corroborate the empirical foundation that the cartoon format is not only effective in language learning but also in the context of Arabic, it has the potential to support the process of natural language acquisition. Considering that until today the use of media in Arabic classroom is not widely used [28], therefore Arabic teachers are recommended to use short animation movies to support learner’s vocabulary acquisition.

Acknowledgements. This paper in conjunction with the 1st Annual International Conference on Language, Literature and Media (AICOLLIM)

References

[16] F. Kurniaty, L. Husna, & Ermati “Teaching Vocabulary by Using Cartoon Movies For Junior High School Students” *Abstract of Undergraduate, Faculty of Education, Bung Hatta University* vol. 3 no. 5 2014, pp. 1-10
Electronic Media Accuracy in Tracking Source of Hadith Research

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Abstract. In era of technology, the use of electronic media cannot be avoided in all aspects of life. In the study of Hadith, the use of this media also cannot be ignored. In some studies, inaccurate data are found in several electronic media. This paper attempts to show the test results on the accuracy of the electronic media in the tracking of initial source of hadith research. This paper is qualitative research by using content analysis to hadith in electronic media presentation of Maktabah Syamilah and Lidwa Pusaka. The results show that some media are accurate, while some others are inaccurate

Keywords: Electronic Media; Hadith; Research.

1 Introduction

Currently, the position of the Prophet’s hadith as the second source after Qur’an is heavily questioned and targeted by criticism. There are criticisms that are useful and there are also criticisms done by cutting compass without going through the knowledge.

When people are confused with the existence of a hadith that doubt its originality and authenticity, antipathy effort is begun. The experts of hadith have a long process. Observations, method discovery, and research rules on hadith begin to be formulated.

The discovery of hadith research rules raises a formula about the validity of hadith. The validity of a hadith is largely determined by validity of sanad and matan [1]. If one of them is invalid, a hadith will not be admitted as a valid hadith. The first step to determine the validity of a hadith is to examine its sanad. There are five rules to determine the validity of a hadith [2]: 1) continuity of sanad (ittisal al-sanad), 2) credibility of narrators (‘ada lah al-ra’i), 3) quality of memorizing (al-dhabl), 4) no irregularity (ghair al-shadh), 5) no disability (ghair al-illah).

Criticism of sanad is intended to support the study of hadith with the primary aim to assess the quality of hadith. The five things that need to be a point of emphasis on the research of a sanad will also affect the quality of hadith. While completing the investigation of sanad, one would conclude whether the sanad is valid and good. Then, investigating matan (content) should commence afterward.

With the invention of technology, everything comes in digital mode and this include the hadith. Hadith, nowadays can be found in many digital presentations like CD, e-books, and websites. Consequently, conventional media will gradually be abandoned.

However, in practice, the transfer of this media faces obstacles and various problems. The simplest problem is the information presented by the electronic media does not correspond to
the information provided by conventional media. However, this digitalization of Hadith comes with several problems to be traced related to: what electronic media used for hadith research? Does this electronic media accurate enough to be used for researching hadith?

This research will focus on e-books in PDF form such as al-Maktabah al-Shamilah and Lidwa Pusaka as the basis of media transfer in hadith research. This paper is qualitative research by using content analysis to hadith in electronic media presentation of Maktabah Syamilah and Lidwa Pusaka.

2 Literature Review

There are several research related to the study hadith in electronic media. Dr. Muhammad Abu al-Laith al-Khair Abadi wrote a book entitled “Takhrij al-Hadith; Nash‘atuh wa Manhajiyatuh” and was published by Dar al-Sha‘kir, Malaysia in 2011 [3]. A part from discussing extensively and comprehensively about takhrij al-Hadith; its development and methods, he also has a chapter discussing about “Takhrij al-Hadith with Computer”. In this chapter, Abu al-Laith recommends some softwares that can be used to perform takhrij al-Hadith, and describes each one of them on how to use them.

In another chapter, Abu al-Laith also explains several hadith books in referent to the description of al-Mu‘jam al-Mufahras li Alfa‘z al-Hadith al-Nabawi by A. J. Wensinck. He recommends using al-Kutub al-Tis‘ah with certain publications and editors in accompanying the practice in al-Mu‘jam al-Mufahras. This information is important for closely related to the discussion in this article below.

In addition, there is also research entitled “Review of Hadith Applications (Lidwa Pusaka)” written by Dliya Ul Fikriyyah. This paper was published in the Journal of the Sciences of the Qur’an and Hadith, vol. XVII, no. II, July 2016. The article contains an introduction to the hadith application named Lidwa, its advantages and disadvantages, and the way it operates [4].

3 Electronic Media Used in Research of Hadith

3.1 Portable Document Format (PDF)

Portable Document Format is one of the most popular and widely used e-book formats such as ePub, HTML, FictionBook, XMDF, BBeb, CBR/CBZ, LIT, Mobipocket/Kindle. This format was created by Adobe System in 1993 for the purposes of digital document exchange. This PDF format is used to represent two-dimensional document that include two dimensional text, letters, imagery, and vector graphics [5].

Generally, PDF file type is the result of the conversation of the file formatted word, excel, power point, and others and transferred into PDF from. In addition, PDF is also a scan of a standard document such as a book, journal or paper, using a scanner tool. It is mostly done on old books including classical books of Islamic studies (turuq). In other words, PDF is the result of photocopy of digitally formatted book or any document. With the presence of PDF, people are more likely to access and get the books or journals they want, so they do not have to spend the time looking for them in libraries or bookstores, as well as being quite economical.
In addition, the existence of PDF is very helpful in Islamic studies, considering that the classical books of Islamic studies is quite difficult to find or they are thick enough and complicated for researchers. Similarly, in the study of hadith, almost all of the books are available in PDF format.

Several PDF used in hadith research are *al-Mu’jam al-Mufahras li Alfa>z al-H{adi>th al-Nabawi>* by A.J. Wensinck, edited by Muh‘ammad Fu‘a>d ‘Abd al-Ba>qi>. This book is an index book used to trace hadith in primary books of hadith “al-Kutub al-Tis‘ah”. Dr. Mohamed Abu Laith al-Khair Abadi recommend using *al-Kutub al-Tis‘ah* as below [5]:

(i) *S{ah{i>h al-Bukha>ri*, edited by Muh‘ammad Fu‘a>d ‘Abd al-Ba>qi>, published by Da>r al-Ihya> al-Kutub al-‘Arabiyyah Cairo 1955, consists of five volumes.
(ii) *S{ah{i>h Muslim*, edited by Muh‘ammad Fu‘a>d ‘Abd al-Ba>qi>, published by Da>r al-Ihya> al-Kutub al-‘Arabiyyah Cairo 1955, consists of five volumes.
(iv) *Sunan al-Tirmidhi>*, published by Mus{t}ofa> al-Ba>bi> al-H{alibi> Cairo 1951. This book consists of five volumes, each volume is edited by different editor. Volume one and two edited by Ah{mad Sha>kir, volume three is edited by Muh‘ammad Fu‘a>d ‘Abd al-Ba>qi>, and volume four and five are edited by Ibra>hi>m ‘At}wah.
(v) *Sunan al-Nasa‘* by Yu>suf al-Mizzi>, written with explanation (h{a>shiyah) by al-Suyu>t}i> entitled “Zahr al-Rabi” and with h{a>shiyah by al-Sindi. This book is printed for four volumes by publisher “al-Maktabah al-Tijariyah al-Kubra” Cairo 1348H.
(vii) *Sunan al-Darimi>* by al-Dhahabi>, published by Da>r al-Rayyan Cairo, the first printed in 1987.
(viii) *Muwat}t}a‘ Ma>lik*, published by Maymu>nah Publisher Egypt 1313H, in six volumes.

The ninth hadith books are the books that recommended in accordance to the study of *al-Mu’jam al-Mufahras li Alfa>z al-H{adi>th al-Nabawi>*. Therefore, they are strongly recommended for researchers when tracing hadith.


### 3.2 Programs of Hadith

In this digital era, the use of technology is inevitable. Technology sophistication proved to be very helpful in human life. Not to forget in the academic world, the use of technology is very helpful and facilitate academics in conducting research, including research of hadith. There are several programs that could be used in the study of hadith, and one of them is *al-Maktabah al-Sha>milah* and *Lidwa*.

*Al-Maktabah al-Sha>milah* is a computer program containing hundreds of thousands of Arabic books. This program was initiated by *al-Maktab al-Ta’a>wuni> li al-Da’wah*, Raud{ah, Saudi Arabia. In the official website www.shamela.ws explained that this program is free dedicated to help students or researchers who need many books.
Al-Maktabah al-Shamilah was first released on April 2005 and continues to grow until now with the addition of various features in it. This program contains hundreds of thousands of books from various disciplines of different authors. These books can be downloaded for free from official website. The latest version of al-Maktabah al-Shamilah is called version 3.64.

In addition to al-Maktabah al-Shamilah, program which is also widely used in research of hadith especially in Indonesia is “Hadis Sembilan Imam” (Hadith of Nine Imam). This is a program of hadith studies released by an institution called “Lidwa Pusaka”, therefore this program is better known as “Lidwa”, not “Hadis Sembilan Imam”. Lidwa Pusaka is an abbreviation of Institute of Science and Da’wah and Publication of Religious Facilities (Lembaga Ilmu dan Dakwah serta Publikasi Sarana Keagamaan). Lidwa Pusaka is an institution engaged in the development and publication of Islamic knowledge and da’wah (mission). The institute was founded by scholars graduated from the Middle East, the Islamic and Arab Institute of Sciences (LIPIA) Jakarta and several other universities.

Lidwa Pusaka provides encyclopedia of nine hadith books in two versions: online and offline. Online version can be accessed directly from its official website www.lidwa.com. Offline version can be purchased for 389.000 IDR through its official website. This program contains more than 62,000 hadiths from al-Kutub al-Tis’ah; Sahih al-Bukhari, Sahih Muslim, Sunan Abi Da’wud, Sunan Tirmidhi, Sunan al-Nasa’i, Sunan Ibn Majah, Sunan al-Darimi, Muwatta Malik and Musnad Ahmad. This program is also completed with Bahasa as translation of the hadith and short explanation about the quality and the narrators.

4 Media Accuracy of The Hadith Studies

4.1 The First Hadith

قال رسول الله صلى الله عليه وسلم: من ترك الكتب، وهو يخطيئ بني له في رضي الجنة، ومن ترك المراء، وهو يحق أبى له في وسطها، ومن حقن خلقه، فإنه في أعلاها.

The keyword used in tracing the source of this hadith is the word “حسن” it is found in al-Mu’jam al-Mufahras volume 1 page 466 with the following information [6]:

Based on al-Mu’jam information above, the hadith is located in several books such as:

(i) Sunan al-Tirmidhi>, volume 4 page 358, kita>b al-birr wa al-silah, chapter 58 number 1993 [7].
(ii) Sunan Abi> Da’wud, volume 5 page 98, kita>b al-adah, chapter 8 number 4800 [8].
(iii) Sunan Ibn Ma’jah, volume 1 page 19, at muqaddimah, chapter 7 number 51 [9].

After locating the hadith as informed above, this research found inaccurate information occurs between al-Mu’jam and Sunan Abi> Da’wud. As indicated above al-Mu’jam notes that the above mentioned hadith is located in chapter 7, whereas in Sunan Abi> Da’wud it is found in chapter 8.

This research also investigate the same search of the hadith above in al-Maktabah al-Shamilah, using حسن خلقه as keyword, the hadith could be found in Sunan al-Tirmidhi>, Sunan Abi> Da’wud, and Sunan Ibn Ma’jah. The result found in al-Maktabah al-Shamilah...
match what is found in the PDF, except for *Sunan Abi Dā'ud*, the hadith is located in volume 7 page 179. The difference is only in volume and page number, not in chapter or hadith number, because the reference used by al-Maktabah al-Sha>milah is different from PDF version used in this research. *al-Maktabah al-Sha>milah* uses *Sunan Abi Dā'ud* published by Dā>r al-Risālah al-'Alamiyyah, 2009, edited by Shu’aib al-Arnaut).

The search of hadith above in *Lidwa*, there are several mismatched in term of numbering of hadith. For example, in *Sunan al-Tirmidhi* it is written number 1916, *Sunan Abi Dā'ud* number 4167, and *Sunan Ibn Majah* number 50. This numbering is different from that of written both in PDF and *al-Maktabah al-Sha>milah*. In addition, in *Lidwa* there is no information about the chapter name or the chapter number.

### 4.2 The Second Hadith

The keyword used to trace the source of this hadith is the word “ﺭﺧﺺ” it is found in *Mu'jam al-Mufahras* volume 2 page 241 with the following information [10]:

- صلى الله عليه وسلم ﻋِﻴْﺪَيْﻦِ ﺍﺟْﺘَﻤَﻌَﺎ ﻓِﻲْ ﻳَﻮْﻡ؟ ﻗَﺎﻝَ: ﻧَﻌَﻢْ، ﻗَﺎﻝَ ﻣَﻦْ ﺷَﺎءَ ﺃَﻥْ ﻳُﺼَﻠِّﻳ ﻓَﻠْﻴُﺼَﻞِّ(.

Based on *al-Mu'jam* information above, I found the hadith in:


(ii) *Sunan Ibn Majah*, volume 1 page 415, *kita>b iqa>mah al-s}ala>h wa al-sunnah*, chapter 166 number 1310 [9].

(iii) *Sunan al-Da>rimi*, volume 1 page 459, *kita>b al-s}ala>h*, chapter 225 number 1612 [12].

(iv) *Musnad Ahjemad*, volume 4 page 372 [13].

After examine the location of hadith based on the above information, inaccuracy is found between *al-Mu'jam* information and *Sunan Abi Dā'ud*. *Al-Mu'jam* indicates the hadith is located in chapter 211, whereas in *Sunan Abi Dā'ud*, it is found in chapter 217.

The search of the hadith in *al-Maktabah al-Sha>milah* using the keyword “ﺭﺧﺺ” is located in *Sunan Abi Dā'ud*, *Sunan Ibn Majah*, *Sunan al-Da>rimi*, and *Musnad Ahjemad*. However, in *Sunan Abi Dā'ud*, there are differences on both the volume number and the page number. The same thing happened to *Sunan al-Da>rimi*, with differences found in pages, chapter numbers, and hadith numbers. In *Sunan al-Da>rimi* (*al-Maktabah al-Sha>milah*), also indicates that hadith is found at volume 1 page 399, *kita>b al-s}ala>h*, chapter 9 number 1758.

Different format of the e-book version of Hadith book influenced significantly to the differences in coding for the source Hadith book. For example, *al-Maktabah al-Sha>milah* provide *Sunan al-Da>rimi* from Dā>r al-Basha>r Beirut in 2013 that edited by Nabi>l Hashi>m al-Ghimari>. For *Musnad Ahjemad*, the differences occurs in volume 32 page 68 which published by al-Risālah, Beirut in 2001 and edited by Shu’aib al-Arnaut, ‘Adil Murshid and others.

Inaccuracy also found in *Lidwa* related to different numbering of Hadith that stated either in *al-Maktabah al-Sha>milah* or PDF format. For example *Lidwa* mentioned the above mentioned hadith located in *Sunan Abi Dā'ud* with written number 904, *Sunan Ibn
Ma>jah number 1300, Sunan al-Da>rimi> number 1561, and Musnad Ah{mad number 18513. These numbering are different from that of written in PDF and al-Maktabah al-Sha>milah.

4.3 The Third Hadith

قَالَ رَسُولُ اللَّهِ صلى الله عليه وسلم: كُلّ عمل ابن آدم له، إلا الصِّيَامُ، فهو نور وجزء من الصِّيامِ.

The keyword used for tracing the source of that hadith is the word "صِّيَام", it is found in al-Mu’jam al-Mufahras volume 3 page 460 with the following information [14]:

كل عمل ابن آدم له إلا الصيام، حم 2، 273، 281، م صيام 163، ن صيام 42، دي صوم 50، ط صيام 58.

Based on al-Mu’jam information above, the hadith located in:

(i) Musnad Ah{mad, volume 2 page 273 and 281 [15].

(ii) S{ah{i>h{ Muslim, volume 2 page 806 and 807, kita>b al-s}iya>m, number 161 and 163 [16].

(iii) Sunan al-Nasa’i>, volume 4 page 163, kita>b al-s}iya>m, chapter 42 number 2216 [17].

(iv) Sunan al-Da>rimi>, volume 2 page 40, kita>b al-s}aum, chapter 50 number 1770 [18].

(v) Muwat}t}a’ Ma>lik, volume 1 page 310, kita>b al-s}iya>m, number 58 [19].

All information contained in al-Mu’jam fits perfectly with what is contained in the books of hadith sources above. Meanwhile, in al-Maktabah al-Sha>milah difference location occurs due to different format used. The differences are: a) At Musnad Ahmad, published by al-Risalah, Beirut in 2001 and edited by Shu’ail al-Arnaut}, 'Adil Murshid and others, the hadith located in volume 7 page 411 and 476; b) Sunan al-Da>rimi> published by Da>r al-Mughni> Saudi Arabia in 2000 and edited by Husein Salim Asaad al-Darani, the hadith is located in volume 2 page 1110, number 1811; c) Muwat}t}a’ printed by Muassasah Zayd bin Sult}an Abu> Dabi in 2004 and edited by Muh|amm|ad Mus}t}of a> al-A’z}ami>, the hadith is located in volume 3 page 445-446. Meanwhile, several differences occur in Lidwa related to different numbering of Hadith in several kitab such as in Musnad Ah{mad with the number of 7368, in S{ah{i>h{ Muslim with the number of 1944, in Sunan al-Nasa’i> with the number of 2186, Sunan al-Da>rimi> with the number of 1705, and Muwat}t}a’ Ma>lik with the number of 603.

4.4 The Fourth Hadith

عَنْ النَّبِيِّ صلى الله عليه وسلم قَالَ: لا يَدْخُلُ الْجَنَّةَ خَبَّةٌ وَلَا بِخْيَلٌ وَلَا سَلَامًا.

The keyword used in tracing the source of this hadith is the word “خَبَّة”, it is found in al-Mu’jam al-Mufahras volume 2 page 1 with the following information [10]:

لا يدخل ....... الجنة خبةً ....... حم 1، 4، 7، ت بر 41

Based on al-Mu’jam information above, the hadith is presented in:

(i) Musnad Ah{mad, volume 1 page 4 and 7 [20].
(ii) Sunan al-Tirmidhi>, volume 4 page 343, kita>b al-birr wa al-sjilah, chapter 41 number 1963 [7].

All information contained in al-Mu’jam al-Mufahras fits perfectly with what is contained in the hadith books above. However, the difference occurs to al-Maktabah al-Sha>milah that located in Musnad Ah>mad, the hadith available in volume 1 page 181, number of hadith 31. In Lidwa the hadith available in Musnad Ah>mad numbered 32, and Sunan al-Tirmidhi> numbered 1886.

4.5 The Fifth Hadith

The keyword used in tracing the source of this hadith is the word “موت”, it is found in al-Mu’jam al-Mufahras volume 6 page 291 with the following information [21]:

Based on al-Mu’jam information above, the hadith available in:
1. Sunan Abi> Da>wud, volume 3 page 314, kita>b al-jana>’iz, chapter 13 number 3108 [22].
2. Sunan al-Nasa>’i>, volume 4 page 3, kita>b al-jana>’iz, chapter 1 number 1820 [17].

Incompatibility between the information in al-Mu’jam and in Sunan Abi> Da>wud occurred related to the location of hadith. In al-Mu’jam indicates that hadith in chapter 9, whereas in Sunan Abi> Da>wud, it is found in chapter 13. Likewise in al-Maktabah al-Sha>milah, the Hadith is found in Sunan Abi> Da>wud in volume 5 page 24. This differences is result from different prints edition used in both al-Maktabah al-Sha>milah and the (PDF) program.

5 Conclusion

Based on the above description, this paper concludes that the use of electronic media in the hadith studies cannot be ignored or avoided. We found various electronic media presentation available to use for. Among the many electronic media used in hadith research is PDF, which is a digital form of the conventional book. The use of PDF is the same as the ordinary books, which distinguish only the medium but the content remains the same. Therefore, research using PDF books is as accurate as using the conventional book.

Unlike the PDF, al-Maktabah al-Sha>milah has a lower accuracy. After comparing the PDF and al-Maktabah al-Sha>milah, this study found that al-Maktabah al-Sha>milah used different reference prints edition and / or different editors, resulting in a disagreement with the recommended books according to al-Mu’jam al-Mufahras li Alfa>z} al-H}adi>th al-Nabawi>. Lidwa Pusaka is less accurate than that of two resources mentioned earlier. There are significant differences found in comparison to two other sources. In addition, Lidwa did not explain further important information like name of the book, chapter number, publisher name, publication year and editor (muhaqqiq). Therefore, for this research it is not recommended to use Lidwa for hadith research.
Further research should be conducted related to these sources, especially related to different edition that might cause differences in number of hadith, volume and also pages. Thus, accuracy of electronic media presentation for hadith studies needs detail and careful transformation so that the content is as accurate as conventional book.

References

[26] Setiabudi D H and Tjahyana L J 2013 Mobile learning application based on hybrid mobile application technology running on Android smartphone and Blackberry Int. Conf. ICT Smart Soc. 1–5
[29] Upton D 2007 Codeigniter for Rapid Php Application Development
Linguistic Inquiries of Unjust Sentence of Victim’s Rape: A Defense from Media

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Abstract. This article discusses the media’s perspective related to incest rape case in Jambi written by the editorial board and posted in The Jakarta Post’s opinion column. The aim of this paper is finding out the media’s evaluation toward the case using an appraisal system. The analysis is done by classifying which utterance in the data that consists of several arguments and opinions. Later on, the researchers highlight and discuss expressions which represent the media’s evaluation of the government, the family member of the victim, and the whole society and state relating to the case. The result of the analysis presents that the media put their negative evaluation toward the hearing decision and sentence addressed to the victim, especially negative evaluation of judgment and appreciation. Those negative evaluations are deemed as a form of defense from media instead of a neutral commentary.

Keywords: appraisal; discourse analysis; incest rape; online media

1 Introduction

As in nature, media functions more than just as a medium of information. Aside from having the power to change people’s attitude, belief, and habit [1], it also becomes a means for the society to deliver their opinions and ideas related to the current phenomena or issues. To serve people’s aspiration, the media provides the opinion column, which becomes the media for everyone to speak on their behalf regarding the current issues. Interestingly, it is not only the society who can deliver their thought in this column but also the media itself. The editorial board of the media often writes their concern toward the current case in the opinion column. This implies that the media does not merely stand as the stakeholder of informing the social issues, but also as a part of society which gives their concern regarding the issues.

Through the existence of opinion columns, the media and journalist do not only express their perspective but put their judgment toward the case. An opinion is formed by several arguments that always belong to either pro or cons side of the story. Argumentation is an activity of justifying or refuting particular controversial phenomenon aimed to influence other people by firming up or weakening people’s acceptability regarding the case by giving a rational judge [2]. Therefore, the arguments written by the editorial board of the media in the opinion column reflects the media’s judgment regarding the particular controversial social issues. Thus, when media puts their opinion, judgment, and even argumentation in the opinion column, they also try to control public opinion and perspective regarding the case. Through media, the variety of ideas influence other people [3]. Up to this point, media is no longer the neutral party which merely aims to keep the society informed by current status quo.
Following the concept above, this paper aims to reveal The Jakarta Post’s standpoint regarding rape case in Jambi. The data of this paper are the opinion column’s post written by the editorial board entitled *Treat Rape Victim as Victim*. This case is interesting to analyze because the rape victim, in this case, is sentenced to jail because she committed an abortion. Furthermore, up to this post is released, the girl was not deemed as a victim because the prosecutors and judges regarded the incest sexual intercourse as a consensual intercourse. To get the result, the writers focus to analyze the media’s judgment embedded in their opinion and argumentation written in the post.

To discover the text producer’s judgment in the text, the writer employs appraisal theory in analyzing the data. Appraisal covers the resource of appraisal used by people in negotiating their social relationship [4]. The social relationship is inferred through the text producer’s attitude by pointing out which affect (feeling), judgment, and value are expressed [4]. Further, the text producer’s attitude becomes the justifying resources to influence the reader of The Jakarta Post to portray the case as same as the editorial board of The Jakarta Post. Eventually, it becomes the text producer’s strategy to lure the reader to believe in him.

To get a comprehensive and detailed analysis, the researchers employ the descriptive qualitative method. By using the qualitative approach, the researcher focuses on meaning embedded in people’s experience by unfolding how people make sense of their lives and experiences, as well as how they interpret them [5]. Firstly, the researchers classify which utterance contains an opinion and argument. Secondly, the utterances containing several arguments and opinions become the excerpt of the paper. Thirdly, the researchers highlight expression which represents the media’s evaluation of the case. Lastly, those expressions are discussed based on the appraisal system.

2 Literature Review

Scholars have agreed that communication becomes a pivotal basis for changes in thinking [6]. Therefore, online media, as any other communication tools, serves not only for sharing and distributing information but also provoking its reader through its text. Text becomes the resources of analyzing discourse because it consists of the people’s cognition toward the world and the social interaction within them [7]. It is also seen as a medium for the text producer to spread out his ideology to the reader or listener and provoking them to believe as what the text producer does [8]. Ideology is a system of belief and values upheld by the text producer based on his perspective in interpreting and representing the world [8]. However, ideology should not be explicitly asserted in the text, it interplays within the choice of word and structure of language used by the text producer [8].

One of the theories that deems language in the text is a resource of meaning-making and resource of any beliefs or ideology asserted by the text producer are Systemic Functional Grammar. It views language as a resource for making meaning [9]. Through SFG, language is deemed systemic and functional. It is systemic because word choice is formed through a system and it is functional because language is socially functioned for particular communicative goals [10]. In SFG, there are three meanings related to the context of the situation; ideational, interpersonal, and textual. Ideational meaning reflects in what is being talked about [11]. Interpersonal metafunction signifies the social relationship negotiated in the text and people’s evaluation of the current affairs [4]. Textual meaning allows us to understand the text holistically through the coherence and cohesion systems.
Appraisal theory is the fundamental element in interpersonal systems [12]. It signifies the social relationship negotiated in the text and people’s evaluation of the current affairs [4]. In appraisal, there are three aspects which can be the resources of appraisal; attitude, how it is amplified and the source of it. Attitudes refer to the scheme of meaning-making which stress the framework of mapping feelings [13]. In negotiating attitudes and evaluating the social relationship, there are three alternative options; affect, judgment, or appreciation [4]. Affect represents the speaker’s feeling drawn in the text, judgment reflects the speaker’s evaluation regarding of someone’s character, and appreciation refers to the evaluation of value asserted in the text [4].

Several studies have been conducted in the scope of appraisal theory. For example, English song is analyzed using an appraisal system to discover the emotions of the songwriter [12]. From the paper, the emotions in the song build the relationship between the songwriter and the reader [12]. The article used the appraisal system to analyze the visual beauty drawn in verbal message advertisements [14]. Her paper revealed that appraisal tools dominate moral judgment with the positive character as a praise and negative one as a criticism. The article entitled Appraisal Analysis: Thailand in the View of Phnom Penh Post on the Preah Vihear Issue reveals how Thailand and Cambodia are viewed through the English newspaper of Cambodia. The result showed that Thailand is negatively evaluated and Cambodia is positively evaluated [15].

Several scholars also used the appraisal system in conducting sentiment analysis drawn in a text. They discussed whether the appraisal system could be an effective means for sentiment analysis [16, 17, 18]. They found out that appraisal taxonomies or frameworks have helped them classifying the positive and negative sentiments in the text [16, 17, 18]. Furthermore, a political news article reporting on Iraq and its economic policies is analyzed using the appraisal system to find out various aspect of sentiment drawn in the text [19]. The result indicates that the appraisal framework has been useful to uncover the sentiment featured in the text [19]. Not to mention, sentiment analysis based on appraisal theory is also utilized in analyzing the marketing intelligence in Indonesia’s mobile phone market [20]. The result reveals the positive and negative sentiment toward several mobile phone products in Indonesia [20].

In this paper, the researchers do not only reveal how appraisal system is used in analyzing the positive or negative evaluation of the speaker toward the case but also discuss the standpoint of the media as the text producer in evaluating the social phenomenon. Therefore, the linguistic scope in analyzing the media’s evaluation regarding the rape case in Jambi is extended into the social analysis.

3 Methods

This paper examined The Jakarta Post’s standpoint regarding rape case in Jambi on July, 24th 2018. The data is the opinion column’s post written by the editorial board entitled Treat Rape Victim as Victim available online. However, the posting taken as the data are those containing the media’s judgment embedded in their opinion and argumentation written in the post. Moreover, this study was only focused to analyze the data using appraisal theory since it discovered the text producer’s judgment in the text.

Furthermore, the researchers apply descriptive qualitative method which focuses on meaning embedded in people’s experience by unfolding how people make sense of their lives
and experiences, as well as how they interpret them [5]. Firstly, the researchers classify which utterance contains an opinion and argument. Secondly, the utterances containing several arguments and opinions become the excerpt of the paper. Thirdly, the researchers highlight the expression which represents the media’s evaluation of the case. Lastly, those expressions are discussed based on the appraisal system.

4 Findings and Discussion

This section consists of two parts. The first part is the findings which describe the types of attitude found in the text. The second part is the discussion which elaborates the strategy of luring the audiences drawn in particular attitudes found in the text.

4.1 Findings

To ease the discussion, this section is classified based on the stakeholder of the rape case and trial which is being criticized by the text producer. There are at least three stakeholders that are being judged; the government, the family member of the victim (especially the mother and the brother), and the whole society and state, including the media, police, prosecutors, judges, the village apparatus, and customary leaders. Therefore, the findings are grouped based on these three stakeholders.

4.2 The Government

Judging the criminal wrong is common, but judging the government which fails to analyze the guilty one is another matter. In this case, the text producer put his judgment to the government because they do not merely accuse the brother of the girl as the rapist but also labels her as criminal. The elaboration of the text producer’s judgment to the government is explained below:

Excerpt 1: Human rights activists have called on the government to review the case and release the girl because she is a minor and by her own brother’s admission, a rape victim (negative judgment: condemnation).

The implication of the negative judgment in the excerpt above is inferred through the expression “have called the government to review and release the girl”. There are two actions asked by the human rights activist to the government; review the case and release the girl. Each act has implied different condition regarding to the case. First, the text producer uses the word review, which implies that it is not enough for the government to view the case once and accuse the girl guilty. In other words, The Jakarta Post believes that the government’s view, in this case, needs to be evaluated. Second, the media also state that the reason why the girl victim needs to be released. This infers that in the current status quo, the girl has not been released from jail by the government based on the decision hearing. Indeed, these two judgments are not those two inferences belong to the act of condemning the government.

Excerpt 2: The Legal Aid Foundation of the Indonesian Women’s Association for Justice (LBH APIK) said sexual and reproductive health services for rape victims in Indonesia, including access to emergency contraception that could prevent an unwanted pregnancy after the rape, were not always available in every region (negative judgment: condemnation).

Another act of condemning the government is drawn in excerpt 2. The use of the adverb “always” in the excerpt above implies the fact that sexual and reproductive health service in Indonesia should be available at all times. Yet, this condition has been refuted by the use of
negation “not” before the adverb. This indicates that in nature, it is the government responsibility to provide and give the sexual and health services to the rape victims but they have failed to do so. This situation describes that the government has not concerned with the needs of the rape victim, which eventually makes the text producer feels sorry for the victim.

**Excerpt 3**: However, emergency contraception should be part of “a full range of services”, said Wulan Danoekoesomo, the founder of the rape survivor support group Lentera Indonesia. Victims needed sexually transmitted disease prevention and physical and psychological help, she added. (negative judgment: condemnation)

The expression of “should be” in excerpt 3 indicates the ideal pack of sexual and health service provided by the government for the rape victims. This auxiliary functions to describe the obligation and the ideal condition that should be met by the stakeholder. In this case, the use of this auxiliary implies that in the status quo the needs of health and sexual services have not been met, especially for the victim itself. As in excerpt 2, this also implies that the government has missed one of its responsibilities, giving the victim’s needs as a victim.

**Excerpt 4**: Certainly, a jail sentence is the last thing a rape victim needs (negative judgment: condemnation).

Up to this news is released, the girl victim is sentenced to jail because of the abortion accusation. Because of this decision hearing, the text producer judges the government negatively. Using the adjective “last”, the text producer criticizes the government’s decision because they should not put the girl victim in jail easily. It also implies that there are a lot of other options that could be considered by the government before deciding to sentence the girl in jail. However, in fact, the government does not seem considering the other options. This judgment has been made by the text producer in a strong force through the expression of “certainly”. This force indicates that the text producer makes a strong affirmation toward his condemnation.

4.3 The family member of the victim

Since it is an incest rape, another stakeholder in the case that is being criticized by the text producer is the family member of the girl victim. More specifically, the ones who have been judged by the text producer is the mother and the rapist itself, her brother.

**Excerpt 5**: Second, the girl’s mother, 38, admitted she was the one who massaged the baby out of the womb, with her own hands. (negative judgment: condemnation and negative appreciation)

The excerpt above belongs to both negative judgments (condemnation) and negative appreciation addressed to the girl’s mother. These negative judgments and appreciation are addressed due to the abortion which is done by the girl victim with the major help coming from her mother. The condemnation and the negative appreciation are drawn through the expression “with her own hands”. It is already common to know that massage is done using the hand of the masseur. Therefore, saying that the abortion is done with the help from the hands of the girl’s mother is actually not aimed as an information but as a portrayal of the irony. Everyone knows that the nature of a mother is protecting and loving woman to her children. Yet, in this case, the mother, who is supposed to protect, makes the girl suffer more due to the abortion. Thus, the text producer condemns the mother’s attitude which is not protecting her daughter and depreciates her actions.

**Excerpt 6**: What could a 15-year-old girl, who had been sexually assaulted at least seven times by someone who should have protected her and had borne the consequences all alone for months (negative judgment: condemnation and negative appreciation), say to her mother?
Another family member who is being condemned by the text producer is the brother, rapist itself. The condemnation toward the family of the girl victim in the excerpt above is drawn through the failure of the girl’s brother, as the rapist, to protect and borne the consequences for the thing he has done. As mention above, the expression “should” indicates that the ideal condition has not been met by the stakeholders. In this case, the protection which should come from the brother has not been met by the girl victim. Not to mention, the rapist, the brother, also fails to be responsible for the rape and leaves the girl alone to face the consequence in saying about her condition towards her mother. Not to mention, to get the reader’s sympathy, the writer tries to provoke the reader’s feeling by inviting them to place themselves as the victim through the use of rhetorical questions.

4.4 The whole society and state

Another stakeholder which is portrayed by the text producer is the whole society and state, including all the social member involved in this case and decision hearing.

Excerpt 7: *First, it was not incest, it was rape* (negative appreciation).

In this excerpt, the text producer clarifies how the case looks like for him. The text producer uses the term with a stronger force to describe the case. He refuses to deem the case as an incest. He states that the case is worse than just an incest, it is rape. Incest indicates that the sexual intercourse done by the family member is a form of sexual relation which may be consensual. By saying that it was rape, not an incest, the text producer seems to eliminate the possibility that the sexual relation may be consensual. In the case of rape, there is no possibility that the sexual intercourse is done by respecting the victim’s consent. This possibility is the main point that the text producer wants to highlight.

Excerpt 8: *It is baffling to find that the media, the police, prosecutors, judges, the village apparatus and customary leaders all have failed to see her for what she really is: a victim.* (negative appreciation)

“Fail” refers to the condition which the stakeholder cannot achieve several purposes or goals. Unlike the negative judgment, the negative appreciation is addressed to criticize things. In this case, the text producer criticizes the work of all media, police, prosecutors, judges, the village apparatus and customary leaders, which has not been successful to analyze the case and give the fair judgment toward the girl victim. As the victim, the girl should be defended and protected by giving her the fairest decision. However, the fairest condition has not been achieved and it makes the text producer depreciate the work all the stakeholders involved in the decision hearing.

Excerpt 9: *The Jambi case is not the only one where the state and society treat a rape victim not as a victim, but as a perpetrator* (negative appreciation).

The failure of the state and the society in giving the fairest decision and the best defendant toward the rape victim is elucidated in excerpt 9. To make it clear, the text producer even points out the label put by the state and society towards the girl victim, a perpetrator. He also strengthens his statement by giving a negation towards the label of “victim”. Thus, the failure of treating the rape victim as a victim is criticized by the text producer.

Excerpt 10: *And for the record, most incest cases in Indonesia are actually sexual assaults, not consensual relationships* (negative appreciation).

Another phenomenon which is highlighted by the text producer is the nature of incest cases. While several people deem incest cases are a consensual relationship, the text producer negates this point by saying that it is actually an assault. This critic belongs to the negative appreciation because the text producer wants to highlight that there is a loss of respectability
point in the case of incest rape. Not to mention, the use of the adverb “actually” indicates the strong force made by the media as the text producer in claiming his opinion.

**Excerpt 11: Father and daughter, older brother and sister, uncle and niece, mother and son: the hierarchy in the relationship says it all (negative appreciation).**

To enhance the media’s reasons in pointing out that incest rape is an assault, the media also criticize the hierarchy of the family. By mentioning the relationship of father and daughter, older brother and sister, uncle and niece, mother and son, the media implies that the lower hierarchy of the family is the victim of the assault while the higher hierarchy in the family becomes the rapist. Therefore, it has the lowest possibility when the incest intercourse is done with consent from two parties. The expression “says it all” indicates that it is clear enough for the text producer to argue that incest sexual intercourse is a rape.

5 Discussion

From the analysis above, the media as the text producer points out three stakeholders; the government, the family member of the girl victim, and the whole society and state. In evaluating the government, the media judge the government as an active stakeholder in resolving and giving the decision towards the girl. The media negatively judge the government because he deems that the decision hearing for the girl victim is unfair. He also points out several major points that cannot be given by the government as the one who serves the society and protects the criminal’s victim. After judging the government, the media has also judged the girl’s brother and mother. In judging those two family members, the media put his negative judgment and his negative appreciation. The negative judgment is addressed due to their negative behavior towards the girl victim. Meanwhile, the negative appreciation is delivered because of their irresponsibility in protecting the girl. The last stakeholder that is being pointed out is the whole society and state. Unlike the first stakeholder, government, which is being judged because of their behavior and decision, the critics towards the whole society and state represent the media’s perspective in evaluating the way society and state treat and regard the girl victim. Thus, it is more evaluating the perspective of the society rather than the society itself. Therefore, all 5 excerpts related to this stakeholder belong to the negative appreciation.

Notice that all of the evaluations appraised by The Jakarta Post are the negative evaluations. The negative judgments and negative appreciations addressed to the stakeholders who are deemed unjust reflect the standpoint of the media itself. Instead of being in the same boat with the government, the family member of the victim, and the whole society and state, The Jakarta Post put his position in supporting the defending the victim through its critics. The media’s evaluation by showing up the infamy of the stakeholders discussed above provoke the readers to also put their negative judgments toward the three stakeholders above and give their empathy to the victim.

6 Conclusion

11 excerpts have been analyzed and 13 appraisal resources have been found. In judging the government, the media put his negative judgment or condemnation towards their behavior in considering the rape case in the fairest state. Another negative judgment related to the improper behavior is also addressed to the victim’s mother and brother. The judgment towards
the girl’s mother and brother also belongs to the negative appreciation because it also implies the irresponsibility from those two family members in protecting the girl as of how she should be. Not to mention, the perspective of the whole society and state in seeing the incest rape is also being negatively evaluated by the media, through the expression of depreciation (negative appreciation). All of these negative evaluations are considered as a defense from media for the victim rape.

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References


The Effect of Cybernetic Learning Toward Students’ Mathematical Creative Thinking

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Abstract. The aim of this research is to analyze the effect of cybernetic learning model toward students’ mathematical creative thinking skills. This research conducted at one of junior high school in South Tangerang in the academic year 2017/2018. The method used was quasi-experimental method with randomized control groups posttest only design. Sampling was taken using purposive sampling technique. The result showed that overall, students’ mathematical creative thinking skills in the class which is cybernetic learning model applied was higher than students’ mathematical creative thinking skills in conventional class. Based on the hypothesis testing with U Mann Whitney test at significant level of 5% it was obtained that the significant level was 0.000 < 0.050. Based on indicators of mathematical creative thinking skills, it showed that the indicators of fluency, flexibility, and elaboration can developed through cybernetic learning model.

Keywords: mathematical creative thinking; cybernetic learning model

1 Introduction

The learning process in the modern era must at least be supported by the competencies needed in the 21st century. In line with this, the National Education Association (NEA) argues there are four abilities that must be possessed in the 21st century known as the "Four Cs", which is one of its capabilities, creativity [1]. Especially in Indonesia, the national education aims to develop the potential of students to be creative people [2]. From the law, it can be concluded that Indonesia has made creative ability as one of the abilities that are the goal of education in Indonesia.

In daily activities, a person will often be faced with decisions that require mathematical abilities. In addition to being creative, students are also expected to be able to think mathematically creative. Mathematical abilities are very diverse. The most important, critical thinking skills and mathematical creative thinking skills are higher than other mathematical abilities. Leikin and Lev [3] stated that there are two creativity in mathematics, general creativity (associated with using problem solving) and specified creativity (refers to creativity in a particular field).

Amid the importance of the ability to think creatively, the level of creativity of the Indonesian people is still relatively low. This was based on the results of The Global Creativity Index survey in 2015 [4] which showed that Indonesia's creativity index was only 0.202. In line with the facts of the survey results, Nurmalianis research in 2014 in one of the state junior high schools [5] showed that students' mathematical creative thinking skills were still relatively low. Only 25.63% of students can think smoothly by giving a lot of answers.
and only 41% of students can provide different solutions. Concern over the low ability of mathematical creative thinking must be immediately followed up. One solution to improve the quality of education is to improve the learning model used.

Cybernetic learning model comes with one of the learning stages, namely using technology [6]. With the use of technologies such as computers as learning media, students are expected to be more active during the learning process. Even in the 2013 curriculum, the use of computers in mathematics learning is one of the basic competencies that students must possess. But the existence of these basic competencies does not necessarily create a computer-based learning process that supports students' creative thinking skills. Based on the results of pre-research interviews that researchers have conducted on one of the mathematics teachers shows that the learning process that occurs in the classroom is only limited to the cultivation of mathematical concepts as usual without using a computer. So that the learning process is still teacher-centered and do not provide a gap for students to think creatively.

In accordance with the previous description, this study aims to examine whether the mathematical creative thinking skills of students who obtain learning using the cybernetic learning model are higher than students who obtain learning using conventional learning models.

1.1 Mathematical Creative Thinking

Mathematical creative thinking is closely related to creativity. General creativity can be seen from two sides, the first is seen from a special way of thinking commonly called divergent thinking and the second can be seen from products that are considered creative [7]. In addition to being seen from the products produced, creativity can also be viewed in terms of the process, namely the process of creative thinking. Creativity is a multi-dimensional construct, consisting of various dimensions, namely cognitive dimensions (creative thinking), affective dimensions (attitudes and personality) and psychomotor dimensions (creative skills) [8]. Creative thinking is the ability to find many possible answers to a problem, where the emphasis is on quantity, usefulness, and diversity of answers [9]. From the many definitions according to some experts, researchers conclude that creative thinking is a process to produce something that is diverse, new, unique, and useful.

Indicators of creative thinking consist of fluency skills, flexibility thinking skills, originality skills, elaboration skills, and evaluation skills [10]. Fluency has characteristics: (1) sparking many ideas, answers, solving problems or questions; (2) provide many ways or suggestions to do various things; (3) always think of more than one answer. Flexibility has the following characteristics: (1) produce various ideas, answers, or questions; (2) seeing problems from different points of view; (3) able to change the way of approach or way of thinking. The characteristics of Originality are (1) being able to give birth to new and unique expressions; (2) thinking of unusual ways to express themselves; (3) able to make unusual combinations of elements. The characteristics of elaboration are (1) able to enrich and develop an idea or product; (2) adding or detailing an object, idea or situation in more detail. The last is the characteristics of Evaluation are (1) determining the benchmark of its own assessment and determining whether the action taken is correct (2) Able to make decisions about open situations; (3) not only spark ideas, but also implement them.

Some experts only cited four characteristics of creative abilities ([8], [9]). In this case, evaluation is not included as a characteristic of creative thinking skills. In this study, the research focused on four indicators of mathematical creative thinking abilities, namely
fluency, flexibility, originality and elaboration. These four indicators are slices of indicators of mathematical creative thinking abilities that have been put forward by some experts.

1.2 Cybernetic learning model

Cybernetic learning model is a learning model that departs from cybernetic theory, some experts call it the term information processing model. This model is based on cognitive learning theory and is oriented to students’ ability to process information that can improve their abilities. Cybernetic learning model is a learning model that combines theory and practice [11]. See Fig. 1 for the steps of the cybernetic learning model [6].

![Figure 1. Steps of Cybernetic Learning Model](image)

2 Methods

This research was conducted in one of the junior high schools in South Tangerang. The method used in this study was quasi-experimental with Randomized Control Group Post Test Only research design. The sample involved 86 students divided into two classes, the experimental class taught using the cybernetic learning model and the control class taught using conventional learning models. Sampling was taken with purposive sampling technique. The population in this study were eighth grade students in the odd semester of the 2017/2018 school year. From the population, two classes were chosen as the experimental class with cybernetic learning model and the control class with the conventional learning model, with the same number of students, 43 students. The experimental class and the control class are both given the same posttest as the design (see Table 1).

<table>
<thead>
<tr>
<th>Group</th>
<th>Dependent variable</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>N</td>
<td>0</td>
</tr>
<tr>
<td>Control</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>
X: Treatment of the cybernetic learning model  
O: Posttest of mathematical creative thinking skills

The procedure in this study is (1) determining students as samples in the experimental class and control class; (2) giving different learning processes in both classes; (3) giving the same posttest. The instrument used in this study is a posttest consisting of nine items of essay. The researcher then analyzes the results of these posttests to determine whether the students' mathematical creative thinking skills in the experimental class (cybernetic learning model class) are higher than the students' mathematical creative thinking skills in the control class (conventional learning model). Data analysis of the research conducted was to examine the differences between the two mean groups with SPSS software at a significance level of $\alpha = 5\%$.

3 Results and Discussions

3.1 Descriptive Statistics

Descriptive statistical data of students' mathematical creative thinking skills from the experimental class and control class are presented in Table 2.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Cybernetic</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>Ideal Score</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Maximum</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>Minimum</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Mean</td>
<td>22.12</td>
<td>18.47</td>
</tr>
<tr>
<td>Std.Deviation</td>
<td>2.21</td>
<td>4.33</td>
</tr>
</tbody>
</table>

Based on Table 2, the highest score in the cybernetic class was greater than the highest score in the conventional class even though the difference was only 2 points. Furthermore, the lowest score for the cybernetic class was also greater than the conventional class that is with a difference of 9. In addition, the average score of 43 students in the cybernetic class was higher with a difference of 3.65 compared to the average score of 43 students in the conventional class. So that based on this, it can be interpreted that the highest mathematical creative thinking skills of individuals are in the cybernetic class while the lowest mathematical creative thinking skills of individuals are in the conventional class. In addition, judging from the standard deviation in Table 2, the standard deviation of the cybernetic class is smaller than the standard deviation of the conventional class, it means that the scores of students' mathematical creative thinking skills in the conventional class are more varied and spread to the class average, while the students mathematical creative thinking skills in the cybernetic class tend to cluster. Based on the descriptions of the descriptive statistics data, it can be interpreted that the students' mathematical creative thinking skills in the cybernetic class is higher than the conventional class.
The ability of students’ mathematical creative thinking skills in more depth is analyzed based on indicators, namely fluency, flexibility, elaboration and originality. The mathematical creative thinking skills reviewed based on indicators are presented in Table 3 as follows.

**Table 3. Mathematical Creative Thinking Based On Indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Ideal Score</th>
<th>Cybernetic Average</th>
<th>Cybernetic %</th>
<th>Conventional Average</th>
<th>Conventional %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluency</td>
<td>6</td>
<td>5.26</td>
<td>87.60</td>
<td>4.81</td>
<td>80.23</td>
</tr>
<tr>
<td>Flexibility</td>
<td>9</td>
<td>7.88</td>
<td>87.60</td>
<td>5.79</td>
<td>64.34</td>
</tr>
<tr>
<td>Originality</td>
<td>6</td>
<td>3.86</td>
<td>64.34</td>
<td>4.00</td>
<td>66.67</td>
</tr>
<tr>
<td>Elaboration</td>
<td>6</td>
<td>5.12</td>
<td>85.27</td>
<td>5.86</td>
<td>64.34</td>
</tr>
<tr>
<td>Overall</td>
<td>27</td>
<td>22.12</td>
<td>81.20</td>
<td>18.46</td>
<td>68.90</td>
</tr>
</tbody>
</table>

From Table 3, it can be seen that the students’ achievement in the cybernetic class for the fluency indicator is 87.60%, while the conventional class has a smaller percentage of 80.23% with the percentage difference between the cybernetic and conventional classes being 7.37%. In this case, the difference that is not too large indicates that the difference in learning provided has not provided a very significant impact on the fluency indicator. Although it cannot be denied that the average value of the fluency indicator in the cybernetic class is higher than the conventional class.

On the flexibility indicator, the average score of cybernetic class students is 87.60%, while the conventional class has a smaller percentage of 64.34% with a difference of 23.26%. The difference is far greater than the difference in the fluency indicator, so it can be said that the use of cybernetic learning models in the experimental class can improve mathematical creative thinking skills on the flexibility indicator.

In contrast to fluency and flexibility which has a greater percentage of cybernetic classes than conventional classes, on the originality indicator the conventional class percentage is even greater than the cybernetic class with a very small difference of 2.33%. The conventional class achievement on the originality indicator was 66.67% while in the cybernetic class it was 64.34%. It can be interpreted that both the conventional cybernetic class and the class both have capabilities that are quite low on the originality indicator.

On the elaboration indicator, the average score of cybernetic class students is 85.27%, this percentage is at 20.93% with the control class having 64.34% achievement. With a large enough difference, it can be said that the use of cybernetic learning models with cooperative strategies in the experimental class can significantly improve mathematical creative thinking skills on elaboration indicators.

Visually, the average percentage score of students based on indicators of mathematical creative thinking abilities of students in the conventional cybernetic class and class is presented in the bar diagram as follows:
Figure 2. Diagram of Mathematical Creative Thinking Skills based on Indicators

From the bar diagram in Figure 2, it can be seen that the achievement indicators of mathematical creative thinking with the best level for cybernetic classes are fluency and flexibility indicators because the two indicators have the same percentage size. In the conventional class, the best achievement indicator is fluency. Overall the achievement indicators of cybernetic class with Cybernetic learning with cooperative strategies are higher than conventional classes with conventional learning, although the originality indicators of conventional class outcomes are better than the cybernetic class with a not too significant difference. For significant differences between the conventional cybernetic class and class there are indicators of flexibility and elaboration, so it can be said that the cybernetic learning model has a considerable influence on flexibility and elaboration indicators.

3.2 Hypotheses Testing

Based on the results of the normality test, it was concluded that data from the cybernetic class came from populations that were normally distributed, while the conventional class came from populations that were not normally distributed. Because one class comes from a population that is not normally distributed, the hypothesis testing used in this study is a non-parametric test. The statistical test used is the Mann Whitney test or "U" test for large samples. The results of the calculation of hypothesis testing obtained in this study are presented in the following table:

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
</tr>
</tbody>
</table>

In Table 4 above, Mann-Whitney U test statistics are obtained by the price of $U = 423$ and $p-value = 0.000 / 2 = 0 <0.05$ or Ho is rejected, so students' mathematical creative thinking abilities in the cybernetics class are higher mathematical creative thinking of students in conventional classes.

3.3 Discussions
The results of the students' mathematical creative thinking ability test in this study showed a positive influence of the cybernetic learning model on students' mathematical creative thinking abilities. This is in line with the research conducted by Arvyati, La Ode Ahmad Jazuli, Rosdiana, Yoo Eka Yana Kansil, Hasnawati and Kadir Tiya [6], with the conclusion that student learning achievement in linear program material increases using cooperative Cybernetic learning. Some of the differences between the research conducted by Arvyati and this study include the abilities studied, learning material, and learning subjects. In this study the abilities studied were students' mathematical creative thinking skills in statistical material, while the research conducted by Arvyati examined student learning achievement in linear program material. However, although there are some differences, both this study and the research conducted by Arvyati both have a positive influence on learning outcomes.

In this study, after applying Cybernetics learning with cooperative strategies in the experimental class the results showed that students' mathematical creative thinking skills in the experimental class was higher than the students' skills applied in conventional learning. This is in line with the information processing theory proposed by Rusman relating to Cybernetic learning, that in learning occurs the process of receiving information which is then processed so as to produce output in the form of learning outcomes [12]. Meanwhile, Arikan found that the creativity of mathematics can arise through authentic problems they submit [13]. In this study, the output was more focused on students' mathematical creative thinking abilities. The mathematical creative thinking ability in this study consisted of four indicators, namely fluency, flexibility, originality, and elaboration. Of the four indicators, the cybernetic class looks superior to the conventional class on the indicators of fluency, flexibility, and elaboration. While the conventional class is superior to the cybernetic class only on the originality indicator.

4 Conclusion

Referring to the results of the analysis and discussion, then in the study of the effect of cybernetic learning on students' mathematical creative thinking skills, it was concluded that:

1. Students taught with cybernetic learning models with cooperative strategies have good mathematical creative thinking skills. The best level of indicator of mathematical creative thinking skills is the fluency and flexibility indicator with the same average results, then the elaboration indicator and the lowest is the originality indicator. Cybernetic learning model is effective learning to develop students' creative mathematical thinking skills, especially on indicators of fluency, flexibility and elaboration.

2. Students who are taught by conventional learning have mathematical creative thinking abilities that are quite low. The best level of indicator of mathematical creative thinking skills in this class is the fluency indicator. Indicators of flexibility and elaboration have the same average results. Students who are taught using conventional learning have better fluency abilities compared to other indicators.

3. The mathematical creative thinking skills of students taught by Cybernetic learning models is higher than the mathematical creative thinking skills of students taught with conventional learning. Specifically reviewed based on indicators of mathematical creative thinking skills, the results of the study indicate that mathematical creative thinking indicators that can be developed through cybernetic
learning models are indicators of fluency, flexibility and elaboration. The cybernetic learning model has not been able to develop mathematical creative thinking skills in the originality indicator. Cybernetic learning models can develop mathematical creative thinking skills on indicators of fluency, flexibility and elaboration.

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References

Blog-Assisted Language Learning in The Writing Class: Opportunities or Threats?

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Abstract. Blog-Assisted language Learning (BALL) is an often-updated website which displays entries containing texts, graphics, and topic-related hyperlinks usually in a reverse chronological order which can be commented by visitors. This paper aims at examining the students’ perceptions towards the use of BALL in the writing class. A total of 30 students majoring in English Education Department of a private university took part in this study. The data were obtained from an 8-item open-ended questionnaire which was followed by an in-depth interview. The students expressed their perceptions towards BALL after being treated using BALL in one consecutive semester consisting of 16 weeks. The results showed that in majority the students have positive attitudes towards BALL and they developed their integrative and instrumental motivation during the treatment.

Keywords: blogs; perceptions; integrative motivation; instrumental motivation.

1 Introduction

The rapid development of Information and Communication Technology (ICT) truly corresponds positively to the teaching-learning process of English as a second or foreign language. Ref. [1] claims that the use of ICT in the classrooms has rapidly developed as students have become increasingly tech-savvy. Ref. [2] mentions that today and more than ever before, there is a tendency to practice more writing on computers and the like: likewise, more people have adopted the habit of on-screen reading. According to Ref. [3], advances in ICT have advantageous potentials in second language writing. Therefore, it stands to logic that ignoring the role of ICT in the writing classroom is irrational. In short, ICT should be integrated in teaching-learning process, including EFL writing class settings.

ICT can be widely used in a variety of ways to facilitate students improve their writing skills. Ref. [4], for instance, applied Blogs and Ning in her EFL writing classes. Ref. [5] also suggests that teachers apply search engines in writing classes such as Google, Bing, Dogpile, or WebCrawler. In addition, Ref. [6] mentions that ICT use, such as Blog – Assisted Language Learning (BALL) seems to be well integrated into writing classes, serving as a tool in creating an interactive atmosphere.

BALL as one of ICT modes has been also used widely in different settings of teaching – learning process. BALL is an often-updated website which displays entries containing texts, graphics, and topic-related hyperlinks usually in a reverse chronological order which can be commented by visitors [7]. Ref. [8] specifies BALL as a web-based space for writing where all the writing and editing of information is managed through a web browser and is
immediately and publicly available on the internet. In addition, computer technologies including weblogs seem to be well integrated into writing classes, serving as an aid in creating an interactive atmosphere in which students can keep their motivation high [6], and by publishing the blog online students have the opportunity of writing for readers or classmates [8]. Furthermore, BALL offers learners opportunities to conduct the pre-writing, drafting, peer review, and revising steps of the writing process. In short, Ball is a beneficial tool to improve learners’ writing proficiency when it is integrated with process writing approach [4].

Several studies investigating the roles of BALL in the writing classes have been conducted by a number of researchers. Ref. [3] found that second language writing students are enthusiastic about BALL in principle, but are not motivated to engage voluntarily in second language blogging activities in practice. Ref. [8] revealed that BALL proves to be an effective tool for students to improve English writing, but he suggests that educators be aware of students’ perceptions and reaction for the use of blogs as a pedagogical tool for EFL students. Ref. [7], on the other hand, revealed that the interaction between bloggers was limited; thus, the study indicates the restricted use of BALL as a tool promoting collaboration in the foreign language classroom.

The findings seem provide inconsistent results suggesting further research focusing on the students’ perceptions towards the implementation of BALL in the writing class. Thus the research questions are formulated as follows: (1) What are the students’ perceptions towards the use of BALL in the writing class? (2) Why did they accept (or reject) BALL?

2 Methods

This study aims at investigating the students’ perceptions towards BALL in the writing class after they were treated using BALL during one consecutive semester consisting of 16 weeks in which there were 2 credits (100 minutes) in a week. A total of 30 students majoring in English Education Department of a private university took part in this study. The data were obtained from an 8-item open-ended questionnaire which was followed by an in-depth interview (see Appendix 1). All respondents answered the items in the questionnaire, then the researcher audio recorded 10 students in an in-depth interview related to the items in the questionnaire in order to get more data related to the students’ perceptions towards BALL in the writing class.

3 Findings and Discussion

The findings demonstrate that the majority of the students (25 students) have positive perceptions towards the intervention and the rest 5 students have negative perceptions. The findings are in harmony with the results of Ref. [9] research which found that the students have positive perceptions towards blog since it reduces their writing apprehension and improves their writing quality. Ref. [2] found BALL has potentials to stimulate discussion and provide feedback, so students are encouraged to make more effort to improve their writings. Then Ref. [10] found that students have overall positive attitudes towards BALL. Also, Ref. [3] and Ref. [11] found that blog increases students’ motivation and self-efficacy. A statement of a student in the in-depth study reveals the importance of motivation in L2 learning:
“I like to share my texts in the class blog since I know I will get feedback from my friends and lecturer to improve the quality of my texts. It is motivating to share my texts in the blog because I believe in my own writing quality.”

The statement of the respondent is in line with the results of a study by Ref. [12] revealing that BALL motivates the students to use English because of interaction with classmates and teacher. Motivation in L2 acquisition is very important in influencing the outcomes of learning. Ref. [13] states that motivation has a very crucial impact in learning English as ESL or EFL. She further explains that there are three main keys of motivation: (1) positive attitudes towards L2 community, (2) the enjoyment of learning, and (3) external pressures.

Positive attitudes towards L2 community can be a reflection of the intervention of the BALL in the writing class. [14] found that students have positive attitudes to learn English in two terms: Integrative and instrumental motivation. Integrative motivation reflects the learners’ willingness to be like a representative member of L2 community. On the contrary, instrumental motivation refers to the need to achieve social recognition or economic advantages through mastering an L2, such as high salary, power, or career.

Integrative motivation may be reflected in this research as students’ effort to be able to produce high quality texts, so they work hard in accomplishing their writing tasks. Another respondent said that she did her best in writing her essay because she knew that her texts would be read by her classmates and lecturer. Her opinions seem in line with Ref. [15] which avows that students have positive perceptions in applying blog and it fosters self-regulation and autonomous learning in the target language. Her motivation resulted on the quality of her texts because, according to the findings of Ref. [16], motivation increases students’ L2 competence and performance.

In contrast, instrumental motivation can be detected from another respondent’s comment who said that she needs writing ability because she has to write her thesis and later on probably she will be a teacher after graduation. Thus BALL motivates them to work harder in writing activities. Ref. [2] found that blog encourages students to work hard as indicated by their hard efforts to improve their writing quality. Also, Ref. [15] revealed that students have positive perceptions in applying blog and it fosters self-regulation and autonomous learning in the target language.

Meanwhile, there are five respondents rejecting BALL for two different reasons: lack of self-efficacy in writing and lack of technology savvy. Self-efficacy, in L2 context, is defined as beliefs in students’ capabilities to accomplish a certain task [17], and technology savvy refers to the students’ capabilities to apply technology in L2 learning. The students rejecting BALL had different performances in writing: 2 students belonged to high achievers, 2 students were average achievers, and the rest, 1 student, was a low achiever. Thus, there was no guaranty that average – high achievers always accept BALL or low achievers tend to reject BALL.

Self-efficacy in L2 in general motivates students to work in comfort. Somehow, a study by Ref. [18] exploring the relationship between academic self-efficacy and language learning motivation found that there is a low level of negative correlation between the two variables. In this present research a student does not feel comfortable to share her product in the blog since she is not really sure with the quality of her essay. She states as follows:

“I am not confident enough to publish my essay in the blog because I am afraid that it has a lot of errors. Thus I prefer pen and paper - based activities”.

The statement above implies that the student is not happy posting her essay because it will be read by online readers due to her capacity in writing an essay. With pen and paper - based activities, it is only the lecturer who will read her product. It is in line with the findings of a study by Ref. [17] stating that students’ perceptions about language learning are affected by
their English self-efficacy. That is why, it is suggested that lecturers encourage their students to have more self-efficacy in language learning, so the outcomes of teaching learning process will be achieved. It is also supported by Ref. [19] stating that self-efficacy is a valid predictor of students’ performance in different language skills and tasks. Thus the higher self-efficacy a student has the better achievement he/she gets.

4. Conclusions

The implementation of BALL in integration with process writing approach make students in majority have positive perceptions towards BALL. It increases students’ motivation and self-efficacy since they can share their products in the blog and get real online audiences in writing activities. Self-efficacy motivates the students to share their products because they have enough confidence with their writing performance. In fact, they have two different kinds of motivation in joining the class blog namely integrative and instrumental motivation. In contrast, a number of students (minority) rejected BALL because of two reasons: lack of self-efficacy in writing and lack of technology savvy. Thus the students with sufficient self-efficacy and technology savvy have a tendency to enjoy BALL in writing classes, but those who lack of the two aspects tend to avoid BALL.

Eventhough in majority students agree with BALL, the teacher should consider the students’ fear of lack of self-efficacy and technology savvy when he/she introduces and implements BALL. He/she teachers also needs to encourage students to be more familiar with ICT, especially BALL, and to train students how to work with it since it has been widely applied in the teaching and learning of English, including writing classes.

Acknowledgment. This paper in conjuction with The 1st Annual International Conference on Language, Literature and Media (AICoLLiM 2018) in Malang, East Java.

References

Appendix A. Open Ended-questionnaire about Students’ Perception towards BALL

1. What do you think of Writing class?
2. What do you know about the importance of writing skills for your future
3. What do you feel if your products are read by your classmates?
4. What do you feel if your products are read by your lecturer?
5. What do you feel if you get feedback from your classmates and lecturer in the class blog?
6. What do you feel if your products are published in the class blog?
7. What is your opinion related to the implementation of BALL in writing class?
8. Is there anything else you want to say or comment about what we have been doing in the Writing class?
QEEG Study on Reading Quranic Verse 36 ‘Yasin’ and Malay Language

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Abstract. This article reports the study on the brainwaves patterns between the activity of reading the Arabic and reading Malay text among the final year undergraduates in the university of Malaysia Sarawak. Three students volunteered for the research and their brain waves were observed and recorded to find out the difference of brainwave pattern while reading Arabic and Malay language. The observation showed a dominant production of delta followed by theta while reading Arabic and Malay language. The text used for reading were from Verse 36 (Arabic and the translated version in Malay) of the Quran. The average mean of delta wave were higher for the reading of Arabic language at the frontal lobe than while reading the Malay translation. The frequency of delta rhythm of the Arabic language differed from the Malay language due to the nature of the Arabic language. The neural circuits of the rhythm from the Arabic recitation implicates not on just the spatial visual area at the parietal lobe but also the visual eye movement at the frontal region guided by the Visual system at the Medial temporal area.

Keywords: EEG, Quran, Brain Waves, QEEG.

1 Introduction

The objective of this study is to observe the differences in the brainwaves patterns between the activity of reading the Arabic and reading Malay text among the Final Year students in University Malaysia Sarawak. QEEG is used as a tool for brain mapping. QEEG is an assessment tool that aids to measure and analyses the brain functions when the subject is engaged with the cognitive process [1]. QEEG was used to record the brainwave while analysing the brain response of participant towards the language use. Arabic is 186 million native speakers of the sixth spoken language in the world after Hindi, Mandarin, English, Spanish and Bengali Mandarin, English, Spainl and Bengali [2]

In of the previous research in Israel, Prof. Zohar Eviatar, Chair of the research team, said: "The characteristics of Arabic make it difficult for the right hemisphere to be involved. When you start something new, there are many of them [right hemisphere] [3]. In the research, 37 of Arabic speakers who aspoke English and Hebrew were involved. Professor Zohor Aviatar narrated that "The right hemisphere is more sensitive to the global aspects of what it's looking at, while the left hemisphere is more sensitive to the local features" [4]. As in previous research, this research The general objective of this research is to observe the differences in the brainwaves patterns between the subject reading the Arabic book and
reading Malay book. Specifically, the objectives are to i. To identify all the brainwaves pattern and brain responses during both activity, reading Arabic book and reading Malay book, and to determine the dominant wave during the reading Arabic language and reading Malay language.

2 Review of Literature

2.1 Quantitative Electroencephalogram

Electroencephalogram or EEG is a machine that records the brain’s electrical activity and is used clinically to detect aberrant activity such as epilepsy and sleep disorders. They are used to detect certain psychological states such as drowsiness and alertness because each of these states is associated with particular patterns of electrical activity. In electroencephalogram (EEG), the electrical signals consumed by the brain mind are written by metal pole and then position on the profiteer using a conductive gel then amplified. In order to prevent wrongly eye movement for brain activity, an electrode usually place near the eye muscles by the researcher which allows EEG signal occur as well as eye movement will be eliminated from time period for further analysis.

EEG were recorded using electrodes and arranged in a particular wave pattern. Brainwaves pattern can be detected using the international system 10 20 in which a method that can determine the location of the scalp.

2.2 Brain Waves

Human brain consists of five common brainwaves which is delta, theta, alpha, beta and gamma. Theta brainwaves (4-8 Hz) are the second slowest magnitude brainwaves which can be represented a day-dream like and happened while we are in unconscious condition. Alpha brain waves (8-12 Hz) has slower and large magnitude. Basically, alpha waves is related to a relaxation condition and our brain will undergo the process of brain shifting into an idling state, relaxed and disengaged with surrounding, slowly responded. The alpha waves increases when we close our eyes. Alpha activity is correlated with working memory and with long-term memory that can helps us to remember more the things around us. Beta brainwaves (above 13 Hz) are small but faster brainwaves. It represents when we are at the state of alertness and engaged with focusing, memory retention activity. Gamma brainwaves (13-100 Hz) is the fastest of the brainwaves with high frequency. Gamma brainwaves occur when are doing perception and in a conscious state and it passes the information rapidly.

2.3 Arabic vs Malay Language

Arabic has twenty eight consonant letters and three of them is also use as long vowels. The root system is used in which four letters convey the basic idea of the word. For instance, the word “معلم” can mean teacher, tutor or professor. The diacritics determine the vowels. Different vowels used will produce different meaning to the root word and Arabic language consists of complete words and completer words [5]. The category of verbs, verbal nouns, adjectives and nouns are the example of complete words meanwhile pronoun, adverb, particles and exclamation words are the example of completer words. The Arabic language is written and read from right to left.

Malay is an Austronesian tongue. Most country in Asia like Malaysia, Indonesia, Singapore, Brunei and Thailand, use Malay language as their first language. During ancient
time, the written Malay script was written in the Indian script. However, when English colonialist came to Malaya, the language had been changed to English language in both written and speaking using Latin alphabets. But, the script that called Jawi that consists all the twenty eight consonants. The similarity between Arabic and Malay language is that Malay language also has complete and completer words and the construction properties of position also consists of verbs, nouns, verbal nouns and adjectives. The Malay script is read.

2.4 Previous Studies

Previous study [6] claimed that meditation and classical music can help a person to be in relaxing condition. 14 subjects were chosen in this study and had performed two cognitive tasks, which was listening to Quran recitation and listening to hard music and they were measured by using EEG machine. The data was analysed by reading the EEG signal and the results showed that, by listening to Quran recitation, the brain are able generate the alpha wave and help a person always in calm condition compared to listening to hard rock music. The subjects were in the excitement condition and were not calmed while listening to hard music task as the result obtained shows that they have high value of beta wave compared to alpha wave. However, the subjects’ who listened to Quran recitation, were in the calm situation with the increase of alpha wave value compared to beta. In a related study [7].

In this research, Arabic language used in the Quran was compared with the official Malay language to see if there is a difference in the brain physiological response. Ultimately, this research might work out on how best manage on strategies. In Arabic language, the meaning of the language might differ with the sounds and diacritical marks in contrast to the Malay language where the consonant and vowels are simply CVC VCVC or VCV. The vibration differs based on the phonological variation and vibration. The objectives of this study were to identify all the brainwaves pattern and brain responses during both activity, reading Arabic book and reading Malay book to determine the dominant wave during reading and Malay language.

3 Methods

This is a case study using Quantitative Electroencephalograph (QEEG) to observe the electrical activity of the brain while reading Arabic and the Malay language. This study involved two main tasks; reading Arabic language and reading Malay language. Electroencephalography (EEG) was used to observe the brainwave pattern while reading Arabic language and reading Malay language. Set of evident data of EEG were recorded from point during the performance of both reading Arabic language and reading Malay language.

3.1 Subjects

Three subjects involved in this study were volunteers aged from 19-26 years old from Faculty of Cognitive Science and Human Development. One of the main criteria for the research is the participants’ ability of reading Arabic language. The briefing and inform consent were given to the participants before undergoing the session to ensure confidentiality of the data. The electrodes were placed based on the international 10/20 system. The artifacts such as noises and eyes blink were removed before the spectrum table and the brain topography were automatically generated for further analysis.
The subjects were instructed to relax and also told to minimize their body movement to minimize the artefact. Four tasks were given; eyes open, eyes close. In the third condition, the subject started to read Arabic language and after three minutes of stabilization, the EEG data were recorded for 10 minutes. In this research, the researcher have chosen the “Ya seen” (verse 36) from the Al-Quran, which is very familiar to the muslim students and commonly read by other muslim in most of the occasion for healing and calming.

In the fourth task the subjects read the book after 6 minutes of stabilization. Same steps applied when reading in Arabic language, the data were taken for 10 minutes. after three minutes of stabilization Nineteen electrodes were placed on the scalp of the subjects based on the international standard, which is 10-20 system as follows: Fp1, Fp2, F7, F8, C3, C4, P3, P4, O1, O2, F7, F8, T3, T4, T5, T6, Cz, Pz, and then A1 and A2 mounted at the right and left ears of the subjects as references.

4. Results and Discussion

Microsoft word and the result were keyed in both SPSS and Microsoft Excel for further analysis. The average values and topographical maps were (Fig.2 and Fig.4 in appendix A) demonstrated to show the Regions of Interests (ROI) while reciting the Al Quran (Yassin) and Malay language.

![Average value of different brainwave pattern](image)

**Figure 1.** The graph of average value of all brainwave patterns in every location during Task 3 for all participants (Reading Arabic language)
The mean value of delta was higher at frontal lobe (Fp2) during the reading of Arabic is higher compared to the reading of Malay language. The Mann-Whitney test was significant at 0.05. The main function of this area is to control important cognitive skills in humans, such as for memory, languages, and emotional expression.

Previous research shows that the delta wave is dominant at the frontal lobe because the main function of this area is to control important cognitive skills in humans, such as for memory, languages, emotional expression and it is the control panel for our personality and our ability to communicate. Thus, this proves that delta wave is dominant at the frontal lobe.
indicated in the research by Professor Aviatar’s team in Haifa, the area for discriminating the local features were left hemisphere in this case study.

The results of this study differed in terms of dominant wave from previous research [8,9] where the recitation of the Quranic verse produced alpha waves and calming relaxation state. In their research, Quran recitation was higher compared to rest condition and listening slow and hard music. They conclude that Quran recitation produced a significant relaxation in which the Quran has an effect on some hormone and chemical responsible for relaxation. In this research, there was a dominant production of delta followed by theta. The recitation of Al-Quran is natural sound that have unique characteristics and effects in human body [10].

There’s a high possibility that production of delta implicated on the temporal region specifically the thalamus and corticothalamus area which is crucial for the healing and regeneration process. This is particularly related to the production of melatonin and suprachiasmatic nucleus which consequently regulate the onset of sleep. The main difference between the Arabic and the reading of Malay language is the dominant delta wave rhythm at the frontal lobe. The frequency delta rhythm of the Arabic language differed from the Malay language due to the nature of the Arabic language. The neural circuits of the rhythm from the Arabic recitation implicates not on just the spatial visual area at the parietal lobe but also the visual eye movement guided by the Visual system at the Medial temporal area or Visual system. The orthographical features of the Arabic writing required a fast movement or saccadic movement from right to left and the transmission of the visual feature from the various visual pathways has to be fast. Due to the deepest levels of relaxation that the delta brainwave provides, the body and mind are easily able to restore themselves after boosting your brain power.

More research should be done comparing the Arabic language and other languages such as Mandarin and Tamil to look at the impact of reading the language on parts of the brain such as Anterior coagulate cortex and temporal lobe. More participants should be included for reliability and generalization of data. The participants should be trained or screened for inclusion in the study. The ability to read based on the appropriate articulation of the Arabic language is important. For example, the pronunciation of the Arabic language might affect the phonological values of the sound and frequencies recorded by QEEG.

Acknowledgment. This work would not have been possible without the cooperation of the undergraduate students and facilities in term of equipment and laboratory in the Faculty of Cognitive science and Human Development.

References

Appendix A. (Figure 2 and Figure 4)

Figure 2. Brain Topography of all participants during Task 3 (reading Arabic language)

Figure 4. Brain topography of all participants during Task 4 (Reading Malay language)
Text-to-Speech Application for Foreign Language Learner’ Listening Comprehension in Indonesia

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Abstract. Listening takes role to provide the main aural input which is really important. The use of difference speech origins for the listening material will bring different effect for students’ listening comprehension. This study identifies whether the students who are taught by synthetic speech have significant difference on their listening comprehension than those who are taught by natural non-native speaker. It used quasi experimental research design. The experimental group consisted of 34 students who treated by using synthetic speech audio material which produced by Text-To-Speech application. The control group consist of 32 students treated by non-native speaker. The instrument used in this research was test. The result of independent sample t-test from the post-test showed significant value of the data was 0.016. From the result above, it can be concluded that teaching listening using different speech origins has effect for students’ listening comprehension. It was proved by the result of the test. It is suggested that English teacher can use synthetic speech audio material which produced by Text-To-Speech application for teaching listening to make the teaching and learning process more enjoyable.

Keywords: listening comprehension; natural speech; synthetic speech.

1 Introduction

In the process of learning English, there are four language skills that should be learnt and practiced by the learners namely listening, speaking, reading, and writing. Among those skills, listening is considered as the important skills that foreign language (FL) learners should be learnt. Listening as “the activity of paying attention to and trying to get meaning from something we hear”[1], [2]. Listening can be considered as the first step in learning a language [3], [4], [5], [6]. It means that language learning, initially, highly depends on listening skill. In listening to spoken language, the ability to decipher the speaker’s intention is required of a competent listener. Meanwhile, listening comprehension is the ability to understand the spoken language of native speakers [7].

In language acquisition, listening takes role as the thing that provide the main aural input which is really important [5], [6]. The auditory input is different, it differs according to the speech origin of the speaker. Speech origin is any kind of auditory input that can recognize by the hearer. Whether the input is from natural speech or synthetic speech. When the aural input is from human who directly speak or record it as the listening material, it called natural speech or human-generated speech. The natural speech can be divided into native speaker and also
non-native speaker. Natural native speaker is people who speak English as their mother tongue or people who comes from English speaking countries, but non-native speaker is people who speak English as their second or foreign language or people who comes from non-English speaking countries. In the other hand, synthetic speech or computer-generated speech is a kind of listening material which is generated from the Text-To-Speech application that can directly transferred any computer text materials into audio files.

The use of difference speech origins for the listening material will bring different effect for students’ listening comprehension. Natural speech requires little effort when listening to the speech signal [8]. When a person listens to natural speech he or she do not need to devote more effort to identification the phoneme because natural speech provides higher rate of phoneme identification than synthetic speech. Although some people say that listening to natural speech is easier then listening to synthetic speech [9], the use of text-to-speech to produce synthetic speech has increase during past decade and became more popular in many education settings [10].

One of advantage of using text-to-speech application to produce synthetic speech audio material is schools do not need to hire any readers to record students’ listening materials. Teachers or people in the school just need to scanned students’ book and change it into type-text and the text can easily be converted to speech [11], [12]. There is no human speaker who must read and record the text, it means the teacher or people in the school can save time, energy and money. Another advantage from using synthetic speech is teachers also can manipulate the sound effect, speaker, language, pause, pronunciation correction, volume, pitch, and the speed through the application. So, the teacher can adjust the listening material that has been created with the ability of the students [2], [4], [13], [14].

Some researchers have investigated about the use of synthetic speech. The first previous study investigated the implementation of text-to-speech media software in teaching listening for eight grades of junior high school. The finding showed that the students could catch the meaning from the audio which was produced by text-to-speech software easily and more enthusiastic with the audio file [15], [16].

The second previous study investigated comprehension of synthetic speech produced by rule: word monitoring and sentence-by-sentence listening times, the finding of this study was contrast to the previous study mention above. It shows that the on-line task performance was slower and less accurate for passages of synthetic speech than for passages of natural speech [17].

Other previous study, syntactic speech can help integrating character education and local genius through balabolka in teaching listening [18]. The possibility of a foreign language teacher to modify the materials based on learner’s needs.

The last previous study, that investigated the comparison of collage students’ ability to comprehend passage material when input (natural and synthetic speech) was provided in different modalities: L-only or listening to the text, R-only or reading the text silently, and RWL or simultaneously reading and listening to the text. The finding showed there was no difference in comprehension for natural versus synthetic speech in any conditions [8].

The finding from previous studies are various, most of them used various kind of text for their listening materials. It is important for the researcher to investigate whether the natural and synthetic speech give any impact for foreign language learners’ listening comprehension especially at first grade high school students when they listen to narrative text as their listening material. This research is expected to reveal further information related to the effect of speech origin on foreign language learners’ listening comprehension. It is also hoped that this research will also reveal which treatment is better for listening comprehension.
The objective of this study is to find out whether students who are taught by synthetic speech have significant difference on their listening comprehension than those who are taught by natural non-native speaker. Theoretically the finding of the research is intended to add new insights and knowledge of theoretical understanding related to of speech origins on foreign language learners’ listening comprehension. For the English teacher the finding of the research is expected to help teacher to select and use appropriate listening material for teaching and learning process. For further researcher the result of this research is expected can become some referential to conduct next research.

2 Methods

This research used quasi-experimental research. There are two kind of variable for this research. They are dependent and independent variable, in this case the dependent variable is foreign language learners’ listening comprehension and for independent variable is speech origin. For the population of this research the researcher used X grade students of SMA Diponegoro Tumpang in East Java, Indonesia while for the sample of this research the researcher took X IPS 4 and X Bahasa for the experimental group and the control group. The researcher used pre-test and post-test as the instrument of the research to collect the data. The instrument consisted of fifteen multiple choices questions. For calculate the data the researcher used SPSS 22 software.

3 Finding

3.1 The Result of the Pre-test

In this research, the primary data were taken from the test. The test was divided into pre-test and post-test [19], [20]. This finding showed significant difference between experimental and control group. The population of this research was first grade students at SMA Diponegoro Tumpang. There were two samples, they were X IPS 4 (treated by synthetic speech), X Bahasa (treated by natural non-native speaker). The total number of students of the sample was 66 students.

The researcher conducted research for both groups. The first step is the researcher gave pre-test to them to know whether both groups are homogeneous or not. The next step the researcher started to applied treatment which is using synthetic speech to teaching listening. But, this treatment was only given for the experimental group. For the control group, the researcher taught by conventional method like dictation by natural non-native speaker. The last step, the researcher gave post-test to both groups to know the significant difference on students listening comprehension between the group which was taught by using synthetic speech and the group which was taught by using natural non-native speaker.

There were three kind of activities; pre-test, treatments, and post-test. The researcher gave the pre-test at the first meeting, the researcher needed to calculate the normality and the homogeneity of the test before implement the treatment. The result normality and homogeneity of the test showed that the significant value in >0.05 it meant that the test had normal distribution and the data was homogeneous before the researcher implement the treatment. After giving the pre-test the researcher gave the treatments at the second and third
meeting. For the treatment, the researcher gave treatment by using synthetic speech audio material for the experimental group and for the control group the researcher teach the students using conventional method or in this case the researcher deliver the listening material by directly dictate it. After implementing the treatment, the researcher gave post-test. The result of the data showed; the mean score of both groups was 77.65 for the experimental group and 73.91 for the control group. To prove whether the treatment was success or not, the researcher used independent sample t-test for analyzing the data. The result showed that the significant value from the independent sample t-test was 0.016. From the result above it was clear that the null hypothesis is rejected because the probability of sampling error is lower than the level set by the researcher (0.016<0.05). In short, it is clear that the implementation of the treatment was successful.

The researcher gave the pre-test for experimental group and control group. The pre-test was conducted in the first meeting for both groups on May 8th and 9th, 2018. The pre-test for control group (X Bahasa) was done on May 8th, 2018 at 09.40 am until 11.00, while for experimental group (X IPS 4) was done on May 9th, 2018 at 09.40 am until 11.00 am. The researcher gave pre-test in the first meeting before researcher gave treatment for experimental group. The pre-test consisted of 15 items of multiple choices. The result of the pre-test will be showed in table 1.

Table 1. Pre-Test Score

<table>
<thead>
<tr>
<th>Class</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>34</td>
<td>30</td>
<td>70</td>
<td>50.88</td>
<td>9.085</td>
</tr>
<tr>
<td>Control Group</td>
<td>32</td>
<td>30</td>
<td>70</td>
<td>48.59</td>
<td>9.266</td>
</tr>
</tbody>
</table>

The researcher gave the pre-test for experimental group and control group. The pre-test was conducted in the first meeting for both groups on May 8th and 9th, 2018. The pre-test for control group (X Bahasa) was done on May 8th, 2018 at 09.40 am until 11.00, while for experimental group (X IPS 4) was done on May 9th, 2018 at 09.40 am until 11.00 am. The researcher gave pre-test in the first meeting before researcher gave treatment for experimental group. The pre-test consisted of 15 items of multiple choices. The result of the pre-test will be showed in table 1.

3.2 Normality & Homogeneity of the Test

Normality test is for testing whether the data is normally distributed. In this research, to test the normality, the researcher also used SPSS 22 with Sapiro-Wilk method. It shows the significant value of the normality test is 0.512 for the experimental group and 0.624 in control group showing that the test has normal distribution.
The aim of homogeneity test is to know whether the respondents on population are equal in term or ability or not. The homogeneity of the respondents has been counted from the pre-test score. It is found that the test of homogeneity between groups is 0.983. The significant value of homogeneity is 0.05 level. It shows no significant differences between experimental and control groups in their listening comprehension, it can be concluded that the data were homogeneous.

3.3 Treatment for Experimental Group

The researcher had two meetings for giving treatment for the students on May 11th and 16th, 2018. The first treatment was held in the second meeting on May 11th, 2018 for the experimental group (X IPS 4). The students of the experimental group were given treatment using synthetic speech audio material for listening. The researcher was started teaching the students about the material which was suitable with the syllabus. The material was about narrative text.

The first, the researcher try to introduce the material by stimulate the students through some questions about what they know about the common legend story that familiar for them and asked about what narrative text is as the pre-listening activities. Almost all the students answered the question. Some students have learnt and know about what narrative text is. Some of them also mention about the example of legend story. However, there were some students who could not answer the questions and forget about what narrative text is. The researcher explained more detail about narrative text, the kinds of narrative text and the generic structures of narrative text.

Second, the researcher asked the students to listen to the synthetic speech audio material about the example of legend story and pay attention about it. The researcher played the audio three times, while the audio was played the researcher asked the students to find out the difficult word from the text at the audio for the whilst listening activities. At the end of the meeting as the post listening activity, the researcher asked the students to discuss the difficult words and find the meaning in Bahasa together.

The second treatment was held in the third meeting on May 16th, 2018 for the experimental group (X IPS 4). At the beginning of the lesson the researcher remaining the students about the narrative text by giving some question related with the previous lesson. Then, the researcher gave the students another example of legend story and asked the students to listen and pay attention to the synthetic speech audio file. Same as the previous lesson, the researcher played the converted audio three times.

Then, the researcher gave a small task to the students, the task was five multiple choices questions about the legend story which have played by the researcher. The aim of the task was for train the students to listen to the synthetic speech audio file and to know the students understanding toward the story that they have heard. At the end of the lesson the researcher asked the students to discuss about the question together and played the synthetic speech audio material once more to find out the best answer for each question.
3.4 Treatment for Control Group

In order to compare the experimental group, the students in control group was treated by using conventional method in their listening activity. In control group, the material that was taught was the same but the aural input that use for teaching listening was different. In conventional method, the students did not listen to the synthetic speech audio file for their listening materials but the students were asked to listen and pay attention to the researcher as the non-native speaker when the researcher read and doing dictation of the legend story. Before read the story, the researcher explain about what narrative text is, the kinds of narrative text, and the generic structures of the narrative text. There was no different for the material; the different was only in the aural input for the listening material that the researcher uses for teaching.

3.5 The Result of Post-test

The researcher gave post-test for experimental group and control group after implement the treatment, the researcher conducted the post-test in order to know the effect of speech origin for students listening comprehension that has been used in experimental and control group. Besides, the researcher also wanted to know the difference mean between the experimental and control group after giving the different treatments. The post test was conducted in the fourth meeting on May 18th, 2018 for both groups. The post-test for experiment group (X IPS 4) was done on May 18th, 2018 at 07.00 am until 08.20 am, while control group (X Bahasa) was done on May 21st, 2018 at 07.00 am until 08.20 am. The pre-test consisted of 15 items of multiple choices.

Table 2. Post-Test Scores

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>34</td>
<td>65</td>
<td>90</td>
<td>77.65</td>
<td>6.424</td>
</tr>
<tr>
<td>Group</td>
<td>32</td>
<td>60</td>
<td>85</td>
<td>73.91</td>
<td>5.783</td>
</tr>
<tr>
<td>Control Group</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on table 2, the result of post-test for experimental group and control group showed that the number of the students in experimental group was 34. Mean score of experimental group (X IPS 4) was 77.65. The minimum score of experimental group was 65 and maximum score was 90. Then the standard deviation was 6.424.

On the other hand, the number of the student in control group was 32. Mean score of control group (X Bahasa) was 73.91. The minimum score of control group was 60 while the maximum score was 85. Then the standard deviation was 5.783.

From the result, we knew that the result of the post-test between experimental group and control group was different. The mean score of experimental group was 77.65 which higher than the mean of control group was 73.91.
The qualification of hypothesis is that if the significant value is less than the significant level (0.05). It meant that there is a significant difference between the two groups (experimental group and control group). If the significant value is more than the significant level (0.05). It meant that there is no significant difference between the two groups (experimental group and control group). The conclusion is if there is significant difference, the null hypothesis (Ho) is rejected and alternative hypothesis (Ha) is accepted. While, if there is no significant difference, the null hypothesis (Ho) is not rejected and alternative hypothesis (Ha) is rejected.

Based on the result of the data above, it showed significant value of the data was 0.016. From the result above it was clear that the null hypothesis is rejected because the probability of the sampling error is lower than the significant level set by the researcher (0.016<0.05).

Based on the descriptive statistic, the mean of the experiment group was higher than the mean score of control group (77.65 > 73.91). So, descriptively the experiment group got higher mean score than control group. The researcher concluded that students who were taught by synthetic speech had better comprehension in listening than students who were taught by natural non-native speaker. So, speech origins had significant effect on foreign language learners’ listening comprehension at first-grade students of SMA Diponegoro Tumpang Kabupaten Malang, EastJava, Indonesia.

### 3.6 The Analysis of Test Validity & Reliability

The researcher established content validity of the listening test in this research the test items were constructed based on the basic course outline of the 2013 curriculum for tenth grade students. To get the content validity, the researcher matched the material with the curriculum, as it was developed based on the blueprint of the test and for measure the blueprint of the test matched with the curriculum the researcher used expert validity.

The researcher calculated the data using Kuder Richardson – 21 (KR-21) reliability by Microsoft Excel on Windows. The result of reliability was important to prove whether the instrument was good enough to give for the students or not. It is found that the mean of the data was 12.18, the standard deviation from the data was 2.69 and the variance of the data was 7.25. From the data above the researcher then calculate the data manually using the formula of KR-21. The result of is 0.757. It meant that the value is between 0.70–0.79. Based on the criteria of coefficient of reliability by Kuder Richardson, the data of test has fair reliability. In short, the test items were given to the students were reliable.

### 3.7 Research Discussion

The effect of speech origins on foreign language learners’ listening comprehension can be seen from the result of the analysis of the mean score on students’ test. The result of the testing revealed that the experimental group, which was given treatment by using synthetic
speech was significantly have better listening comprehension with the mean score of the experimental group was 77.65 and the mean score of the control group was 73.91.

Based on the finding of the research, it is clear that using synthetic speech as the audio file material for teaching listening can help the students at SMA Diponegoro Tumpang being more interested and pay more attention to the listening material. So, they can get the message from the audio file easily. This point related to previous study which were investigated the implementation of text-to-speech media software in teaching listening for eight grades of junior high school have found that the audio file which was produced by text-to-speech software could build a good atmosphere in the classroom. The students could catch the meaning from the audio easily and more enthusiastic with the audio file [7].

However, the finding of this research was different with the finding of the studies which investigated about the comprehension of synthetic speech produces by rule: word monitoring and sentence-by-sentence listening times. The finding of previous study showed that the online task performance was slower and less accurate for passages of synthetic speech than for passage of natural speech [8]. It was different with present research because this research used simple and short text for the listening material so it helped students to understand the message from the text easily.

The finding of this research was also different with the finding of previous study who investigated the comparison of college students’ ability to comprehend passage material when the auditory input (natural and synthetic speech) was provided in different modalities: L-only or listening to the text, R-only or reading the text silently, and RWL or simultaneously reading and listening to the text [4]. The finding showed there was no difference in comprehension for natural versus synthetic speech in any conditions. It was different with present research because Taake used college students as the object of the research while the present research used high school students as the object of the research. High school students pay more attention to the synthetic speech audio material because they think that this kind of listening material is interesting for them.

4 Conclusion and Suggestion

The conclusion of this research is drawn in accordance with the result of the data analysis in the previous chapter. There are some significant differences between experimental group and control group. In the result of the post-test of experimental group was 77.65 which was higher than the control group 73.91. It means that teaching listening using synthetic speech audio material was better than teaching listening using conventional method by natural non-native speaker.

The result of calculation using the t-test showed that significant value of the data was 0.016, from the result it was clear that the null hypothesis is rejected because the probability of the sampling error is lower than the significant level set by the researcher (0.016<0.05). It can be concluded that there is a significant difference between students who were taught by synthetic speech and the students who were taught by natural non-native speaker in their listening comprehension at SMA Diponegoro Tumpang Kabupaten Malang. From the explanation above, it can be concluded that teaching listening using different speech origins has effect for students’ listening comprehension at first-grades students of SMA Diponegoro Tumpang Kabupaten Malang.
The researcher gives suggestion to further researcher to develop this research by applying
the application on other kinds of text, such as report, procedure, or recount text. Then, the
researcher hopes that the research can be perfected in the content and result by further
researchers which are related to the effect speech origins on foreign language learners’
listening comprehension.

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Science and Technology (ICONIST) 2018

References

Press Inc. 1966.
American English”. Journal of Basic Writing Vol 5 No 2 1986
Learner. San Diego: Domini Press. 1994
Reading. Saint Louis, Missouri: All Theses and Dissertations (ETDs). 2009.
1997.
“Comprehension of synthetic speech produced by rule: word monitoring and sentence-by-
491.
[18] Herawati, Yayuk W. Integrating character education and local genious
through Balabolka in teaching listening. Lingua Journal. vol 11, No 1, 2016

Effect of Pegagan and Beluntas Combination on Diestrus Length and Proliferation of Vaginal Epithelium on *Rattus norvegicus*

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Abstract. A variety of reproductive health problems often appear to both men and women, so it takes a natural remedy to reduce the usual side effects on the use of chemical drugs. The people of Indonesia have widely known Pegagan (Centella asiatica) and Beluntas (Pluchea indica) as a plant that has benefits as a medicine. The effect of leaf extract of *C. asiatica* and *P. indica* on the female reproductive system can be known by the change of the estrous cycle, especially in diestrus phase and vagina proliferation. This study used 24 Wistar female rats, aged of 2 months, and weighed of 120-150 g. Combination of pegagan and beluntas extract utilizing a ratio of 1: 1. The treatment consisted of control (C) dose of 0 mg/kg bw, the first treatment (T1) 25 mg/kg bw, the second (T2) 50 mg/kg bw, the third (T3) 75 mg/kg bw, the fourth (T4) 125 mg/kg bw and the fifth (T5) is 200 mg/kg bw. Data were analyzed using ANOVA (α 5%) if there were a significant difference then tested continued using DMRT (α 5%). The results showed that combination of leaf extract of pegagan and beluntas significantly influenced the proliferation of vaginal epithelium, indicated by the increase of maturation index and vaginal epithelial thickness, but did not affect to the length of diestrus. The highest vaginal maturation index and vaginal epithelial thickness value obtained by a T4 dose of 75 mg/kg bw, thus this dose was the most optimal for use as a fertility supplement.

Keywords: Pegagan and beluntas leaf extract; diestrus; vaginal maturation index; vaginal epithelium thickness

1 Introduction

Microscopic evaluation of the types of cells in the vaginal smear has long been used to document the stages of the estrous cycle in rats and as an index of the functional status of the hypothalamic-pituitary-ovarian. Thus, the estrus cycle assessment has been used both as a primary measure in the determination of reproductive cycles and as additional tests in reproductive studies [1].

The reproductive system is one of the physiological processes that occur in living things to sustain offspring and survival. Several problems of the female reproductive system include menstrual cycle disorders (estrus), dysmenorrhea, vaginal discharge, bleeding during menstruation and other reproductive disorder can interfere with fertility [2]. Therefore, it takes drugs that can solve the problem. However, the use of chemical medicines so far is feared will
have a negative impact on the reproductive system. Herbal medicine is believed to cause fewer side effects and beneficial to a human with many advantages.

Medicinal plants commonly used by Indonesian people include Pegagan (Centella asiatica) and Beluntas (Pluchea indica). Pegagan (C. asiatica) is one of the favorite herbs among Malaysians and Indonesians, and it has been widely used as ulam or folk medicine in many countries. This plant contains high bioactive compounds such as madecassoside, madecassic acid, asiaticoside (glycoside) and asiatic acid (terpene acid) which are related to medicinal properties. C. asiatica leaves extract can be used for wound healing, acts as an alternative treatment for various diseases, and has fertility and antifertility properties [3][4]. Andria research reported that ethanol extract of pegagan at high dose 560, 630, and 700 mg/kg bw decreased on estrogen levels [5]. Muchtaromah revealed that combination of pegagan and beluntas dose of 25, 50, 75 mg/kg bw elevated total follicle, and ovulation number of ovarium but the dose of 125 and 200 mg/kg bw declined these parameters [6].

The active compounds were found in P. indica leaves such as lignans, terpenes, phenylpropanoids, benzois, tannins, flavonoids, and hydroquinone phenols, which were reported to reduce the number of spermatogenic cells and testosterone [7]. The community uses Beluntas as an anti-inflammatory, antibacterial, pathologies vaginal discharge, menstrual disturbances, and hepatoprotector drug [8][9]. Fajriyat's study reported that the administration of 945 mg and 9450 mg of beluntas extracts prolonged the metestrus and diestrus phases and shortened the proestrus and estrus phases [10].

The combination of pegagan and beluntas is used traditionally by the people of West Sumatra as fertility herbs (to get a baby), with a dose of 1 handheld consumed two times a day [9]. The results of the combination can be both synergistic and antagonistic. The results were said to be synergistic if the combinations had a more significant effect than a single use, then called an antagonist if the combination results had a smaller impact than a single application. Based on the background, It was hoped that research of combination of pegagan and beluntas in several doses would produce beneficial effects for the fertility supplement, which could be determined by vaginal cytology and histology (diestrus length, vaginal maturation index and vaginal epithelial thickness).

2 Methods

2.1 Experimental design

This study used wistar strain female rats, two months old, weight 120-150 g. The sample size was about 24 rats divided into six treatment groups; each group consisted of 4 rats as replicates.

The treatment group was divided as follows: Control (C): rats treated with extract of pegagan dose of 0 mg/kg bw + beluntas 0 mg/kg bw; T1: pegagan 25 mg/kg bw + beluntas 25 mg/kg bw; T2: pegagan 50 mg/kg bw + beluntas 50 mg/kg bw; T3: pegagan 75 mg/kg bw + beluntas 75 mg/kg bw, T4: pegagan 125 mg/kg bw + beluntas 125 mg/kg bw; T5:pegagan 200 mg/kg bw + beluntas 200 mg/kg bw.

2.2 Extraction

The fresh leaves of pegagan and beluntas were obtained from Materia Medica, Batu Malang. The procedure for the extraction referred to the process previously described by [11] [12] on C. asiatica leaves. The extract was dissolved in NaCMC 0.05% and given orally 2.5
ml daily for 15 d. The extract was administered 3 d after the injection of prostaglandin hormone 0.01 ml/head.

2.3 Vaginal Smear Method

To collect cells from the vaginal canal, approximately 0.2 ml of saline was drawn into the pipette or dropper. The tip of the dropper was gently inserted into the vaginal orifice at a depth of approximately 5–10 mm and then the saline flushed into the vagina and back out 2 or 3 times. After the lavage, a small drop of the sample was then placed evenly on the slide in a thin layer (smear) and allowed to air dry. Giemsa staining was used for the identification of the different cell types of vaginal smears [1].

A light microscope observed the result of vaginal swab with 100x magnification. The length phase of diestrus was determined by comparison of nucleated epithelial cells, cornified epithelial cells, and leucocytes on the vaginal smears. Comparison of cell types in vaginal smears and diestrus phase in estrous cycles was referred to [13]. The estrous cycle examination was performed daily for 15 d of treatment. A surgery was performed after 15 d of treatment and confirmed in the diestrus phase. The rat was sacrificed by servical dislocation and dissected at the median region of the vagina for making histology preparation with hematoxilin eosin staining. The preparation was observed and photographed. Vaginal maturation index (VMI) was described the relative proportion of parabasal, intermediate and superficial cells in vaginal cytology (PB: I:S). VMI was obtained by the following formula \((PB \times x) + (I \times 0.5) + (S \times x)\) [14]. Cell maturation evaluation was calculated at least 100 cells under a light microscope with 400 magnification, through the ratio of parabasal, intermediate, and superficial cells in one field of vision repeated up to 8 fields of view in 1 preparation [15]. The thickness of the vaginal epithelium was calculated using the Image Raster application starting from the lumen edge. This was repeated up to 8 times the field of view on one preparation.

2.4 Data Analysis

Data of diestrus length, vaginal maturation index, and vaginal epithelial thickness were analyzed using one way anova test \(\alpha \leq 5\%\). If the F count> F table then conducted a further test with Duncan Mean Range Test \(\alpha \leq 5\%\). The classification of the vaginal maturation index (VMI) 0-49 showed a low estrogen effect, VMI 50-64: moderate estrogen effect, VMI 65-100: high estrogen effect [15] [16].

3 Finding & Discussion

3.1 Diestrus Lenght

The average data of diestrus lengths were presented in Fig. 1. The results showed that rats treated with a combination of pegagan and beluntas extract experienced longer diestrus compared with control. The control (C) rats had an average length of diestrus for 47.4 ± 1.99 h. T1 had a diestrus length for 51.6 ± 2.35 h. The diestrus phase in the T2 group experienced an average length for 69 ± 1.99 h per cycle. T3, the average diestrus remained for 57± 3.11 h. The longest extension of diestrus phase was seen in T4 (dose 125 mg/kg bw) with average, ie 76.8 ± 1.93 h, while at T5, the highest dose of 200 mg/kg bw decreased the length of diestrus up to 70.8± 3.12 h.
Figure 1. The average of diestrus length for 15 days treatment.

Statistical analysis of diestrus length data showed no significant difference between treatments. The length of diestrus phase in normal rat refers to Shanon, et al., (2012) lasts 48-72 h. Thus the range of diestrus phase in each treatment group (47.4-76.8) was still in the normal category [17].

This was influenced by the content of phytoestrogens in the natural ingredients. The high content of phytoestrogens could cause a negative feedback mechanism on the hypothalamus-pituitary axis that could extend the diestrus phase and estrous cycle.

3.2 Proliferation of vaginal epithelial Vaginal Maturation Index

Observation of rat vaginal epithelial proliferation included consideration of vaginal maturation index and vaginal epithelial thickness. Vaginal maturation index reflects the level of estrogen effect on cellular maturation.

Figure 2. The average of vaginal maturation index after 15 days treatment.
The analysis of variance result revealed that the combination of pegagan and beluntas extracts affected the vaginal maturation index. The further test used DFMR (α 5%) to determine the effective dose of the treatments. The results were obtained in Fig. 2.

Fig. 2 showed the value of vaginal maturation index of the control group (C) of 25.88 ± 1.65, indicating low estrogen effect, not significantly different with T4 (21.31 ± 3.88) and T5 (33.42 ± 1.15). T3 resulted in the highest maturation index of 65 ± 1.15 (high estrogen effect), not significantly different with T2 of 60.34 ± 2.78 (medium estrogen effect), and T1 of 55.86 ± 4.06 (moderate estrogen effect) but substantially different from other treatments.

Table 1. Distribution Of Vaginal Epithelial Cells After 15 D Treatment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Cell average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parabasal (%)</td>
</tr>
<tr>
<td>C</td>
<td>66.31</td>
</tr>
<tr>
<td>T1</td>
<td>20.39</td>
</tr>
<tr>
<td>T2</td>
<td>18.10</td>
</tr>
<tr>
<td>T3</td>
<td>5.69</td>
</tr>
<tr>
<td>T4</td>
<td>66.68</td>
</tr>
<tr>
<td>T5</td>
<td>45.63</td>
</tr>
</tbody>
</table>

The high percentage of superficial cells on T1, T2, and T3 indicated that the differentiation of cells in these groups run well. A sharp decrease in superficial cell percentage occurred in T4 and T5. This suggests that the process of differentiating epithelial cells in these groups was slow. This result was proportional to the vaginal maturation index value in T4 and T5. The high percentage of superficial cells indicated high estrogen effects, whereas high parabasal cells showed a low estrogen effect in the body. Estrogen deficiency would result in decreased epithelial proliferation as well as epithelial maturation into intermediate and superficial cells. This happens because all layers were missing except the basal cell layer [18].

3.3 Vaginal Epithelium Thickness

The analysis of variance result indicated that vaginal epithelium thickness had significant differences between control and other treatments. Based on the DMRT (α 5%) results, the following notations were presented on Fig. 3. Fig. 3 revealed that the higher the dose was given, the higher the thickness of the vaginal epithelium. The highest vaginal epithelial thickness was found in T5 (0.63 ± 0.06) followed by T3 (0.53 ± 0.05), T1 (0.41 ± 0.04), T4 (0.37 ± 0.03), T2 (0.37 ± 0.03) and control (0.35 ± 0.01). Vaginal maturation index and vaginal epithelial thickness were obtained from vaginal histology. Histological profile of rat vaginal tissue treated by the combination of pegagan and beluntas extract with HE staining presented in Fig. 4. Fig. 4 showed the thickness of the vaginal epithelium and the superficial, intermediate, parabasal cell composition between treatments.
Figure 3. The average of vaginal epithelium thickness after 15 days treatment.

Safrida study (2011) revealed that ovariectomy rat fed by 100 g dry weight/kg bw/day soybean flour and tempeh flour affect length of the estrus phase, the proliferation of vagina epithelia cell, and estrogen level. Normal rat fed by 100 g dry weight/kg bw/day tempeh flour have a prolonged of diestrus phase and estrus cycle but not in soybean flour [19]. The differentiation of vaginal epithelial cells may influence the thickness of the vaginal epithelial layer. The distinction is a structural and functional change of cells to maturity. Differentiation can occur directly or indirectly through estrogen binding on each estrogen receptor (ER) α in stromal and epithelial cells. The mechanism of epithelial cell differentiation is more complicated, but it is known that epithelial differentiation events require a proliferation process first. Cell differentiation can be seen from the cytological changes in vaginal epithelial cells, i.e., parabasal cells into superficial cells in the vaginal epithelial lining. It then causes keratinization in the upper layers of the vaginal epithelium [20].

Castelo-Branco, et al., (2005) revealed that laboratory diagnosis is based on the value of vaginal maturation (VMV), can identify vaginal atrophy caused by a decreased number of a superficial cell [21]. Several hormonal and nonhormonal methods have been proposed to reduce the negative impacts caused by vaginal atrophy [22]. So far, estrogen therapy is the only effective method through which the collagen content of the skin and its thickness are improved [21].

Combination of pegagan and beluntas that contains phytoestrogens can increase the band thickness of the ERα protein [20]. The expression of ERα is much higher than the ERβ in the vagina. The Erα is required for the proliferation, stratification and keratinization of vaginal epithelial cells induced by estrogen. ERβ alone is not sufficient to mediate the estrogen effect in the absence of ERα [23]. Because of the existence of ERα, vaginal epithelial cells can proliferate in response to phytoestrogens [23] from these plants.

The effect of estrogen will be obtained optimally if using the right dose. The results showed that in the vagina, a dose of 75 mg/kg bw could give the highest effect. This was consistent with the results of the Muchtaromah (2017) study [6] which proved that the highest estrogen levels in the blood were obtained in combination of pegagan and beluntas extracts at doses of 75 mg/kg bw. At higher doses (T4) and (T5) actually had the opposite effect because of the negative feedback mechanism from the hypothalamic-pituitary-gonad axis. Raden (2011) reported that extract of Pegagan at ovariectomized rat at doses of 30 mg, 60 mg, and
120 mg/kg bw respectively as long as 40 d, increased the thickness and elasticity of vaginal wall [14].

Beluntas has active compounds such as flavonoids, alkaloids, triterpenes, tannins [24], monoterpenes or sesquiterpenes, sterols, phenols, and hydroquinones [25]. Pegagan has the main active ingredient, terpenoid, especially triterpenoid, consisting of asiaticoside, centellosida, madecassoside, brahmosida and brahminosida (saponin glycosides), asiaticentoeic acid, cential acid, centoeic acid and madecassic acid [26]. Triterpenoid saponins contain steroids called diosgenin or often called genins. Genin is used as a raw material for the synthesis of steroid hormones. It can be converted into progesterone through a series of chemical processes that produce testosterone and estradiol [5].

Saponins, alkaloids and triterpenoids allegedly entered the steroid biosynthesis pathway, especially estrogen that will produce material which has a structure similar to estrogen (phytoestrogen). Furthermore, phytoestrogens and estrogens are secreted to target cells together. They will compete in binding to estrogen receptors, consequently, the action of estrogen on target cells will decrease [27]. PEBDANI, et al. (2014) reported that participants received Ginkgo biloba extract containing phytoestrogens at doses of 120-240 mg daily for 30 d had a positive effect on the sexual desire of menopausal women [28].

4 Conclusion

The combination of leaf extract of pegagan and beluntas significantly influenced the proliferation of vaginal epithelium, indicated by the increase of maturation index and vaginal epithelial thickness, but did not affect to the length of diestrus. The highest vaginal maturation index and vaginal epithelial thickness value obtained by T4 dose of 75 mg/kg bw, thus this dose was the most optimal for use as a fertility supplement.

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References


Designing B2C Honey Bee E-Commerce System using Object Oriented Method

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Abstract. Honey is a natural product produced by bees, both sting bees and stingless bees. Both types of bees produce honey which is very beneficial for human health. Honey bee cultivation has been widely practiced in Indonesia. The need for honey annually increases both in Indonesia and in the world, but the marketing of honey products is still very simple, mostly using traditional trade. So, the utilization and improvement in the IT field is something very necessary in order market these products so that people can quickly feel the benefits. The purpose of this research is to develop Business to Costumer (B2C) e-commerce system, which introduces the benefits and products of bees (containing honey, propolis and bee pollen) and online sales. The research method consists of collecting data with interviews and literature studies; and developing system with the Rapid Application System Development (RAD) method, using object-oriented analysis and design techniques and the Unified Modeling Language (UML) as a tool. The results of this study are the establishment of an e-commerce system, that can manage product, customer, and sales data and also provide reports, as well as reduce risks in the transaction process.

Keywords: e-commerce, b2c, honey bee, object oriented analysis and design, rapid application development, uml

1 Introduction

In the current era of globalization, free trade and privatization, information technology plays an important role in terms of producing something competitive. With the existence of a global market and through all the parts covered by IT such as email, multimedia, electronic banking, internet and so on. With the existence of IT, we can use it in any case. One of them is using IT in terms of sales. Sales made using IT are certainly easier to do in terms of selling or buying. We can sell or buy items we want by using IT.

E-Commerce one of the developments of IT in terms of business activities involving consumers (consumers), manufactures, service providers and intermediaries by using computer networks (internet networks), so that they can make it easier for consumers or customers who will buy accessories so they can access via the internet and online.

Definition of E-Commerce itself, namely as one of the dynamic sets of technology, applications, and business processes that connect certain companies, consumers and communities through electronic transactions and trade in goods, services, and information...
carried out electronically [1]. It can be concluded that E-Commerce means to buy or sell electronically that is done on the internet network. E-Commerce looks more real, with the need for sellers and buyers to make transactions.

Bees are God's creatures that produce honey. Many properties are produced by honey and God commands us to be able to use honey as a medicine. Honey is a natural product produced by stinging bees and stingless bees. Both types of bees produce honey with specific phenolic and flavonoid content which is very beneficial for human health [2].

Honey bee cultivation has been widely practiced in Indonesia. The need for honey annually increases both in Indonesia and in the world, but the marketing of honey products is still very simple, mostly using traditional trade. So, the utilization and improvement in the IT field is something very necessary in order market these products so that people can quickly feel the benefits. The purpose of this research is to develop Business to Costumer (B2C) e-commerce system, which introduces the benefits and products of bees (containing honey, propolis and bee pollen) and online sales.

2 Literature Review

The bee that is currently booming is cultivated is Trigona Stingless Bee. The bee is a stingless bee that is not dangerous and can be cultivated anywhere, both in large gardens and in the land around the house. Trigona cultivation allows for those who do not have large land. Trigona is the largest genus of bees without sting. Trigona is in the Neotropic region and also throughout the Indo-Australian region. There are about 150 species that belong to this genus, which distinguishes mainly from the hind legs. The Trigona Stingless Bee classification is as follows:

- Kingdom: Animalia
- Phylum: Arthropoda
- Class: Insecta
- Order: Hymenoptera
- Superfamily: Apoidea
- Family: Apidae
- Subfamily: Apinae
- Tribe: Meliponini
- Genus: Trigona

Jurine, 1807

Stingless bee bees besides producing honey and propolis also have other benefits, namely as a pollinator. Stingless bees can become pollinators better than honeybee pollinators. Trigona SP stingless Bee can grow and develop around the house (yard, on house terraces, under the roofs of houses protected from rain. Trigona SP bee cultivation is much easier
compared to Avis Mallivera (stinging bees) because it must be done with a system of angon (migratory beekeeping), that is bees grazed in a mobile manner following the flower season of plants [4].

These are the two options for electronic trading (electronic commerce or e-commerce): Business-to-Consumer (B2C) and business-to-business (B2B). Business-to-consumer, is a process for selling products directly to consumers. B2B, which stands for business-to-business, is a process for selling products or services to other businesses. [12].

3 Research Method

This research method begins with literature study, by collecting literatures, papers, and books from prior studies that discuss about Bee, especially for the Stingless Bee, and materials about e-business and e-commerce. The next step is interviews, that asking questions to the interviewees about the process of Stingless Bee cultivation and the honey production. The next step is observation. Observation is carried out the direct observations of the trigona bee cultivation process at the Compost House of UIN Jakarta. The results obtained are bee trigona culture can produce honey propolis and bee pollen. The last step, is document review, that is collecting data by tracing and recording relevant data, like form or report documents, archives, and references at the UIN Jakarta Compost House.

For developing this e-commerce system, System development method used is the Rapid Application Development (RAD) development model [kendal]. There are three phases in RAD that involve: 1) Requirements planning phase, This phase is carried out to identify the purpose of the application or system and to identify the information requirements that arise from this goal. Orientation in this phase is solving company problems, that align with company's goals. 2) RAD design Workshop phase, This phase is to design and improve which can be described as a workshop. Analysts and programmers can work to build and demonstrate visual representations of design and work patterns to users. System Analysis and Design method that used in this study are Object Oriented Analysis and Design (OOAD) using UML tool. Process design which consists of identifying actors, identifying proposed system use cases and designing proposed system use case diagrams, database design, and interface Design. In this phase also produces a system prototype designed and improved based on user responses. If the developer is an experienced developer or user, Kendall believes that this creative effort can drive development to an accelerated level. 3) Implementation. During this implementation phase, analysts work with users intensely during workshops and design business and non-technical aspects of the company. As soon as these aspects are approved and systems are built and filtered, new systems or parts of the system are tested and then introduced to the organization.
4 Result

Bees are special creatures, created by God Almighty that provide health benefits and enjoyments to humans, so that the activity of bee cultivation is a beneficial activity for human life. This is related to the implementation of trigona bee cultivation at the composting house of UIN Jakarta.

The results of the benefits of trigona bee production which produce honey, propolis and bee pollen provide business opportunities for cultivation. The productivity of bee trigona products at Kompos UIN House is the amount of honey, propolis and bee pollen produced in one year

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Results</th>
<th>Unit of Production</th>
<th>Number per Bottle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bee</td>
<td>15.068 mL</td>
<td>250 mL</td>
<td>60</td>
</tr>
<tr>
<td>Propolis</td>
<td>27.189 gram</td>
<td>250 gram</td>
<td>109</td>
</tr>
<tr>
<td>Bee Pollen</td>
<td>6.956 gram</td>
<td>250 gram</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>197</strong></td>
</tr>
</tbody>
</table>

Resource: Elpawati & Wahyu Rochman, 2017

Details of honey bee trigona products amounted to 15,068 mL or 60 bottles of 250 mL with selling price in the domestic market averaging Rp. 150,000, - and generate revenue of Rp. 9,000,000, - propolis products amounted to 27,189 grams or 109 bottles of 250 grams per bottle and the selling price in the domestic market is averaged Rp. 250,000, - and generate revenue of Rp. 27,250,000, - while the product amounted bee pollen to 6,956 grams or 28
bottles of 250 grams with a selling price of Rp. 100,000, - and generate revenue of Rp. 2,800,000.

The largest amount of production produced by Bee Trigona at the Composite House of UIN Jakarta is the production of propolis compared to the production of honey and bee pollen. This is due to the lack of flower feed which produces nectar and pollen in the cultivation area. While foreign market participants benefit from the production of Bee trigona which produces honey and propolis, it provides business opportunities at this time, the wholesale market price of honey and propolis is around AU $ 50 per kg in Asia, the stingless beekeeping for pollination is only beginning to take root in Asia South, India and in Southeast Asia including Malaysia and the Philippines [14].

4.1 System Comparative Analysis

Based on the proposed e-commerce system design, the comparison of the system running with the proposed system is shown in Table 2 as follows:

<table>
<thead>
<tr>
<th>Current System</th>
<th>Proposed System</th>
</tr>
</thead>
<tbody>
<tr>
<td>The process of inputting orders is still via email or telephone by the consumer and recorded in Microsoft Excel by the sales department.</td>
<td>The process of inputting orders has been automated on the system online and stored directly in the database. System will automatically update stock, and produce invoice/billing transaction</td>
</tr>
<tr>
<td>Verification and validation of orders and stock checking still manually checks the stock file.</td>
<td>Order verification and validation are automated by displaying the latest stock of the items ordered.</td>
</tr>
<tr>
<td>Distribution route creation is still manual by the distribution department.</td>
<td>Making automated routes using certain formulas.</td>
</tr>
<tr>
<td>Making manual shipping and sales reports refers to order data.</td>
<td>Making automated shipping and sales reports on the system according to the data stored in the database.</td>
</tr>
</tbody>
</table>

4.2 Identification of Actors

Actors involved in this e-commerce system are grouped into 5 actors, namely Admin, Customer, Sales Division, Distribution Division and Executive. A clearer definition of the description of the roles of these actors can be seen in Table III regarding the identification of actors.
Table 3. Identification of Proposed System Actors

<table>
<thead>
<tr>
<th>No.</th>
<th>Aktor</th>
<th>Deskripsi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Admin</td>
<td>Admin is an actor who can manage accounts (create, change, and delete) on the system.</td>
</tr>
<tr>
<td>2.</td>
<td>Customer</td>
<td>Customer is an actor who can input orders, which refers to a person who buys the goods or commodity and pays the price for it. Customer can be a consumer, the one who consumes the goods.</td>
</tr>
<tr>
<td>3.</td>
<td>Sales Division</td>
<td>The Sales Division is an actor whose role is to verify and validate orders and make sales invoices.</td>
</tr>
<tr>
<td>4.</td>
<td>Distribution Division</td>
<td>The Distribution Division is an actor who can check incoming orders, make routes for distribution and make travel documents.</td>
</tr>
<tr>
<td>5.</td>
<td>Executives</td>
<td>Executives are executive level actors who can view shipping reports and sales reports</td>
</tr>
</tbody>
</table>

4.3 Identification of Use Case

Table 4 shows the interaction between actors with the proposed system which will be expressed in the form of use case identification tables. Use case is description of system functions from the perspective of external users in terminology they understand.

The system consists of several functions, there are login, order input, create an invoice, order verification and validation, manage user, view order, create distribution route, create shipping documents, view sales report, view delivery report, logout function.

Table 4. Identification of Use Case Proposed Systems

<table>
<thead>
<tr>
<th>No.</th>
<th>Use Case Name</th>
<th>Description</th>
<th>Actor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Login</td>
<td>Use case ini menggambarkan proses aktor masuk ke dalam sistem.</td>
<td>Admin, Sales Division, Distribution Division, Customer, and Executive</td>
</tr>
<tr>
<td>2.</td>
<td>Order Input</td>
<td>This use case describes the actor's process in making an order, and system will update stock automatically</td>
<td>Customer</td>
</tr>
<tr>
<td>3.</td>
<td>Order Verification and Validation</td>
<td>This use case describes the actor's process of verifying and validating incoming orders.</td>
<td>Sales Division</td>
</tr>
<tr>
<td></td>
<td>Use Case</td>
<td>Description</td>
<td>Actor(s)</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Manage Users</td>
<td>This use case describes the actor's process of managing (creating, changing and deleting) user accounts in the e-commerce system</td>
<td>Admin</td>
</tr>
<tr>
<td>5</td>
<td>View Order</td>
<td>This use case describes the actor's process in checking orders to prepare product shipments</td>
<td>Distribution Division</td>
</tr>
<tr>
<td>6</td>
<td>Create Distribution Route</td>
<td>This use case describes the actor's process in making the right order distribution route.</td>
<td>Distribution Division</td>
</tr>
<tr>
<td>7</td>
<td>Create shipping documents</td>
<td>This use case describes the actor's process in preparing shipping documents</td>
<td>Distribution Division</td>
</tr>
<tr>
<td>8</td>
<td>Create an Invoice</td>
<td>This use case describes creating invoice automatically to customer</td>
<td>Sales Division</td>
</tr>
<tr>
<td>9</td>
<td>View delivery report</td>
<td>This use case describes the actor's process in creating and viewing delivery reports</td>
<td>Executive</td>
</tr>
<tr>
<td>10</td>
<td>View sales report</td>
<td>This use case describes the actor's process in creating and viewing sales reports.</td>
<td>Executive</td>
</tr>
<tr>
<td>11</td>
<td>Logout</td>
<td>This use case describes the process of the actor coming out of the system.</td>
<td>Admin, Sales Division, Distribution Division, Customer, and Executive</td>
</tr>
</tbody>
</table>

### 4.4 Design of Proposed System Use Case

The interaction between actors with the system which will be expressed in the form of use case diagram, shown in Figure 2. It shows the interaction between actors with the B2C system.
4.5 Design of Proposed System Database Scheme

In Figure 3 is a relational database scheme for the proposed B2C e-commerce system. This is the result of mapping from the class diagram, which shows data collection in systems that are interrelated with each other and organized in the system to run processes that exist in the e-commerce system.

4.7 Design of User Interface

Figure 4, 5, and 6 show the examples of user interfaces of the e-commerce system. There are home interface of the e-commerce website, interface of product profiles and benefits, order and billing transaction interface.
Figure 3. Proposed System Database Scheme
Figure 4. Home Interface of The E-Commerce Website

Figure 5. Interface of Product Profiles and Benefits
5 Conclusion

The e-commerce system built can help to sell honey bee products online to all customers, also can manage the stock of products and billing transaction. Based on the results of black box testing, the e-commerce system that was built was in accordance with what was expected and could function properly.

This system is one of the channels to increase product sales competitiveness, it must still be supported by other channels to market this product. And if this e-commerce website wants to be implemented, it must still be supported by other promotional facilities such as advertisements to introduce online shop brands, so that customers are aware of the e-commerce system brand, and want to visit this website.

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References


Forward Chaining Algorithm to Identify \textit{Haid} and \textit{Istihadhah} based on Quran-Hadith

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\textbf{Abstract.} One of Muslim woman is lack of knowledge about distinguish \textit{haid} or menstrual blood and \textit{istihadhah} blood. A lot of women who are still confused and do not know the rules from Quran and Hadith in this regard. In addition, many people do not know about the term of \textit{istihadhah} and how to define it. This study aims to build application that can help people, especially Muslim woman, to identify \textit{haid} and \textit{istihadhah} clearly. We used forward chaining algorithm in this study, because it is simple and considered suitable for determining the identification of \textit{haid} and \textit{istihadhah} and also because the facts, rules, and goals have been clearly defined. We tested our system with questionnaire of 50 respondents. The result showed that 86\% of \textit{haid} and \textit{istihadhah} cases was correctly identify.

\textbf{Keywords:} forward chaining, haid, istihadhah

1 Introduction

Menstrual period for women is important. Especially for Muslim women, menstrual periods affect their worship activities. Many women are still confused to distinguish menstrual blood and \textit{istihadhah} blood. \textit{Haid} in the meaning of language is "flowing". As for the shari'a, \textit{haid} or menstruation is the blood that comes out from the inside of a woman's womb at certain times that is known, not because of illness or calamity, but a natural state created by God in woman\textsuperscript{[1]}, \textsuperscript{[2]}. While, \textit{istihadhah}'is blood that goes outside the days of menstruation and childbirth, not with good causes (a disease) that out from the womb. There are several factors and differentiation of menstrual blood and \textit{istihadhah} blood, either based on the type and color of blood, the time of blood discharge, the duration of blood, and so forth.

With Information System (IS) in this era, knowledge of menstruation and \textit{istihadhah} can be stored and accessed at any time. IS is a combination of information technology and human activity that uses computerized technology \textsuperscript{[3]}. Information system is a system that processes data in an organized way\textsuperscript{[4]}, information system has a high level of flexibility that allows development into a better system\textsuperscript{[5]}. Based on many research findings, the information system has advantages in terms of: good data accessibility\textsuperscript{[6]}, time efficiency\textsuperscript{[3]}, accuracy \textsuperscript{[7]}, supporting decision appropriately \textsuperscript{[8]}, efficient/low cost\textsuperscript{[9]}, broad accessibility\textsuperscript{[10]}, improving
Implementation of IS can help women to identify menstrual blood and istihadhah with accurate and detailed. This certainly helps dispel doubts whether a woman is having menstruation or istihadhah. So, this study this study utilizes technology with Forward Chaining algorithm to identify menstruation and istihadhah. Forward Chaining is a rule-based algorithm that is simple and easy to implement. Many studies use Forward Chaining to solve problems, such as decision support, predicting a case study, expert systems, and so on. The level of accuracy that produced by the forward chaining algorithm is also quite high, depending on whether the rules are given have been completed or not yet. Because Forward Chaining requires clear rules and goals. Based on previous research, there are no research that specific to build the system to solve and identify about haid and istihadhah.

Haid and Istihadhah are identified and grouped into 7 categories, among others: Muqtadiah Mumayyizah, Muqtadiah Ghoiru Mumayyyizah, Mu'tadah Mumayyizah, Mu'tadah Ghoiru Mumayyyizah Dzakirotun Li Adatitha Qodron Wa Qodron Waqti, Mu'tadah Ghoiru Mumayyyizah Nasiyayun Li Adatitha Qodron Wa Qodron Waqti, Mu'tadah Ghoiru Mumayyyizah Dzakirotun Li Adatitha Qodron La Waqti, and Mu'tadah Ghoiru Mumayyyizah Dzakirotun Li Adatitha Qodron La Waqti. For each category will be explained completely including with its laws based on the Quran and Hadith in Section II.

2 Research Methodology

This research is a conceptual design that developed from prototype of information system for the identification of menstruation and istihadhah. Systematics and design stages use the Research and Development (R&D) model with the final product of software. The design of prototype is limited to conceptual design. R&D model is dominant applied for technology development that have 3 activities, among others basic research, applied research, and development research. In this study, knowledge about menstruation and istihadhah is used as basic research, and for applied research we have Forward Chaining algorithm for identifying haid and istihadhah. Then, in development we used software engineering with object oriented analysis and design, because it is powerful modeling.

3 Result and Discussion

3.1 Understanding Haid and Istihadhah based on Quran-Hadith

With information technology in this era, knowledge of menstruation and istihadhah can be stored and accessed at any time. Included in helping women to identify menstrual blood and istihadhah with accurate and detailed. This certainly helps dispel doubts whether a woman is having menstruation or istihadhah. According to the Quran, Surah al-Baqarah verse 222 which means: "And they ask you about menstruation: say, "It is harmful, so keep away from women during menstruation. And do not approach them until they have become pure. Once they have become pure, approach them in the way God has directed you." God loves the repentant, and He loves those who keep clean."", explains that menstruation is dirty blood that
naturally comes out of a woman's womb. This verse shows that God gives clues about the period of menstruation that ends after the sacred, that is after the dry and the cessation of blood. Not depending on the number of days. So that, the basis of law or benchmark is the presence of Haid's blood itself. If there are blood and its nature so it is a menstruation, then apply the law of menstruation. But if not found blood or its nature is not menstrual blood, then do not apply menstrual law to her. Shaykh Ibn Utsaimin added that if there is indeed a certain day limit in the period of menstruation, there must be from the Quran and Hadith that explain this. Shaykh Islam Ibn Taimiyah said: "In principle, every blood that comes out of the womb is menstruation. Unless there is evidence to suggest that the blood is Istihadhah." [28].

The limit of time period of menstruation is also explained according to the Shafi’iyah Ulama the minimum period of menstruation is a day and night, and the maximum limit is 15 days. If more than 15 days then blood is Istihadhah blood and obligatory for the woman to bathe and pray. Meanwhile, Imam Ibn Taimiyah in Majmu’ Fatawa said that there is no definite limit on the minimum and maximum period of menstruation. And this opinion is the most powerful and the most reasonable, and agreed by most scholars, including Shaykh Ibn Uthaimin also took this opinion. The indicator of the completion of menstrual period is the presence of white clots or mucus (such as whiteness) that comes out of the way of the uterus. However, if you do not find any white mucus, it can be checked with white cotton is inserted into the vagina. If the cotton does not contain any spots, and is completely clean, it is mandatory to take a bath and pray. The law of women who are menstruating according to Islamic law, among others: forbidden at the time of menstruation to have sex, forbidden menstruating women to perform prayers and fasting, forbidden women menstruation do thawaf in Ka’ba, and and some other law that there are differences of opinion among fiqh scholars and return to the understanding and belief respectively.

Meanwhile, istihadhah is a blood that comes out of the habit, which is not in the period of menstruation and not also due to childbirth so often referred to as blood disease. Imam Nawawi in Sharah Muslim said that istihadhah is a blood flowing from the female genitals that are not in time. Women who experience istihadhah matters become vague because of the similarity between menstrual blood and istihadhah. If the blood comes out of it continuously or for a long time it will be difficult to determine when the time is considered as the period and when the time is considered as istihadhah period, where prayer and fasting are not abandoned because of it.

The color of blood coming out of a woman's womb also affects the identification between menstruation and istihadhah. The color of the blood include: dark red (dark brown), red, yellowish red, yellow, and yellow whitish (cloudy). Dark Red Blood (Old Brown) is strong blood. Red blood is weak when compared to blood Blackish black (brown old), and strong when compared to yellowish red blood. Yellow blood is stronger than Yellow blood. Yellow blood is stronger than yellowish white blood (Snoring).

In terms of circumstances Istihadhah divided into 7 Groups, following the name of the class and its explanation:

1. Mubtadiah Mumayyizah is the first woman to menstruate and able to distinguish the blood of both nature and color. The laws are the strong blood (see color difference) is menstruation, the weak blood is Istihadhah. With detail conditions, among others: strong blood is not less than the minimum limit of menstruation (more or more 24 hours), strong blood does not exceed the maximum limit of menstruation (15 days, 15 nights), weak blood is no less than the sacred minimum (15 days, 15 nights), or weak blood must be continuous (unbroken). If one of the those conditions does not exist, then it can not be classified to Mumayyizah. For example: there was a woman
who that the blood flows for the first time for 20 consecutive days, 3 days red blood black (strong blood) and 17 days red blood (weak blood). So we can identify that the menstruation period is 3 days, and the istihadhah is 17 days. Another example, there is a woman has black blood for 5 days, yellow blood for 17 days, and black blood again for 6 days. So, the menstruation period is 5 days, Istihadhah is 17 days and menstruation again for 6 days.

2. Mubtadiah Ghairu Mumayyizah is category for a women who first menstruate who are not able to distinguish blood either nature or color. The law is when she knows or remember the first time her blood flowed, then the menstruation is 1 day 1 night (24 hours), and the sacred for the next days. But, if she does not know or remember her blood flowed time, then she is categorized as Mutahayiroh. For example: women come out blood for 17 days with the same color and nature. So, it can be punished menstruation 1 day 1 night, else is Istihadhah. Alternatively, the woman bleeds as follows: 20 days of red blood and yellow blood 6 days. Because of the red strong blood longer than the maximum limit of menstruation (15 days 15 nights), then her first menstrual is 1 day and istihadah his 25 days later.

3. Mu’adah Mumayyizah when a women who regularly menstruate and are able to distinguish blood either nature or color. The law is strong blood of menstruation, weak blood of istihadhah. Even though, contrary to her menstrual habits. For example, women have a habit of bleeding for 5 days at the beginning of each month (1 to 5). And in the other month he was out blood for 25 days, with dark red blood for 10 days and red blood 15 days, so that the menstruation is 10 days (due to strong blood) and Istihadhah is 15 days. Or, the woman has had menstruation experience as follows: yellow blood for 12 days and red blood 7 days, so the menstruation is 7 days and the istihadhah is 12 days. In Mu’adah Mumayyizah, determination of menstruation with a look of strong blood did not look at the history of menstruation of the month before.

4. Mu’adah Ghairu Mumayyizah Dzakirotun Li Adatiha Qodron Wa Waqtan, is for a women who do not able to distinguish blood but remember the first time and duration of menstrual habits. The law is returned to custom and time, it means that it can be judged by the habit in the previous month. For example, the women usually menstruate for 7 days at every beginning of the month. This month she bleeds for 17 days. She also can not distinguish the color of blood, or his blood comes out with 1 color. So we can identify that her menstruation is 7 days because in equated with the previous month's curiosity, and the last 10 days is istihadhah.

5. Mu’adah Ghairu Mumayyizah Nasiyatun Li Adatiha Qodron Wa Waqtan, women who have been menstruating and forget the customs or habits both the duration and the beginning of menstruation. For example: a woman who bleeds for 20 days and her blood can not be distinguished, it means that her blood is only 1 color, or blood can be distinguished but can not be identified because she forgot about menstruation also its time. The law for her the menstrual law in the matter of the forbidden, such as have a sex, but the sacred law in the matter of Obligation (Salat, fasting, thawaf, thalaq, i’tikaf, and must take a bath every do those obligation).

6. Mu’adah Ghairu Mumayyizah Dzakirotun Li Adatiha Qodron La Waqtan, for a women who have been menstruating and sacred, and also remember the customs or habits for menstruation duration but not remember for the beginning of menstruation time. For example: a women usually menstruate for 5 days in the first 10 days and she does not know the start. But she knows and believes that the first day she was holy.
And this month she came out full blood for a month. So the law is in the sixth day is menstruation, for first day is not menstruation same as the last 20 days. As for the second day until the fifth day there is a possibility can be menstruation or can be not. Likewise, for seventh day to tenth there is a possibility like that too (can be menstruation or can not be).

7. *Mu’ātadah Ghoiru Mumayyīzah Dzakirotun Li Adatiha Waqtan La Qodronis* for a woman who has been menstruating and remember its start time but not with the time duration. For example: there is a woman who usually menstruate at the beginning of the month but do not know how long, and in this month the blood flows for a month. So the law is: The beginning of the month sure menstruation, and for the next day there is the possibility of menstruation or not.

### 3.2 Analyzing Rule of Haid and Istihadhah as Knowledge for Forward Chaining

Forward Chaining is one of rule based algorithm that give the best decision or answer or conclusion from the facts (represented by rules). That rules is to be knowledge base for system to learn every facts that given. The mechanism of the forward chaining begins by added a set of facts into memory, then matching those facts to the IF part of the IF-THEN rules. If there is a fact that matches the IF section, then the rule is executed. When a rule is executed, a new fact (THEN part) is added to the database. Each time the matching starts from the top rule. Each rule can only be executed once. The matching process stops when there is no more executable rule or has reached a goal or no longer a rule whose premise matches the with the fact. Searching technique that can be used for forward chaining among others, depth-first search, breadth-first search, and best-first search. In this research we used depth-first search because of the rules are not too many and according to the needs of identifying menstruation and *istihadhah*.

Based on the explanation about menstruation and *istihadhah* above, we have 5 variables or parameters that influence identification process. Then, we have 7 categories as a result of identification of menstruation and *istihadhah* based on Quran-Hadith. Table I describes about code of variables and result, “V” for variables and “H” for result. Then Table II describes about relationship between variables and results that can be represented by decision tree (described in Fig. 1) and rules (describes in Table III).

<table>
<thead>
<tr>
<th>Code</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>It has been menstruation</td>
</tr>
<tr>
<td>V2</td>
<td>Know the characters of blood</td>
</tr>
<tr>
<td>V3</td>
<td>Understand the terms of good and bad about menstruation</td>
</tr>
<tr>
<td>V4</td>
<td>Remember the menstrual duration.</td>
</tr>
<tr>
<td>V5</td>
<td>Remember the first menstrual time</td>
</tr>
<tr>
<td>H1</td>
<td>Mu’tadiahMumayyīzah</td>
</tr>
<tr>
<td>H2</td>
<td>Mu’tadiahGhoiruMumayyīzah</td>
</tr>
<tr>
<td>H3</td>
<td>Mu’ātadahMumayyīzah</td>
</tr>
<tr>
<td>H4</td>
<td>Mu’ātadahGhoiruMumayyīzahDzakirotun Li AdatihaQodronWaWaqtaan</td>
</tr>
<tr>
<td>H5</td>
<td>Mu’ātadahGhoiruMumayyīzahNasiyatun Li AdatihaQodronWaWaqtaan</td>
</tr>
<tr>
<td>H6</td>
<td>Mu’ātadahGhoiruMumayyīzahDzakirotun Li AdatihaQodron La Waqtaan</td>
</tr>
<tr>
<td>H7</td>
<td>Mu’ātadahGhoiruMumayyīzahDzakirotun Li AdatihaWaqtaan La Qodron</td>
</tr>
</tbody>
</table>
Table 2. The Relationship between Variables and Result of Haid and Istihadhah

<table>
<thead>
<tr>
<th>Code</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>V5</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>H5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>H6</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>H7</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 3. Rules Representation of Haid and Istihadhah Identification

<table>
<thead>
<tr>
<th>Rules</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>IF V1 = No AND V2 = Yes AND V3 = Yes THEN H1</td>
</tr>
<tr>
<td>R2</td>
<td>IF V1 = No AND V2 = Yes AND V3 = Yes THEN H1</td>
</tr>
<tr>
<td>R3</td>
<td>IF V1 = No AND V2 = Yes AND V3 = No THEN H2</td>
</tr>
<tr>
<td>R4</td>
<td>IF V1 = Yes AND V2 = Yes AND V3 = No THEN H2</td>
</tr>
<tr>
<td>R5</td>
<td>IF V1 = No AND V2 = No AND V3 = No THEN H2</td>
</tr>
<tr>
<td>R6</td>
<td>IF V1 = No AND V2 = No AND V3 = No THEN H2</td>
</tr>
<tr>
<td>R7</td>
<td>IF V2 = No THEN V3 = No, IF V3 = No AND V1 = No THEN H2</td>
</tr>
<tr>
<td>R8</td>
<td>IF V3 = No AND V1 = No THEN H2</td>
</tr>
<tr>
<td>R9</td>
<td>IF V1 = Yes AND V2 = Yes AND V3 = Yes THEN H3</td>
</tr>
<tr>
<td>R10</td>
<td>IF V1 = Yes AND V2 = Yes AND V3 = Yes THEN H3</td>
</tr>
<tr>
<td>R11</td>
<td>IF V1 = Yes AND V2 = Yes AND V4 = Yes AND V5 = Yes AND V3 = No THEN H4</td>
</tr>
<tr>
<td>R12</td>
<td>IF V1 = Yes AND V2 = Yes AND V4 = Yes AND V5 = Yes AND V3 = No THEN H4</td>
</tr>
<tr>
<td>R13</td>
<td>IF V1 = Yes AND V4 = Yes AND V5 = Yes AND V3 = No THEN H4</td>
</tr>
<tr>
<td>R14</td>
<td>IF V1 = Yes AND V4 = Yes AND V5 = Yes AND V2 = No AND V3 = No THEN H4</td>
</tr>
<tr>
<td>R15</td>
<td>IF V2 = No THEN V3 = No, IF V3 = No AND V1 = Yes AND V4 = Yes AND V5 = Yes THEN H4</td>
</tr>
<tr>
<td>R16</td>
<td>IF V2 = No THEN V3 = No, IF V3 = No AND V1 = Yes AND V4 = Yes AND V5 = Yes THEN H4</td>
</tr>
<tr>
<td>R17</td>
<td>IF V1 = Yes AND V2 = Yes AND V3 = No AND V4 = No AND V5 = No THEN H5</td>
</tr>
<tr>
<td>R18</td>
<td>IF V1 = Yes AND V2 = Yes AND V3 = No AND V4 = No AND V5 = No THEN H5</td>
</tr>
<tr>
<td>R19</td>
<td>IF V1 = Yes AND V2 = No AND V3 = No AND V4 = No AND V5 = No THEN H5</td>
</tr>
<tr>
<td>R20</td>
<td>IF V1 = Yes AND V2 = No AND V3 = No AND V4 = No AND V5 = No THEN H5</td>
</tr>
<tr>
<td>R21</td>
<td>IF V2 = No THEN V3 = No, IF V3 = No AND V1 = Yes AND V4 = No AND V5 = No THEN H5</td>
</tr>
<tr>
<td>R22</td>
<td>IF V2 = No THEN V3 = No, IF V3 = No AND V1 = Yes AND V4 = No AND V5 = No THEN H5</td>
</tr>
<tr>
<td>R23</td>
<td>IF V1 = Yes AND V4 = Yes AND V2 = Yes AND V3 = No AND V5 = No THEN H6</td>
</tr>
<tr>
<td>R24</td>
<td>IF V1 = Yes AND V4 = Yes AND V2 = Yes AND V3 = No AND V5 = No THEN H6</td>
</tr>
<tr>
<td>R25</td>
<td>IF V1 = Yes AND V4 = Yes AND V2 = Yes AND V3 = No AND V5 = No THEN H6</td>
</tr>
<tr>
<td>R26</td>
<td>IF V1 = Yes AND V4 = Yes AND V2 = No AND V3 = No AND V5 = No THEN H6</td>
</tr>
<tr>
<td>R27</td>
<td>IF V2 = No THEN V3 = No, IF V3 = No AND V1 AND V4 AND V5 = No THEN H6</td>
</tr>
</tbody>
</table>
Rules | Descriptions
---|---
R28 | IF V2=No THEN V3=No, IF V3=No AND V1=Yes AND V4=Yes AND V5=No THEN H6
R29 | IF V1=Yes AND V2=Yes AND V5=Yes AND V3=No AND V4=No THEN H7
R30 | IF V1=Yes AND V2=Yes AND V5=Yes AND V3=No AND V4=No THEN H7
R31 | IF V1=Yes AND V5=Yes AND V2=No AND V3=No AND V4=No THEN H7
R32 | IF V1=Yes AND V5=Yes AND V2=No AND V3=No AND V4=No THEN H7
R33 | IF V2=No THEN V3=No, IF V3=No AND V1=Yes AND V5=Yes AND V4=No THEN H7
R34 | IF V2=No THEN V3=No, IF V3=No AND V1=Yes AND V5=Yes AND V4=No THEN H7

![Decision tree representation of Haid and Istihadhah identification](image)

**Figure 1.** Decision tree representation of Haid and Istihadhah identification

**Table 4.** Result of Haid and Istihadhah Experiment

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Result by System</th>
<th>Manual</th>
<th>Keterangan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YES YES YES NO NO</td>
<td>✔</td>
<td>H3</td>
<td>Correct</td>
</tr>
<tr>
<td>2</td>
<td>YES NO NO NO YES</td>
<td>✔</td>
<td>H7</td>
<td>Correct</td>
</tr>
<tr>
<td>3</td>
<td>YES NO NO YES YES</td>
<td>✔</td>
<td>H4</td>
<td>Correct</td>
</tr>
<tr>
<td>4</td>
<td>YES NO NO YES NO</td>
<td>✔</td>
<td>H6</td>
<td>Correct</td>
</tr>
</tbody>
</table>
3.3 Software Development and Evaluation

We built a web-based application to test whether the Forward Chaining algorithm that we used to identify menstruation and istihadhah is well enough and able to provide an accurate conclusion. Using 5 variables or input parameters, 7 result groups, and 34 rules, Forward Chaining successfully identified menstruation and istihadhah with an accuracy of about 86%. This accuracy is obtained from 50 case studies of women's menstrual experience (as
respondents). Using a simple statistical formula, 43 of 50 cases can be identified by the system appropriately, while the other 7 are incorrect. This is because some of the possibilities error, such as in the process of identifying input variables is wrong or the absence of results that refer to the answer. This proves that Forward Chaining depends heavily on complete or incomplete, correct or incorrect rules that defined as its knowledge base. Table IV shows the result of experiment of this study.

Blood color analysis can be performed to identify menstruation or istihadhah, further development of the system may involve the introduction of color as a database to express menstruation or istihadhah. One model that can be developed is software that presents information in the form of multi-media, especially images. Through the use of multimedia, in addition based on the time of menstruation, women can learn to distinguish menstruation and istihadhah based on blood color. In education, multimedia can be used as instructional media or personal learning media[29]. The use of multimedia for instructions has enhancing the learning effectiveness of learning [30], enhancing learning motivation[31], and improving the level of understanding [32]. Further development that can be developed is to convey various variants of information from women fiqh, given the fatwa of various scholars have a variety of styles.

4 Conclusion

Haid and istihadhah is important knowledge for woman, especially for Muslim because it deals with what should and should not be done during menstruation. Not a few women are confused whether the blood coming out of their wombs is menstrual blood or not. This study helps solve the problem, to identify menstruation and istihadhah by applying the Forward Chaining algorithm. Experimental results show that Forward Chaining is able to identify menstruation and istihadhah well. The error in the identification due to the rules that do not accommodate the possibility of a particular case. So for future research, rules need to be analyzed and replenished so that all possible cases can be resolved. In addition, this research can be developed into expert system research or data mining so that more powerful.

References


Searle’s Speech Act in Hamdan bin Muhammad’s Tweets on Twitter

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Abstract. Speech act is one of the theories to study utterance in the scope of pragmatics. Because utterance is not only orally but also in written, this study describes theory of speech act in the tweets on twitter. This study concerns with the twitter of Hamdan bin Muhammad's account, a crown prince of Dubai. The formulation of the problem in this study is the various speech acts in Hamdan bin Muhammad's tweets on twitter. It used descriptive-qualitative methods with the primary data source Muhammad's story on Twitter. The secondary data sources comprise comments of the tweets, books and journals related to pragmatics and speech act theory. The results show the existence of Searle's speech act in Muhammad's tweets covering assertive, directive, expressive and declarative speech act. In his tweets Muhammad's tweets were mostly in the form of expressive speech act to show his feeling of happiness, pride, gratitude and positive mood to share with others.

Keywords: expressive speech act; pragmatics; twitter.

1 Introduction

Humans are social beings who communicate with language. Language itself has two forms, written and spoken. As for its use, humans use both in communication. By using language, humans can convey the desired message and meaning to the speech partner. After the message is conveyed to the speech partner, the speaker will get a comment or response from the speech partner.

Comments and responses from speech partners are one of the language phenomena incorporated in the theory of speech acts on pragmatic science. Speech act theory itself was developed by one of the philosophers, John Searle [1] [2]. Speech acts discuss the meaning associated with speech and deeds [3]. It involves five parts, namely assertive, directive, expressive, commissive, and declarative [2] [4].

This theory is used to get the meaning of utterance that cannot be separated from it situational context. For example, the expression ‘thank you!’ can be mean either ‘i thank to you for the chance’ or ‘i refuse this chance’. Moreover, for Searle, the eventuality that the interlocutor fails to answer Thank you does not affect the meaning of the first speech act (and the meaning of Thank you, too, is independent from whatever preceded it) [5].

Every person uses language to express their idea, exchanges their opinions and feelings, and conveying humanitarian news [6]. So that, they can’t think without language [7]. And there are two kinds of languages, spoken language and written language. These two kinds of
languages are used by people in their daily communication [7] [8]. Which is the written language is used in the social media as a tool of communication.

The language phenomenon in the study of speech acts also can occur on social media. Social media are used for communicating with a number of people (relations, colleagues, friends) through electronic services, which provide fast information delivery on a large scale. The social media not only gives information, but also synchronize and interact with people while providing users with this information to exchange the information through the internet immediately [9].

Including twitter, the todays social media that grow explosively providing millions of people opportunity to make and share content with the unimaginable situation a few years ago. Because of this widespread information about content, it is natural to target one’s messages to highly connect people through social networking. This is especially apparent in twitter, which is one of the fastest growing social networks on the internet [10].

An example of speech acts that occurred on twitter was Hamdan bin Muhammad's tweet on December 6, 2017 below.

“وقنا آمنة، فلنستلمه في الخير. أطلقت اليوم مبادرة #اليوم_لدبي لترسيخ مكانة دبي على الساحة العالمية كأكبر مدينة معتدلة. شاركون في dayfordubai.com”. This tweet is about his invitation to the people of Dubai to help each other and fix it to be a different city and strengthen Dubai's position as a big city with good tolerance. So with the existence of these tweets, it can influence the people of Dubai and will get comments and responses from followers on Hamdan's twitter.

Hamdan bin Muhammad was the second child of Muhammad bin Rashid al Maktoum. In other words, he is the crown prince of Dubai. So, he has a great influence on what he cited through twitter to the people of Dubai.

The formulation of the problem in this study is what types of speech act according to Searle in Hamdan bin Muhammad's tweets on twitter.

2 Theoretical Framework

2.1 Speech Act

Speech act is one of the fields in pragmatic science discovered by John Austin and his student John Searle. The speech act is an act or action taken based on someone's speech or expression [11]. Speech acts are the actions performed in saying something [12]. The action would be performed when the utterance produced can be analyzed on three various levels These three various levels are locutionary act, illocutionary force, and perlocutionary effects [13] [14] [15].

Locution is ‘what is said’, the form of the word uttered. So, locutionary act is known as the act of saying something [14]. Illocutionary force is what the speaker’s doing with his words, what is done in uttering the words, the specific purpose that the speaker has in his mind [14]. This illocutionary force known as the act of doing something. Perlocutionary effect is the result of the words, or what is done by uttering the word. So, it is the effect on the hearer, the hearer’s reaction of the utterance [14]. This perlocutionary effect known as the act of effecting something [16].

The center of speech act is found in illocutionary act, so illocutionary act also can be called as the speech act theory [17]. Realising that the Austin’s speech act don’t enough to describe the specific classification meaning of the illocutionary act, Searle divided the theory
of speech acts into five types; assertive, directive, expressive, commisive, and declarative [11] [17].

Assertive is a speech act that states the truth that is believed by speakers [18]. The form of assertive speech acts in the form of a statement of fact, description of something, and a conclusion. In other words, it can be shown in the word of describing, claiming, hypothesising, insisting and predicting [14].

Directive is a speech act that expects someone to do an act based on the will of the speaker. This type of speech act shows the desire of speakers [18]. The form of governing directive speech acts, requests, suggestions, etc. Also can be stated in the form of commanding, inviting, and forbidding [14].

Expressive is a speech act that expresses the feelings or emotions of the speaker. This expressive statement is a form of the psychological statement of the speaker [18]. The form of expressive speech acts in the form of apologies, thanks, expressions of happiness, sadness, condolences and everything that shows emotion in it.

Commisive is a speech act that states the relationship between speakers and the future in accordance with their speech [18]. The forms of commisive speech acts are in the form of promises, pledges, threats, etc. Theses forms are also shown at the state of offering, refusing, vowing and volunteering [14].

Declarative is a speech act that states a change that occurs through speech [18]. Expression and word that change the world by the speaker’s utterance. The form of declarative speech acts is a declaration of something.

3 Research Method

In terms of research design, this study is library research. The method of this research is qualitative-descriptive which requires a description and explanation in the form of writing and narration and does not use numbers in explaining the results of the research [19].

The researcher used the descriptive method to describe the manifestations of language, regardless of the attempt to create ills such as causes. In other word, researcher describe datas in words, not in numbers [20]. The data sources used by researchers are the primary data sources and secondary data sources. The primary data in this research is Hamdan bin Muhammad's tweet. Secondary data cover the comments of his tweets, books and journals related to pragmatic science.

In collecting data, it employs the documentation method. By taking the tweets starting from December 2, 2017 until January 31, 2018. The tweets were stored using screenshot as an image storage device.

The analysis using descriptive-qualitative method was done by examining the tweets to analyze the story [21]. The purpose it to find out the conditions and intentions the tweet as well as the comments including the situational context around the story.

4 Findings and Discussion

The following are tweets, conditions and meanings and types of speech acts used on twitter.
4.1 Datum one

On that day, there was a celebration of Dubai's Independence Day, so Hamdan devoted his feelings to twitter. The intention in Hamdan's tweet is that he feels proud of Dubai's independence which has been running for forty six years which has succeeded against the invaders. He also invited Dubai citizen to foster a sense of love for the country as what had been taught by previous heroes, so that it could be a pride for the nation.

4.2 Datum two

There was a gathering for the establishment of a government agenda for 2018 on that day. At the same time there has been notification of what achievements Dubai had obtained during 2017.

4.3 Datum three

The tweet is related to the event when he won the race on government activities with the program he brought. It is a program to educate the government with a product called "Montaji" which was based on the votes of the general public. The intention that Hamdan wants is to thank all the people and all parties who have supported him to win the race.

4.4 Datum four

There was a gathering between the people of the Dubai government who were talking about the 2017 Dubai economic report.

The meaning by his tweet is that Hamdan’s team was satisfied and accepted the 2017 economic report. This economic report highlights the main developments in several sectors and also as a whole.
Regarding the type of speech act found in Hamdan bin Muhammad's tweet, it is categorized as assertive speech act. This tweet is classified as an assertive type of speech because there is a description form that occurs in the sentence: "الذي يستأثرب "أهام التواترات في اقتصاد دبى إلاّ عاملاً و ناسرًا تائهًا و كما أن فائدة اقتصادنا خليلاً حاصلًا".

4.5 Datum five

He tweeted in time with the New Year celebration. Hamdan's intention in the tweet above is to congratulate the coming of the New Year to the wider community of Dubai. The tweet mentions sweet memories and beautiful events that can be stored.

The type of speech act contained in this tweet is expressive speech act. It is categorized as Expressive speech act because he shows his happy feelings and shows what he likes with the phrase "ما لسلامة يا أجمل الذكرياتي".

4.6 Datum six

"اللقاء اليوم سيرجي برين، المؤسس الشريك لغوغل، ورئيس شركتها الأم، التفايت إلك، سيرجي وصديقته لاري بيج أسسا غوغل من غرفة تفاعلاً في سكينها الجامع لتصبح قيمتها السوقية حالياً تقدر بأكثر من 60 مليار دولار. هدفها كان تنظيم المعروفة وجعلها متاحة للجميع".

At the moment he tweeted this was due to a meeting between Hamdan bin Muhammad as one of Dubai's representatives who took care of Dubai's economy and Sergey Brin as google's inventor and google's owner. His intention to tweet it on his personal twitter account is to provide information about how great Google companies are.

The type of speech act contained in Hamdan's tweet above is assertive speech act which contains an overview of Google's company development and the provision of information about its meeting with Google company owners.

4.7 Datum seven

"محمد بن راشد وجه جميع مراكز خدمة المتعاملين في مختلف مناطق دبي أن تقدم مستوى تميز من الخدمات.. وسعادة المتعاملين هي المحفظ لمزيد من التطور والتقدم في مسيرة الخدمات الحكومية".

On that day, Hamdan visited the control passport department. His intention to tweet is Mohammad bin Rashid requests the development of an employee’s services, then they can reach the excellent services to the customers. The type of speech act contained in Hamdan's tweet above is directive speech act the sentence "محمد بن راشد واجب جميع مراكز خدمات المتعاملين في مختلف مناطق دبي أن تقدم مستوى تميز من الخدمات.. وسعادة المتعاملين هي المحفظ لمزيد من التطور والتقدم في مسيرة الخدمات الحكومية".

4.8 Datum eight

"بين القائد والقائد في ظل زايد الخير".

#عام_زايد"
He tweeted when he is attending the graduation ceremony of the police academy. His intention to tweet it is saying congratulation to the graduate police and the head commander of the police. It will be a good police under the great commander. So, the type of speech act contained in this tweet is expressive speech act through the phrase "fi zili zayid alkhayra"

4.9 Datum nine

"ابروح الفريق الواحد يمكننا أن نحدث التغيير وتنجز الكثير.. قضيت يوم غير تقليدي مع فريق في
مجلس التدفني لتغيير روح الفريق وتشجع الهمم للمرحلة القادمة. أدعو جميع المسؤولين بالتركيز على فرق العمل
وترعى الروح الإيجابية فيها"

The tweet is in the occasion that Hamdan collected the executive council to strengthen the spirit of the team and sharpen the attention to the next stage. He asked all officials to focus on the task forces and to improve their positive spirit. The type of speech act contained in Hamdan's tweet above is directive speech act by the word “adeu”

4.10 Datum ten

"شهدت اليوم تخريجي دفعتين من جامعة حمدان بن محمد الذكية.. الرحلة مستمرة من أجل تطوير
أساليب التعليم وتبني الإبداع والابتكارات الذكية وأحدث الابتكارات لمواجهة المستقبل والمتغيرات على الساحة العلمية
الدولية"

He tweeted this when he was attending the graduation of two batches of Hamdan Bin Mohammed Smart University. He shows his proud of this university, the development on the methods of education, adoption of creativity, smart technologies and the latest innovations to face the future and changes in the international scientific arena. The type of speech act contained in Hamdan's tweet above is expressive speech act, because of his pride to the university.

5 Conclusion

This study found four types of Searle’s speech act in Hamdan bin Muhammad's tweets on twitter. These types of speech act are assertive, directive, expressive, and declarative. There is no commissive speech act founded in Hamdan bin Muhammad's tweets on twitter. The details finding of this study is fifteen (15) assertive speech acts, ten (10) directive speech acts, twenty (20) expressive speech acts and five (5) declarative speech acts.

From the results above, the researchers concluded that the most frequent type of speech acts that used by Hamdan bin Muhammad’s in his tweets is expressive speech acts. Whereas he rarely wrote his tweet on twitter in the form of commissive speech acts. It reflects that the utterance of elite like a crown prince has the specific pattern where the focus is on showing the feeling of happiness, pride, gratitude and positive mood to share with others.

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References


The Information Structure of Clause in The Qur’ān: Corpus Based Study of Functional Grammar

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Abstract. This research investigates the information structure of Theme and Rheme in the Qur’an. Theme is defined as the given information and the Rheme is considered as the new information. Arabic clause is divided into two basic information structures (Theme + Rheme) in the (mubtada + khabar) and (fi‘l + fā‘il). The main data in this research was collected from the Quranic Arabic Corpus (QAC). The first problem in this research is to describe the grammatical aspect of triliteral root sīn hamza lām (TRSHL) in the clause of Qur’ānic Arabic Corpus. The second problem is to elaborate the triliteral root sīn hamza lām in the construction of Theme and Rheme, this triliteral root occurs in the Qur’an 129 times, in six derived forms. This triliteral root was selected to become the model of the other and the next research about the triliteral root at the Qur’ānic Arabic Corpus. Therefore, the annotation of Corpus in Qur’ān had been developed by investigating the information structure based on the Arabic roots. The lack of annotation in the Qur’ānic Corpus can be filled by the data mining about the (Theme + Rheme) construction based on the triliteral root at Qur’ān.

Keywords: data mining on Qur’an; Theme and Rheme; given information; new information; Quranic Arabic Corpus; Arabic root.

1 Introduction

The study of annotation has the significant role in the process of developing the data mining in Qur’ān. One of annotation study in Qur’ān can be elaborated from the analysis of Theme and Rheme. Theme is defined as the given information and Rheme is defined as the new information. The Theme and Rheme in Arabic language can be investigated from two types of clause in Arabic language which is constructed from (mubtada’ + khabar) and (fi‘l + fā‘il). The following verse is the example:

اﻫﺒﻄﻮا ﻣﺼﺮا ﻓﺈن ﻟﻜﻢ ﻣﺎ ﺳﺄﻟﺘﻢ
Ihbithū mishran fainna lakum mā sa’altum
Go into (any) settlement and indeed, you will have what you have asked (2:61)

By elaborating the example at Qur’ān verse (2:61), we can conclude that there are two components of information structure. First, the information structure found in the first clause is (fi‘l + fā‘il), “ihbithūmishran”. The word “ihbithū” is considered as the given information. It means that the speaker and the listener have known the information; the new information in this clause is “mishran”. Second, the information structure found in the second clause is
The theme in the second clause was “fa inna lakum mā sa’altum” (given information), it was considered that the speaker and the listener have known this information. What is new from the second clause is “mā sa’altum” as the Rheme (new information). It was regarded as the new information between the speaker and the listener or the reader. It is obvious that elaborating about Theme and Rheme in Qur’anic Arabic Corpus can annotate the information structure of clause. It is very important to find the information construction (Theme + Rheme) in the Qur’anic verse to gain the information about the given and the new. It can be assumed that the lack of annotation can be supplied by investigating the Theme and Rheme in Quranic Arabic Corpus.

Corpus in the Arabic language can be defined as *mulawwanah* (مدونة) or *majmū’un-nushūsh* (مجمووع النصوص). Corpus also can be defined as “textbooks” being analyzed and compared or as sample of sentences or utterances which are analyzed for their linguistic features. In addition, corpus is also defined as “a collection of materials that has been made for particular purpose. To make a fully beneficial corpus needs annotation [1]. There are three types of annotation in corpus, they are: (1) structural mark up, (2) part of speech mark up, and (3) grammatical mark up. This research elaborates the grammatical mark up in the Al-Qur’an. It can be seen that the novelty of this research is the implementation of functional grammar in the data of Arabic Corpus Al-Qur’an. In addition, the main purpose of this research is to develop the model of annotation in Quranic Arabic corpus. The main data was collected from http://corpus.quran.com. The triliteral root *sin hamza lām* (TRSHL) was selected as the main model to gain the data mining on Qur’an annotation. The previous research about “root” in Arabic and Semitic language was elaborated comprehensively by Rubin [2]. But in this case, Rubin did not elaborated the Arabic roots in Qur’an annotation. There is a gap in this research. All verbs and the majority of nouns have a set of root consonants, usually three, thus in this case we call triliteral, which is used in conjunction with vocalic templates to form words. The roots have lexical meaning, while the templates have grammatical functions. It seems that the roots in Semitic language, especially in Arabic language have significant role in shaping lexical and grammatical meaning. For example, the Arabic root RKB has meaning associated to the act of riding, as seen in the words rakiba ‘he rode’, yarkabu ‘he rides’, rākibun ‘a rider (NOM.)’, rakkābun ‘a (professional) horseman (NOM.)’, markabatun ‘vehicle; carriage (NOM)’, and murakkabun ‘mounted (NOM.)’. In each of these words, the roots appear in particular set of vowels, along with a prefix and/or a suffix. It is obvious to develop the investigating of root in Quranic Arabic Corpus to develop the analysis of annotation. The verb “annotate” in Arabic language can be defined by two verbs /yu’alliq/ (يَعْلِقُ) or /yu’tā mulāchadzāt/ (يَعْتَهِ مَلَاحَظَاتِ) [3]. From this terminology, it can be inferred that the annotation in Qur’an has special task to give the notes, to explain, to supply a work with critical commentary or explanatory notes, to provide interlinear explanations for words or phrases, in this case Arabic grammatical notes, and to develop the information about verse in Qur’an. The previous research about Arabic annotation, especially in translation studies, was elaborated comprehensively by Almanna [4]. Related with the Theme and Rheme in Arabic language, Anis elaborated the translation of an object inside the Arabic Theme and Rheme construction [5]. This research describes the variant structure of objects which occurred in Arabic Theme and Rheme construction using the translation perspective. Anis emphasizes that in Arabic texts, the Theme and Rheme are developed in certain patterns (thematic progression patterns)[6]. Anis outlines and compares the constructions of Theme and Rheme in the Arabic and Javanese languages [7]. On the other hand, Sukesti investigates the construction of Theme and Rheme in the Javanese “NgokoBanyumas” dialect [8]. Suparno also investigates Theme
and Rheme constructions, focusing on the local dialect of Malang, East Java, Indonesia [9]. These recent research studies are primarily structurally focused.

Related to functional grammar, it is obvious to refer to M.A.K. Halliday in the analysis. Functional grammar refers to the conceptual framework by which has base in functional one rather than formal one. It is functional in three distinct although closely related senses: in its interpretation (1) of texts, (2) of the system, and (3) of the elements of linguistic structures. Bloor emphasized that the term functional concerned with language in use [10]. The word function is often used for the way a word or a group operates in relation to the other words or groups in the clause. Related to language in use, there are three broad categories known as metafunctions, they are: (1) ideational metafunction related to the language use to organize, understand and express the human perceptions of the world and of self-consciousness, (2) interpersonal metafunction related to the language use to enable the people to participate in communicative acts with other people, to take on roles and to express and understand feelings, attitude and judgments, and (3) textual metafunction related to language use to relate what is said (or written) to the rest of the text and to other linguistic events. This involves the use of language to organize the text itself. This research focuses on how textual metafunction works in Quranic Arabic corpus as main annotation in the data mining.

2 Methodology

This research used distributional method to analyze the triliteral root sīn hamza lām (TRSHL). There are three basic steps in this research, namely: (1) collecting the data by using the observation method. The observation began with the elaboration of TRSHL in Qur’anic Arabic Corpus. It can be classified by the variants of clause in the position of TRSHL in the Quranic verse. The TRSHL (http://corpus.quran.com/qurandictionary.jsp?q=sAl) is in the scope of Qur’an Dictionary. The triliteral root sīn Hamza lām (ﺱ ﺃ ﻝ) occurs 129 times in the Quran, in six derived forms:

1. 106 times as the form verb I sa-ala (ﺱﺎَﻝَ)
2. nine times as the form verb VI yatasāalu (ﻳَﺘَﺴَﺂءَﻝُ)
3. once as the noun suāl (ﺱُﺆَﺍﻝ)
4. once as the noun su’l (ﺱُﺆْﻝ)
5. seven times as the active participle sāil (ﺱَﺂﺋِﻞ)
6. five times as the passive participle masūl (ﻢَﺴَـ"

The TRSHL was randomly selected to be the main data by some reasons: first, because it occurred in the first position at the letter /sīn/. This research becomes the introductory research for the prototype to the other roots at the Quranic Arabic Corpus (QAC) as the modification of annotations; and second, because this research elaborates the information structure in QAC. As Halliday proposed, in order to gain the main theme in a clause is by using the question “what does the clause tell about?” and “What do I tell about?”. By elaborating the root TRSHL, the information structure in QAC can be analyzed by looking at the TRSHL. The Theme and Rheme in QAC can be divided by TRSHL, for example:

イスラム教における アラビア語は モロニック言語の 一部分として 考えられます　イスラム教と アラビア語
yas’alūnaka ‘an = THEME = given information
al-‘ahillah = RHHEME = new information
qul = THEME = given information
hiyamawāqītulinn-āsīwal-chajji
This research is classified as qualitative research because it adapts to the research problems. The aims of this research are (1) elaborating the grammatical aspects of TRSHL and (2) investigating the information structure of TRSHL in QAC. Miles elaborated that qualitative analysis data in research can be divided into three basic steps, they are: (1) reduction of data, (2) display of data, and (3) conclusion or verification of data [11]. In this research, the reduction of data describes that the clause is reduced and selected randomly from jumlah ismiyyah and jumlah fi’liyyah which have the TRSHL inside the clauses. The data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions. The data reduction in this research focuses on the variant models of Theme and Rheme in the Qur’an and the models of TRSHL inside the clauses. The display of data is divided into two basic problems, they are: (1) grammatical aspect of TRSHL and (2) the TRSHL inside the construction of Theme and Rheme based on SFL theory (sistemic functional linguistics). Data reduction is not something separate from analysis. It is part of analysis. Thus the data reduction had been followed by the classification of the conclusion data.

3 Result and Discussion

There are two basic findings in this research. The first finding and discussion in this research is related to the grammatical aspect of the triliteral root sīn hamza lām (TRSHL) in the Qur’anic Arabic Corpus. The second problem is to elaborate the triliteral root sīn hamza lām (TRSHL) in the construction of Theme and Rheme.

3.1 Grammatical Aspect of TRSHL

This case shows the grammatical aspect of TRSHL in the clause at QAC. Elaborating root in language analysis has significant role, especially in data mining in Quranic Arabic Corpus’ annotation. Haywood asserts that Arabic language is rich in derived verb forms which extend or modify the meaning of the root form of the verb, giving many exact shades of meaning [12]. TRSHL in QAC was found dominantly in the verb form. TRSHL was found in QAC just two nouns: seven forms of active participle and five forms of passive participle in some verses. For example in the verse (93:10:2).

\[\text{waammas-sāila} = \text{THEME (data 1)} \]
\[\text{falātanhar} = \text{RHEME} \]

\[\text{wafī āmālīhim ħāqā lī sā'īlā wal-maḥrūm} \]
\[\text{Waammas-sā’īlal-machrūm} = \text{THEME (data 2)} \]
\[\text{Chaqqunlis-sā’ihiwal-machrūmi} = \text{RHEME} \]

By looking both of the data, it can be concluded that the TRSHL in QAC is in the position of Theme and Rheme. The TRSHL analysis in this part focuses on transitivity concept. This concept hopefully becomes the annotation in QAC. Transitivity is defined as the set of options relating to cognitive content, the linguistic representation of extralinguistic experience, either the phenomena of the external world or of feelings, thoughts, or perceptions. There are three main components of the process of transitivity: (1) the process,
(2) the participants, and (3) the circumstances [4]. These three main components of transitivity can be used as annotation of the roots in Qur'an. The participants are divided into six basic processes, they are: (1) actor/goal (doing process), (2) senser/phenomenon (sensing process), (3) carrier/attribute vs. identified/identifier (relational process), (4) behaver (behaving process), (5) sayer/verbiage/receiver (saying process), (6) existent (existing process). For example, in data 1 and data 2, the TRSHL has role as the participants. In data 1, the word /as-sāîl/ "one who asks" can be classified as participant (GOAL) and in data 2, the word /as-sāîl/ can also be classified as participant (GOAL).

Circumstance is divided into five basic circumstances, namely: (1) circumstance of extent: spatial, (2) circumstance of location: temporal, (3) circumstance of manner: quality, (4) circumstance of cause: reason, (5) circumstance of cause: purpose. The TRSHL in this case can be found as circumstance of manner. It can be found from TRSHL as the passive participle in the data 3 below.

\[
\text{Kāna 'alaRabbika = THEME (data 3)}
\]
\[
\text{Wa'danmasūlan = RHEME}
\]
The word masūlan "questioned" can be classified as circumstance of manner.

Finally, process is divided into six basic processes, namely: (1) material process (process of doing), (2) mental process (process of sensing), (3) behavioural process (process of behaving), (4) verbal process (process of saying), (5) relational process (process of being), and (6) existential process (process of existing). By elaborating the TRSHL in QAC, it can be seen that TRSHL can be divided into two basic form of verb, they are: (1) verb I "to ask" and (2) verb form VI "to question, to ask, and to inquire". By looking at data 4 below, it can be seen that the TRSHL can act as relational process.

\[
\text{waaqbalaba’dhuhum ‘alala’dhin = THEME (data 4)}
\]
\[
\text{yatasāalūn = RHEME}
\]
The word yatasāalūn "questioning one another" can be classified as relational process. There are 9 words yatasāalūn in QAC.

Finally, the TRSHL is actually related to the mental process. Some processes do not involve material action but involve phenomena best described as states of mind or psychological events. Hence, they are classified and labeled as mental processes. Mental processes tend to be realized through the use of verbs like think, know, feel, smell, hear, see, want, like, hate, please, disgust, admire, enjoy, fear, frighten [10]. They can be found in data 5 below (79:42:1) an-nāziāt.

\[
\text{Yas’alūnaka ‘an ‘they ask you’ = THEME (data 5)}
\]
\[
\text{As-sā’ahayyānamursāhā = RHEME}
\]

3.2 TRSHL in the Construction of Theme and Rheme

This part investigates comprehensively TRSHL in the construction of Theme and Rheme. Before doing the analysis, the definition of Theme and Rheme is elaborated first. Theme is the units of language which serve as the starting-point for the message in the text: it is what the clause is going to be about. Theme typically contains familiar, or given, information between the listener and the reader. In this case, the information has already been mentioned somewhere in the text or is familiar from the context [13].
Rheme is part of the clause in which the Theme is developed. Rheme typically contains unfamiliar or new information. The identification criteria for the Rheme is simple; every unit of language in the text that is not Theme is Rheme [13]. The TRSHL can be used as Theme and it indicates Rheme. It can be seen in data 6 and 7 below.

By looking at data 6, the TRSHL derived as the verb /sa’ala/ ‘to ask’ is classified as the Theme of the clause.

Fījannātin = THEME (data 7)
Yatasālūn = RHEME

In data 7, it can be seen that TRSHL derived as the verb /yatasālūn/ ‘asking each other’ is the Rheme of the clause. It can be concluded that the concept of information structure has significant role to develop the annotation of the Qur’anic Arabic Corpus.

4 Media Accuracy of The Hadith Studies

The conclusion in this research is related to the two findings and discussion, they are: (1) grammatical aspect of TRSHL in the clause, and (2) TRSHL in the construction of Theme and Rheme. By looking the grammatical aspect, it can be concluded that TRSHL is constructed dominantly by the verb, two nouns, seven forms of active participle and five forms of passive participle. The roots in Arabic language is related to the concept of transitivity. This concept can be main annotation of Quranic Arabic Corpus (QAC). In the TRSHL, the active participle can be identified as participant (goal). On the other hand, the passive participle can be identified as the circumstance of manner. TRSHL in QAC can be divided into two basic forms of verb, for example, the word yatasālūn as derivative form of TRSHL can be classified as the relational process. Finally, the three main components of the process of transitivity: (1) the process, (2) the participants, (3) the circumstance, can be main annotation in QAC and they can be the model of roots analysis in QAC. It can also be concluded that The TRSHL can be Theme and Rheme.

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References

[2] Rubin A D A B 2010 Introduction to the Semitic Languages (USA: Gorgias Press LLC)
Construction of Question Answering System for Factoid and Non-Factoid Type Question for History of Khulafaur Rasyidin

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Abstract. Question answering system is one of sub-fields information retrieval that integrates information from multiple sources as document collection whether local or web to provide concise answer to specific question which is entered by the user. This question answering system is about history of Khulafaur Rasyidin which is expanded from another researcher with adding types of question word; such as: “what, why, and how”. So, this question answering system provides question words: “who, when, and where” as factoid question and “what, why, and how” as non-factoid question. This question answering system consists of several processes: question analyzer, document retrieval, and answer extraction. The question analyzer aims to classify question to obtain answer type, clue word, and query. This query will be used in document retrieval to obtain document candidate which contain exact answer by using search engine which is called Lucene. The sources that are used came from previous research. It has been we reviewed and corrected. Answer extraction aims to obtain exact answer which is desired by the user. Answer extraction for factoid question is performed by calculating distance between answer candidate to all queries from the question in sentence answer and for non-factoid question is performed by sentence pattern which has priority value for each sentence. System testing is performed by giving 30 question words for factoid question and non-factoid question. The evaluation of answer result refers to another researcher which has 5 categories, namely:” true, inappropriate, not supportive, unanswered, and wrong”. The result of the system evaluation shown factoid question has high performance to obtain exact answer and non-factoid question has low performance.

Keywords: Information Retrieval, Question Answering System, Factoid and Non-Factoid Type Question, The history of four caliphs (Khulafaur Rasyidin)

1 Introduction

Nowadays, information technology has developed rapidly. Advancement of technology has brought human race in the new cultural pattern. Nearly, every human activity uses media information technology to solve a problem. It is caused by a number of inventions and innovations of the information technology that doesn’t stop growing. Based on this condition,
the impact makes information communication technology has substantial position on daily activities.

Construction of information technology gives a major influence on human. It will look wasting if it’s not used to look for information, particularly in the Islamic world. Therefore, it takes an integrated system that can be created between technologies and Islamic, such as by utilizing question-answering system that related to Islam. It research based on “Question Answering System in Indonesia Language for Khulafaur Rasyidin History” [1].

The Question types which are handled by question answering system are divided into 5 types, there are: factoid, non-factoid, yes-no, list, and opinion [2]. Question answering system that has been developed by [1] only applied three types of question word, namely: “who”, “when”, and “where”. According to [2] those three types of question word are also called factoid question, where factoid question is a question which has answer that contains phrase such as: “people, location, organization, date, number”, and other short answer types. Meanwhile according to [3], factoid question is a question which based on fact and has short answer. So far, there isn’t elaboration of question answering system which has been developed by [1] yet. Meanwhile, several other researchers are used as a method to develop this system by us. Therefore, we will perform system elaboration in order to handle non-factoid question which often is used to understanding something. Based on those matters above, the impact of system elaboration can make people who will use this application easier to look for information about Islamic history, especially Khulafaur Rasyidin than have to read the detail books.

2 Literature Review

2.1 Question Answering System

Question answering system is one of sub-fields of Information Retrieval [4]. Question answering is a technology to find information from a big text based on a given question [3]. The question answering system virtualization is that user to state his or her information need in a more specific and natural form. It is like a natural language question and that it doesn’t return full documents. They have to be skimmed by the user to determine contains. The answer is short text and phrases [5].

2.2 Architecture of Question Answering System

A prototypical question answering system of general architecture displayed the main components. The prototypical system has four components: question analysis, document retrieval, document analysis, and answer extraction. Each of these components discussed below [5]:

2.3 Analyze Question

The first phase is to analyze the question. It included a morpho-syntactic analysis of the question. The question is also classified to determine what it is asking for, in example whether it is asking for a date, a location, the name of person, etc [5]. The application in Indonesia language. The question words are formulated by 5W+1H, that is: “what, where, who, when, why, and how”. They shown in the table:

Table 1. Types of Question Words
<table>
<thead>
<tr>
<th>Question</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>What</td>
<td>State of Thing</td>
</tr>
<tr>
<td>Where</td>
<td>State of Place</td>
</tr>
<tr>
<td>Who</td>
<td>State of Person</td>
</tr>
<tr>
<td>When</td>
<td>State of Time</td>
</tr>
<tr>
<td>Why</td>
<td>State of Causal</td>
</tr>
<tr>
<td>How</td>
<td>State of Condition or Manner</td>
</tr>
</tbody>
</table>

A retrieval query is formulated which is posed to the retrieval component. The question analysis component must formulate a request based on the retrieval component as an addition to classifying the question. Each first word is normalized to its morphological roots. Usually, this is done using rule-based stemmers, such as the Porter stemmer or by looking for morphological roots in a machine-readable dictionary. The morphologically normalized words are used to submit the query to the retrieval engine.

2.4 Document Retrieval

The retrieval component is generally a standard document retrieval system that identifies documents. They contain terms from the request given. The retrieval component returns a set or list of document ratings. Then it is analyzed by the document analysis component.

The retrieval component returns both a series of non-sequential documents that may contain answers or a list of document order depending on the actual retrieval machine used. These documents are ranked in relation to their possibility of containing answers.

Document retrieval is only one component of the overall question answering process. Its effectiveness is very important for the overall performance of the question answering system. The document retrieval fails to return any document analysis and the answer selection component will also fail to identify the correct answer [5].

2.5 Document Analysis

The processes of Documents Analysis are: The first; it takes as an input document that contains answers to the original questions, together with the question analysis component to be generated. Then do extracting a number of candidate answers which are sent to the answer selection component.

The set of entities named are: person's name, organization, date, location, temporal, spatial distance, etc. it must be related to the information needs expressed by the question, to consider it, if a phrase is the right type. Potential answers or candidate answers.

The document analysis component passes through the list of candidate answers to the answer selection component. Each candidate's answer is related to the question. Example: it is due to analyzing syntactic structures, applying pattern matching, lexical chaining, or proximity constraints. [5].

2.6 Answer Selection

The final component chooses a phrase that is most likely the answer to the original question from the phase of the candidate's answer derived from the document analysis component. The choice answer component does not have to return one final answer to the
user, but can also return a list of ranking answers, where the answers are ordered in connection with the trust that the system has in each.

Document analysis components do not provide candidate answers or only candidates. It is only related to questions with proximity and only related to low frequency. Finally the answer selection component can decide to jump back to the question analysis component and try to reformulate the retrieval question by adding the candidate's answer [5].

3 Analysis and Design The Question Answering System Architecture

Question answering system architecture that will be used for this study is as follows:

The system has three main elements, there are: input, process, and output. The architecture above explains that the processes are started from input that is entered by the user which called question, and then passed through several processes that are performed by search engine which produce the expected output information that is suitable with the user needs that is obtained from document in which is stored with (.txt) file form that related to history of Khulafaur Rasyidin.

![Architecture of Question Answering System on History of Khulafaur Rasyidin](image)

Figure 1. Architecture of Question Answering System on History of Khulafaur Rasyidin

The question answering system divide into three components; first component is called question analyzer. User enters a question as input in question analyzer component, while the output from this component will be an input for the second component that is called document retrieval, in which document is used in this component is about History of Khulafaur Rasyidin that is obtain from previous research by [1]. The output that is retrieved by document retrieval component is used in the third component; it’s called answer extraction to obtain exact answer to question which is entered by the user.

The component of the question answering system architecture is used:

3.1 Question Analyzer

The scenario of this component is user enters a question, and then question will be processed by question analyzer to be analyzed. Question analyzer will analyze the question which entered by the user to obtain expected answer type, clue word, and query as output from question analyzer component.

Expected answer type and clue word are obtained by examining a question word which is entered by the user by doing string matching to question. Question word that is entered by the user can be classified into two types: factoid question and non-factoid question. Factoid question is question which looks for short answers and based on fact such as: “Who”,
“When”, and “Where”. Whereas non-factoid question is question which looks for explanation or definition answers such as: “What”, “Why”, and “How”. The following is table of question words based on Expected Answer Type (EAT) classification rule [7] which has been modified:

<table>
<thead>
<tr>
<th>EAT</th>
<th>Question Word</th>
<th>Clue Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factoid</td>
<td>Person</td>
<td>Who, Who Is</td>
</tr>
<tr>
<td></td>
<td>Location</td>
<td>Where, Where Is</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>When, When Is</td>
</tr>
<tr>
<td>Non-factoid</td>
<td>Definition</td>
<td>What, What Is</td>
</tr>
<tr>
<td></td>
<td>Reason</td>
<td>Why</td>
</tr>
<tr>
<td></td>
<td>Method</td>
<td>How, What about</td>
</tr>
</tbody>
</table>

If question word is found, question analyzer component will store the appropriate answer type to the question word.

To explain the performance of question answering system in question analyzer component in order to determine answer type and clue word, the author makes two scenarios. First scenario is the example for factoid question. The user enters a factoid question to the system, such as: "What is the full name of Abu Bakar?"

from a factoid question above, question analyzer will analyze the question until obtain a question word “Who”. Based on EAT classification table, question word “Who” refers to PERSON expected answer type. Meanwhile, second scenario, a question which is entered by the user is non-factoid question, such as: "Why in the year of Uthman’s government was the year of nosebleeds?"

from the question above, question analyzer will analyze the question to obtain a question word “Why”. Based on EAT classification table, question word “Why” refers to REASON expected answer type and has clue word “Because”, “therefore”, “cause”, “cause of”, “effect”, “causes”, “caused”, or “therefore”, "karena", “oleh karena itu”, “penyebab”, “sebab”, “akibat”, “menyebabkan”, “diakibatkan”, or “oleh sebab itu.

In addition to the processing of determining expected answer type and clue word in the question analyzer component, there is also the process of query extraction. The query is words that can be used to describe the content of question and its words in a question or words that is related to word in question. Query will look for document which is approximated contains answer to question which is entered by the user. In other words, wrong query can produce wrong relevant sentences so it doesn’t produce exact answers to question.

In question analyzer component, the process of query extraction is performed by removing question word, removing question mark, and removing stopword to the question. Stopword list which is used in this system is obtained from [1] which was modified by the
Based on the example of factoid question which is entered by the user, so query which is obtained from the question is:
"Full name of Abu Bakar"

whereas, for non-factoid question, query which is obtained from the question is:
“The year of Uthman’s government was the year of nosebleeds”.

3.2 Document Retrieval

Document which is used in this research based on previous research by [1]. It has been reviewed and corrected by the author. Document came from two books of [8, and 9]. The document uses Indonesian language and it is stored in a text file.

Searching relevant sentences against document uses Lucene (4.0 version) as search engine. Searching relevant sentences is performed by using query for factoid question and non-factoid question which is obtained in the question analyzer component. It searched to finding some sentences of the document that contains query for factoid or non-factoid questions. [10]

This section, document retrieval component will return 20 top ranking sentences based on the level of relevance to the query for factoid question or non-factoid question. This system uses boolean query, namely AND boolean operator in order to retrieve all sentences that have all words in query. [11]

3.3 Answer Extraction

This process is the final component of the question answering system to determine exact answer which is suitable to question which is entered by the user. The next After part of document is retrieved with query by Lucene [6, and 7] as search engine to obtain 20 relevant sentences in the document retrieval component, so 20 relevant sentences which are as answers candidate to question will be processed to obtain exact answer. To obtain exact answers, this system uses expected answer type and clue word. In this system, answer extraction is divided into two processes:

1. Factoid Question

In this component, the output which is obtained by document retrieval component will be input in answer extraction component. The input in this component is 20 relevant sentences which will be given score based on query occurrences and name entity tagging.

The steps for factoid question are:

- Every independence clause from document retrieval component is separated into token or word.
- Perform name entity tagging to each word which has entity.
- Every independence clause take all name entities that appropriate with the EAT as answers candidate. The answers of candidate that only contain query from question will not be included.
- Every answer candidate computed the distance between the answers candidate to all the queries from the sentence answer of question. Distance is calculated by counting the number of words between the answers candidate and query.
- Sort the answers candidate based on the distance between the answers candidate with query in the sentence.
2. Non-factoid Question

In this component, 20 relevant sentences which are obtained from document retrieval will be processed. For non-factoid question, answer extraction component uses pattern matching with sentence pattern based on [7] which includes all possibilities of query and clue word occurrences in the sentence. Sentence answer for each category of questions have patterns that are similar to each other. The difference lies in the clue word that follows the sentence answer for each question category.

The steps for non-factoid question are:
- The fist check pattern of sentence that is used in each sentence. It retrieved by document retrieval component. Then match the query occurrence in that sentence.
- The sentence with the highest find priority for each sentence. This sentence is chosen as answer candidate for question.
- The answers candidate based on the priority is sorted value in the sentence pattern.

The next step is making table of sentence pattern for non-factoid question and table of clue word based on [7].

3.4 Application Design

1. Use Case Diagram, 2. Use Case Narrative, 3. Activity Diagram, 4. Sequence Diagram

3.5 Graphical User Interface Design

This is the interface design of the system which consists of header, question input box, search button, and answer box for answer which are provided by the system:

3.6 Construction

In this phase, the author constructs a system based on previous phases. The author will construct the system by using Java programming language and Netbeans platform. We used Lucene version 4.0 as search engine, and pattern matching method to obtain answer [10].

3.7 Graphical User Interface Implementation

In the implementation phase, Graphical User Interface (GUI) design which has been performed in workshop design is implemented on GUI implementation that can be seen similar with the Fig. 2 and Fig. 3.

4 Testing Scenario, System Testing and Result

System testing scenario is performed by attempting 30 questions that are arranged manually by the author. Those 30 questions are divided into 6 types of questions, there are: 5 questions for “Who” or “Who Is”, 5 questions for “Where” or “Where Is”, 5 questions for “When” or “When does”, 5 question for “What” or “What is”, 5 questions for “Why”, and 5 questions for “How” or “How does”.

The application made in Indonesian Language. This is system testing for factoid and non-factoid question types based on the system testing scenario which has been conducted by the author.

1. Factoid question
Figure 2. GUI Implementation for Factoid

2. Non-factoid question

Figure 3. GUI Implementation for Non-factoid

The assessment of the results refers to the system response [1]. Category the assessment of the results of the answer is:

Table 3. Category System Answers

<table>
<thead>
<tr>
<th>Category</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>The system returns the correct answer and extracted from the relevant document</td>
</tr>
<tr>
<td>Not Agree</td>
<td>The system returns the correct answer but obtained from document that isn’t relevant to the question</td>
</tr>
<tr>
<td>Not Correct</td>
<td>The system returns the answer in the form of string which is more than the actual answer or lose some of the answers and extracted from the relevant document to the question</td>
</tr>
<tr>
<td>False</td>
<td>The system returns the wrong answer.</td>
</tr>
<tr>
<td>No answer</td>
<td>The system cannot find an answer.</td>
</tr>
</tbody>
</table>

From the system testing which has been conducted by the author previously, this is the result of this experiment can be seen in the table below:
Table 4. The Test Results With The Passage 20

<table>
<thead>
<tr>
<th>Category</th>
<th>TOTAL</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>27</td>
<td>80%</td>
</tr>
<tr>
<td>Not Agree</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>Not Correct</td>
<td>1</td>
<td>3.33%</td>
</tr>
<tr>
<td>False</td>
<td>1</td>
<td>3.33%</td>
</tr>
<tr>
<td>No answer</td>
<td>1</td>
<td>3.33%</td>
</tr>
</tbody>
</table>

Based on the table above, the author analyzes that from the scenario which has been conducted by the author previously, for 30 questions there are 27 question which have value “True” which are answer by the system, 0 question has value “Unsupported”, 1 question has value “Not Correct”, 1 question has value “Wrong”, and 1 question has value “Not Answered”. This case shows that this question answering system which has been created by the author is adequate work well because of 90% answer which is produced by this system provides the exact answer to a question.

5 Conclusion

Based on the discussions in the previous chapters the author concludes as follows:
1. The corpus which is used in this question answering system is taken from the previous research [8]. It has been corrected and reviewed by the author because the author found indication that the corpus still has weakness.
2. The architecture of question answering system that is described on chapter III is still not able to answer all questions that are entered by the user correctly. The results for each testing of the system give information that the system can answer 27 questions correctly is 90%, the question which has “Not Correct” category is 3.33%, the question which has “not agree” category is 0%, the question which has “false” category is 3.33%, and the question which has “not answer” category is 3.33%.
3. For factoid question, this question type has tested on system testing which is conducted by testing scenario and the resulting of testing for factoid question is quite good because all questions that are input by user can be answered by the system correctly.
4. For non-factoid non-factoid question, the resulting of testing process is not good enough because there are so many answers which aren’t available (no answer) or not exact answers. Those answers are because the exact answers have more than a sentence pattern or usually there’s no clue word which is suitable to question.
5. The best performance is shown by Who-type, Where-type, and When-type of question words because based on the testing result, the system is able to handle factoid question which is input by the user. Otherwise, for the unsatisfactory result is shown by what-type, Why-type, and How-type because the system is quite difficult to handle the answers which have more than one sentence pattern.
Based on the results of research that is conducted, we suggest the next researcher as follows:

1. The existence of further development of the system in identifying file type extensions such as: pdf and chm files that previously have not been identified by the system. To development of the next system can use all types of file extensions.
2. Using larger document so that the system has a larger database to answer the question that entered by the user.
3. For next Implementation expected to be developed within a wider scale implementation such as the application of internet.
4. Limitation of question words that can be used include: "who", "when", "where", "what", "why", and "how"; is still not cover all types of question words that will be able to answer all kinds of question words which are entered by the user.
5. The type of interrogative sentence that can be used in this system is still a single interrogative sentence, so the author suggests extending the interrogative sentence that can simultaneously handle two types of questions which is asked by the user.

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References

# Al-Quran Translation Parallel Corpus for the Development of Al-Quran Translation Studies in Indonesia

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Abstract. In the field of language studies and research, Al-Quran is often used as an object and source of primary data. In line with the dynamics in technology, data and format of conventional Al-Quran writing is converted and developed to become a digital data. Further development brings Al-Quran digital data becoming a corpus with all its variants, including parallel corpus which pairs Al-Quran texts in Arabic with its translations in non-Arab languages. This makes use and utilization of this type of data easier for the development of broader studies on Al-Quran. This study aims to describe the urgency of Al-Quran parallel corpus and its Translation in Indonesian language and local languages in the Indonesian archipelago. This study applies the descriptive method to discuss the availability of materials and data of Al-Quran translation in several local languages in the Archipelago. Furthermore, we will also describe the experimental process in preparing an initial model for the Al-Quran parallel translation in Indonesian language. The result of this study reveals that the availability of products containing materials and data of Al-Quran and its Translation in Indonesian language and local languages can be an important capital and main basis for preparation of an Al-Quran parallel corpus and its Translation for the development of Al-Quran translation studies in Indonesia. Furthermore, the result of study can be utilized to evaluate or review the methodology used for translation of Al-Quran into local languages in Indonesia. It is also important to introduce this step and continued with strategic efforts to encourage Al-Quran translation studies into local languages. This prototype of model Al-Quran parallel corpus and its Translation into Indonesian language can at least be tested through corpus processing applications available in the website of Sketch Engine.

Keywords: parallel corpus; Al-Quran and translation; Indonesian Translation; local language translation

## 1 Introduction

In Indonesia, translation of Al-Quran has been performed since around the 17th century. In reference to Izzan, Baihaki mentioned that the first person, in the record, translating Al-Quran into Malay language is Syekh Abdul Rauf bin Ali AlFansuri (died in 1693). He is considered as the first person to use Arab-Malay letters in his work [1, p.46]. This work is assumed as the initial point of the translation history of Al-Quran into Indonesian language. Officially, the Government of the Republic of Indonesia pioneered translation of Al-Quran
into Indonesian language and published it in 1965 through Lembaga Penyelenggara Penyelenggara Kitab Suci Al-Qur’an, or the Institution of Al-Quran Translation of the Ministry of Religious Affairs [2, p.229]. In addition to Indonesian language, in the past, Al-Quran had also been translated into local languages in the Archipelago. Baihaki recorded from several literatures that at least since the 1930s, Al-Quran was found to have been translated into Javanese language in Solo, Central Java [1, p.53]. This dynamic describes activities of Al Quran translation vigorously done since long time ago. This also reflects the dynamic of development of Islamic studies in this country. In line therewith, there are also many Islamic studies and linguistic studies based on or referring to Al-Quran.

In the past, Islamic and linguistic studies still relied on printed Al-Quran Mushaf, and now in line with the time and development of computer technology, studies require conversion of printed Mushaf to become digital Mushaf. This digital Mushaf contains various formats, both images and texts. Particularly, in the context of linguistic studies, for example, digital texts are required in a certain format referred to as corpus. This corpus can be processed with a certain application and the corpus must be specially formatted to be compatible with the relevant application.

Digital data model or Al-Quran corpus are now widely available and varied to be used as a data object. However, specifically for the purpose of translation studies, a special corpus is needed called parallel corpus containing two texts in two languages namely the source language and target language. For that purpose, this study aims to reveal the urgency of Al-Quran parallel corpus and its translation in Indonesian language and local languages by utilizing material and data readily available for development of Al-Quran translation studies in Indonesia. Furthermore, an experiment preparing the prototype of Al-Quran parallel corpus and its translation into Indonesian language will be elaborated.

2 Methodology

This study applies the descriptive method to present the finding as a result of literature studies on Al-Quran translation into Indonesian language and local languages along with findings from the result of survey on the availability of Al-Quran corpus. Furthermore, an experiment will also be carried out on preparation a prototype of Al-Quran parallel corpus and its translation into Indonesian language. To prepare this corpus, the material and data of Quranic Arabic texts file should be in the format of *.txt (extension of text files) without diacritics and downloaded from tanzil.net. The Indonesian translation texts are obtained from the Lajnah Pentashihan Mushaf Al-Quran of the Ministry of Religious Affairs of the Republic of Indonesia. The preparation of parallel corpus prototype refers to the mechanism stipulated by the Sketch Engine.

3 Literature review

According to the Lajnah Pentashihan Mushaf Al-Qur’an of the Ministry of Religious Affairs of the Republic of Indonesia, Al-Quran translation published by the Ministry of Religious Affairs of the Republic of Indonesia is still more popular and mostly used than Al-Quran Indonesian translation, for example by Hassan, Shihab, Thalib, and so forth, or the work of Al-Quran translation, using local languages [2, p.230-231]. There are no many research done on translation into Indonesian language and local languages other than the research carried out
by Istianah on criticism against Al-Quran translation by the Ministry of Religious Affairs of the Republic of Indonesia [3], research by Kiptiyah on the tradition of writing of Al-Quran exegesis in Javanese language [4], research by Saifuddin on Al-Quran translation into Javanese language in the philological review [5], and research by Haris on his records on Al-Quran translation in Sasak language (Lombok) [6].

Related to Al-Quran computation, the research by Safeena and Kammani mention that the computational linguistic approach expanding to Al-Quran digital text thus far uses the techniques of *Natural Language Processing*, *Treebank*, and *Syntactic Annotation*. This is concluded from their observation on a number of literatures on Al-Quran computation and several models of digital data and Al-Quran data processing application [7]. In the context of digital data product in the form of Arabic and Al-Quran corpus, Eddakrouri [8] identified that to this date there are 18 Arabic language corpus in the form of digital text materials, but there is no information on Al-Quran corpus. However, there are also 19 website-based Arabic language corpus, four of which is Al-Quran corpus. The existing Al-QuranCorpus is the Al-Quran corpus with annotation without translation texts and there is no at all Al-Quran parallel corpus.

There is a source which presents special Al-Quran corpus namely the website of tanzil.net [9]. In this website, Al-Quran translation corpus is available in various languages, including Indonesian language, but only in the form of translation texts, and no Al-Quran translation parallel corpus [10]. Another source on Al-Quran corpus and its translation in English is in the websitecorpus.quran.com. English language translation for each verse is taken from seven works of Al-Quran translation in English and positioned in parallel [11]. There is an interesting finding on digital Al-Quran application for cell phones available in the Google Play Store. This application provides Mushaf translation in Indonesian language, international languages and local languages. There are 11 versions of local language translation for image-format Mushaf translation, namely Jawa Banyumasan, Mongondow, Kaili, Toraja, Makassar, Dayak Kanayatn, Minang, Batak Angkola, Sasak, Aceh, and Sundanese [12].

From a number of literatures and existing corpus models, there is no as yet a model of Al-Quran parallel corpus model and its translation as desired in this research plan.

### 4 Result and discussion

The latest dynamic in the revision process of Al-Quran translation into Indonesian language commenced as from year 2002. The result of revision has widely circulated and is used in the printing of Al-quran Translation circulating in Indonesia. However, based on inputs from various parties, the subsequent revision process was done since 2016 more comprehensively covering the aspect of language, translation consistency, substance, and format of preparation systematics [2, p.230]. In the prototype of Al-Quran parallel corpus that we have made, the text of language translation that we use are still from the text in the revised edition of year 2002. Based on the above situation, we consider making further prototype using Indonesia translation texts as the result of the latest revision. This is important in the context of presenting a number of corpus variants for a wider interests. These two corpus can be used as the object of research on Al-Quran translation and its development diachronically based on the material from cross-time data.

In order to enrich the corpus, it should be noted that the translation process of Al-Quran into local languages in the Archipelago has actually been quite active. Thus far, the translation process and publishing of 12 Mushaf of Al-Quran in local languages have completed, namely
translation in the languages of Makassar, Bolaang Mongondow, Sasak, Ambon, Bali, Batak Angkola, Padang, (Javanese) Banyumas, Banjarmasin, Toraja, Kaili, and Dayak Kayanatn. There are two translated Mushafs in two other languages that are currently being processed namely in Acehnese, Madurese, and Bugis languages, while in two other languages are still under the planning stage, namely in Palembang and Sundanese languages (based on personal telephone contact with Salim, Staff member at the Center for Research and Development of Lectures on Religious Richness and Organizational Management, the Research, Development, Education and Training Agency of the Ministry of Religious Affairs of the Republic of Indonesia, June 8, 2018). In view of large number of languages throughout Indonesia, the translation process of Al-Quran into local languages will continue and reach other local languages, particularly major ethnic languages which are the main root of more varied sub ethnic languages. Hence, Indonesia potentially have and present unique cultural products in the form of Al-Quran translation in various ethnic languages not the national language in the country with the most languages. This is highly possible and will certainly become the country’s richness with a very valuable culture and religion tradition.

The availability of Al-Quran Mushaf in translation in the above various local languages opens a room for further research on the richness of comparative Arabic language and local languages in the context of dual languages or multi languages if the research to be conducted involves more than two languages in the context of inter-language contrast analysis. This must be seen as huge potency and at the same time an interesting challenge for research and study on language, translation, and also culture in a very wide coverage. Although there has been available the printed version of the Mushaf and digital version in the form of image with per page display of Mushaf, to support research on computational linguistics and corpus linguistics, the existing format still must be changed in this matter to become a pure text.

Further, slightly different from the format of regular text corpus, for the purpose of translation studies, the corpus used is parallel corpus which contains texts in the source language and the target language in two columns side by side and made using the application of spreadsheet processing such as Microsoft Excel and the like. The file format is in the form of *.xlsx, *.jmx, *.xml, *.xliff, and so forth. In this initial stage of experiment, we attempt to prepare a corpus containing data in two languages and is arranged in a two-column table. This is the simplest model intended for novice users.

This corpus is made using the format of two-column table side by side, on the first line of each column of which contains the name of language to become the source language and the target language side by side, in this case Arabic on the left column and Indonesian language on the right column. The more the variant of the target language, the more number of column it will have. Next, we fill in the left column with the Al-Quran text in Arabic that we took from the tanzil.net [13]. We use the text “Quran Simple Clean” containing Al-Quran texts in standard Arabic writing, not the Utsmani version, and without diacritic signs. This selection is taken to anticipate technical constraints in the process of processing and searching data at the time using the menu available in the application found in the Sketch Engine website. The text of Al-Quran translation in Indonesian language is directly obtained from Lajnah Pentashihan Mushaf Al-Quran of the Ministry of Religious Affairs of the Republic of Indonesia through direct correspondence. The following is the result of application of the mechanism in the corpus prototype that we make as seen in figure 1.
As seen in figure 1, the numbering of each verse in Arabic and its translation is made with two types of number. The first number ended with the punctuation mark of period (.) marks the sequence number of Surah in the Al-Quran and the second number also ended with the period mark (.)— is to separate it from the text of the verse or translation — marking the sequence number of the verse in the relevant Surah.

1. Users must Sign in to register their account or Log in if they already have an account in the Sketch Engine.
2. Users download the corpus file they made under the format *.tmx or *.xls. In this case we download the file under the format *.xls made using the spreadsheet processing application of Microsoft Excel.
3. Give a name to the corpus to be uploaded to the user’s personal account.
4. Make sure the language of corpus content uploaded is accurately recognized by the application, then click “Create”.
5. The process of uploading and making corpus in the account completes in this step.

Upon completion of uploading, the display of the account owner’s page that contains the corpus made is as seen in figure 2 below.

On the front page of the user’s account, there seen several files stored under different names. We try to do experiment on two names each for searching words in Arabic and words in Indonesian language, each of which is marked with the word “Arabic” and “Indonesian” in
accordance with the header of each column in the uploaded corpus data. This is important to ensure that the source of searching against the target language, in this case Indonesian language is from the right column.

After the corpus is uploaded in the account, the user may perform desired searching process. The following is an example of searching word /ḥasanat/ and its translation in ‘good’ Indonesian language from the intended corpus.

![Figure 3. Example of application page for presenting corpus with the menu for searching the word /ḥasanat/ and its translation in ‘good’ Indonesian Language](image)

Option for searching in the menu as seen in figure 3 is quite varied and covers the projection of unit to be sought, whether a word, phrase, even character and lexical unit of special grammatical code (CQL). In this regard, we try to search the word /ḥasanat/ in the form of character to anticipate wider coverage against combined emergence of the word in the text of verses in Arabic writing. The option for searching translated word or its equivalence in Indonesian language is directed to the word “good”.

After completion of searching, the application will display the result of searches by placing the word sought in the middle of the sentence containing it and mark it with red color. Hence, the user will find it easy to find collocation of words related to the word /ḥasanat/ and the word “goodness”, as seen in figure 4 below.

![Figure 4. Example of standard page display for presenting the result of search of word /ḥasanat/ and its translation in ‘good’ Indonesian language](image)
To analyze collocation, the user only needs to determine the extent of coverage of the word to the left or to the right from the word or query being sought then formulate the result of analysis. If the limitation still needs to be expanded, the user only needs to change the format of result display to the mode “Sentence” to display complete sentences which includes the word or query sought as displayed in figure 5 below.

Figure 5. Example of display of presentation page of the result of searching by displaying complete sentences which include the sought word.

In the display in the “Sentence” mode as in figure 5 above, the user can no longer see the found word in the middle column from the series of searching result, but the position of the word has been random in accordance with the original composition in the relevant sentence. However, complete sentence display as such can help broader analysis at the level of discourse by observing the whole part of the sentence in its relation with the sought word.

The Indonesian language text uses standard characters commonly used, unlike translation of Al-Quran into local languages that have special characters or even non-Latin alphabets. Translations into Banyumasan Javanese, for example, there are a number of special characters that are not commonly used in the applicable standard writing, such as the character “é” and others. Through Digital Al-Quran application for cellular phones [12], seen from the figures 6, there seems to be other problems in the conversion of special character to the format of characters, such as appearance of character “Ø” and the imperfect writing of the name of Surah Al-Fatiyah.
In common cases, as seen in figure 6 above, loss or change of characters in the conversion process is caused by difference in the inter-computer operating system which processes the making of application or technical problems in the system language available or installed. Consequently, if a certain character from a text with a language is not available in the computer operating system of the data processor, there will occur mis-conversion and then appear a technical problem that may have serious impact on the text display or content as a whole.

More complex problems will be found if the text of the target language still uses non-Latin alphabets as in the case of AlQuran translation in Makassar language as in figure 7.

Figure 7 shows that the alphabet used in the Makassar language translation is the Lontara alphabet from Bugis region, South Sulawesi. For the interest of preparing Al-Quran parallel corpus and its translation, we see the need for conversion of writing in that alphabet to Latin writing using the transliteration system. This will certainly need further technical handling. However, if the process is completed and successfully applied, similar model can also be applied in the case of other local languages using non-Latin alphabet. Hence, the process of preparing Al-Quran corpus and its translation into local languages in the Archipelago can be continued and will become an important contribution to the richness of the corpus with its typical and unique characteristics.

4 Result and discussion

It can be concluded that technically it is highly possible to prepare an Al-Quran parallel corpus and its translations in Indonesian language and local languages in the Archipelago. The availability of translated Mushaf as existing is an important capital for the process to the next stage namely digitalization of texts and materials to prepare standard corpus format or parallel corpus. In the future time, the existence of this parallel corpus will become an important contribution to the richness of cross-sciences in Indonesia and is very urgent for the projection
of development of Al-Quran translation studies in particular and multidisciplinary language studies in Indonesia.

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References

Implementation Method of Weighted Product (WP)
Determining The Amount of Distribution Zakat Funds to Mustahik

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Abstract. Zakat is one of the obligations that must be met as a Muslim. Recipient of zakat in Islam is called a Mustahik. Baitul Maal Hidayatullah as one of the zakat institution in Indonesia is calling for a zakat funds to Mustahik right. In the process of distribution of zakat, BMH sometimes have little trouble memporsikan nominal amount of the distribution of zakat funds to Mustahik. The distribution of zakat funds were good and fair is an obligation for BMH in giving zakat funds to Mustahik, according to the background of each Mustahik. Background factors could be considered fair in the distribution of zakat funds to Mustahik, so there is no jealousy between Mustahik. BMH to facilitate the channeling zakat, then takes a decision support system. Implementation Method of Determining the Amount of Weighted Product In Against Mustahik Zakat Disbursement will allow BMH in calculating zakat funds will be received in accordance Mustahik their background. This decision support system was developed using the programming language PHP and using MySQL to manage the database. Calculation method for determining the amount of distribution of zakat funds to Mustahik using Weighted Product (WP). This method will do the calculations based on the criteria that have been determined and taking into account the values of alternatives based on these criteria. The end result of this decision-making system, BMH can determine the amount of nominal distribution and charity towards each Mustahik.

Keywords: Decision Support Systems, Distribution of Zakat Fund, Mustahik, WP

1 Introduction

According to the language, the word "zakat" means growing, growing, lush or growing. In the Al-Quran and hadith mentioned, "God destroyed the usury and fertilize the charity" (QS. Al-Baqarah [2]: 276); "Take alms of their wealth, the charity that you cleanse and purify them" (QS. At-Tawbah [9]: 103); "Dole will not reduce property" (HR. Tirmizi). The distribution of zakat funds is one way to create income generation and reduce the gap between the poor by the rich, so as to create a prosperous life as aspired Islam.
In channeling zakat funds Amilin less attention to the background of Mustahik, although they are included in class 8 Mustahik. Background based on such, income level, the level of consumption, or ability level can form the basis for determining the amount of the distribution of zakat funds to Mustahik. Zakat is actually not just to meet the needs of consumer goods that character for a moment, but give the sufficiency and prosperity on them, in a way to eliminate or minimize the causes of their lives for the poor and suffering.

As one of the zakat, Baitul Maal Hidayatullah (BMH) has helped many Mustahik with one of the economic program to help a previously existed as Mustahik could be a Muzakki. With some Mustahik criteria predetermined by BMH in distributing zakat funds to Mustahik, BMH sometimes have to estimate how much zakat funds will be channeled to Mustahik for the right target.

To help this, known as Decision Support Systems (DSS). This system helps to facilitate decision-making based variables are appropriate and necessary to produce a useful information. This system is used to help make decisions in situations of semi-structured and unstructured situations, where no one knows for sure how the decision should be made.

In the Decision Support System (DSS) itself, there is one method that is used in the search for decision support that method Weight Product (WP). Product Weight method is one method of settlement on MADM problems. This method evaluates several alternatives to a set of attributes or criteria, where each attribute each independently of one another.

The method of Weighted Product use multiplication techniques to connect rating attributes, where each attribute rating should be raised to advance with the corresponding attribute weights. This process is similar to the process of normalization.

2 Research Methods

2.1 Data Collection Method

In compiling this thesis the writer will use the data collection method as follows:

a) Interviews

This method is done by conducting interviews to parts and Utilization Program Baitul Maal Hidayatullah, Mr Ade Syariful Allam regarding related problems. This is done in order to obtain complete information - details about the distribution of zakat funds terhdap Mustahik in Baitul Maal Hidayatullah as acauan in conducting this research. In this interview there are some questions about the assessment process for the selection of Mustahik ongoing and expected solution. The timing of the interviews were conducted at:

Place : Baitul Maal Hidayatullah
Day : Tuesday
Date : 5 April 2016
Addressed : Bapak Ade Syariful Allam
Title : Director of Programs and Reforms

b) Study Library

Researchers to study literature by reading and studying books related to the analysis and design of Decision Support Systems (DSS), web programming as well as books that support the method of Weighted Product and waterfall system development methods discussed in the preparation of this thesis. There are several books that may be referenced in this thesis sunan turtles and for a list of books - books can be seen on the bibliography.
2.2 System Development Method

System development method used in this study is a Waterfall. The stages in Waterfall method are: requirements analysis and definition, system and software design, implementation and unit testing, integration and system testing, and operation and maintenance.

3 Implementation

3.1 Analysis of Current System

Analysis of walking needed to assess how the existing system in BMH...

This is an explanation of the analysis contained in the system is running BMH:
1. Candidates Mustahik volunteered to be a Mustahik at BMH by handing over personal data to be processed by Amilin.
2. Amilin do Mustahik candidate data processing and assessment by conducting home visits Mustahik candidate.
3. The results of these assessments become a reference in the feasibility mentukan Mustahik whether the candidate eligible to receive zakat funds.
4. After assessment by Amilin based on specified criteria, will be processed Mustahik eligible to receive aid and charity.
5. Determination of the amount of charity funds that will be channeled into consideration Mustahik remains to be done manually so that sometimes the nominal amount received less in accordance with the results of assessment between Mustahik with each other Mustahik.
6. Mustahik receive zakat according to the results of the consideration Amilin who served as a charity fund managers based on the assessment, by the time of survey.

3.2 Supplementary Analysis System
Based on the analysis of system running research, the writer makes an analysis of follow-up with the aim to improve the existing system.

![Supplementary Analysis System](image)

**Figure 2. Supplementary Analysis System**

Here’s an explanation of subsequent system analysis, as follows:

1. Candidates Mustahik volunteered to be a Mustahik at BMH by handing over personal data to be processed by Amilin.
2. Amilin do Mustahik candidate data processing and assessment by conducting home visits Mustahik candidate
3. The results of these assessments become a reference in the feasibility mentukan Mustahik whether the candidate eligible to receive zakat funds
4. After assessment by Amilin based on specified criteria, will be processed Mustahik eligible to receive aid and charity. Results of the assessment will be processed through a CMS system to find out how the amount of nominal zakat funds to be received Mustahik.
5. Mustahik receive zakat according to the results of calculations performed by the CMS system determining the nominal amount of the distribution of zakat funds to Mustahik.

### 3.3 Perhitungan Manual WP

Implementation methods Weighted Product (WP) in the application decision support system for determining the nominal amount of zakat fund distribution will be explained in the manual calculation method:

<table>
<thead>
<tr>
<th>No.</th>
<th>Assessment Criteria</th>
<th>Symbols Criteria</th>
<th>Status Criteria</th>
<th>Eight Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>C1</td>
<td>Benefit</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Status Of</td>
<td>C2</td>
<td>Benefit</td>
<td>4</td>
</tr>
</tbody>
</table>
The next step was to make the weight criteria, the following calculations:

\[ \sum \frac{W_i}{W_j} \]

Where:

\[ W = \text{Weight of criteria} \quad j = \text{Criteria} \]

a. Age Criteria (C1)

\[ W_1 = \frac{1}{1+4+5+4+4+4+4+2+2} \]

\[ W_1 = 0.04 \]

b. Status Of Residence Criteria (C2)

\[ W_2 = \frac{4}{1+4+5+4+4+4+4+2+2} \]

\[ W_2 = 0.15 \]

c. Income Criteria (C3)

\[ W_3 = \frac{5}{1+4+5+4+4+4+4+2+2} \]

\[ W_3 = 0.2 \]
The next step is to calculate the vector S, where the data will be multiplied, but reappointment previously done with weights

\[ S = (W_{ij} A_{wj}) \cdot (W_{in} A_{wn}) \cdot w \]

Where:
- \( W \) = Weight of criteria / sub-criteria
- \( J \) = Criteria
- \( S \) = Preference alternative analogy as vector S

**a. S1 (Oki)**

\[
S_1 = 1,13 \times 1,17 \times 0,06 \times 6,63 \times 5,06 \times 0,98 \times 2,51 \times 2,44
\]

\[ S_1 = 17,77 \]

**b. S2 (Roni)**

\[
S_2 = 1,13 \times 1 \times 0,06 \times 6,45 \times 4,98 \times 1 \times 2,37 \times 2,46
\]

\[ S_2 = 15,28 \]

**c. S3 (Adih)**

\[
S_3 = 1,13 \times 1,10 \times 0,05 \times 7,81 \times 5,20 \times 1,10 \times 2,51 \times 2,54
\]

\[ S_3 = 16,97 \]

After doing the calculations to get the value of each vector S Mustahik, then after that the authors calculated to determine the value of vector V, the following calculation to find the value of each vector V:

\[
\frac{S_i}{V_{jn} = \sum S_i}
\]

**V1 (Oki)**

\[ 17,77 \]

\[ V1 = \frac{17,77}{50.02} = 0.35 \]

**b. V2 (Roni)**

\[ \]
\[
V_2 = \frac{15.28}{50.07} = 0.31
\]
c. \( V_3 \) (Adih)
\[
V_3 = \frac{16.97}{50.07} = 0.34
\]

Value Vector \( V \) which is owned by each Mustahik, will then be multiplied by the nominal zakat funds will be channeled by BMH to the Mustahik. Nominal Zakat funds would be channeled Rp. 1,000,000. Here's the end result:

Table 4. Mustahiq Nominal Zakat

<table>
<thead>
<tr>
<th>Mustahik Name</th>
<th>Nominal Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oki</td>
<td>Rp. 330,000</td>
</tr>
<tr>
<td>Roni</td>
<td>Rp. 310,000</td>
</tr>
<tr>
<td>Adih</td>
<td>Rp. 340,000</td>
</tr>
</tbody>
</table>

3.4 Use Case Diagram

Use case diagram is a description of the functionality of a system, so that the customer or system users know and understand about the usefulness of the system to be built. Use case diagram is a system from the perspective of the system user (user), thus making the use case is more emphasis on the existing functionality in the system, not based on the flow or sequence of events.

The figure 3 is the use case diagram in making a decision support system that I did. In making the use case diagram, there are two actors who have their respective functions.
Amilin is the zakat institution that will be using this system. Amilin which will take a decision in assessing the Mustahik in calculating the nominal amount of the distribution of zakat funds. Admin is the zakat institution that will use this CMS system to manage data Amilin in zakat institution.

4 Result

After all the stages of making a decision support system for determining the amount of zakat fund distribution terhadap Mustahik has been completed, the results display will be explained in the picture below:

Figure 4. Login Page Views

Figure 5. Input Display Mustahik
Figure 6. Input Display Criteria

Figure 7. Page Views Input Ratings
Figure 8. Display Count Vector S

Figure 9. Display Count Vector V
5 Conclusion

Based on the results of the research that the author has explained, it can be concluded that:
1. Implementation Method of Determining the Amount of Weighted Product In Zakat Disbursement Against Mustahik (Case Study: Baitul Maal Hidayatullah) has helped Amilin in calculating the amount of the distribution and charity towards mustahik and has produced the expected output as a result of the testing Black Box.
2. Implementation Method of Determining the Amount of Weighted Product In Zakat Disbursement Against Mustahik (Case Study: Baitul Maal Hidayatullah) built using the PHP programming language and MySQL database. System development method used is Waterfall. Functional systems already produce the expected output is the nominal amount of zakat distribution of funds received by each Mustahik based on the criteria that have been determined BMH.

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References


Figure 10. Display Count Nominal


Learning to Recite the Qur’an through Mobile Applications

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Abstract. Muslims are expected to be able to recite the Quran. Unfortunately, many Muslims cannot do this in proper ways. Fortunately, mobile applications can help Muslims how to recite the Qur’anic verses in proper ways. Focusing on a mobile application known as “Quran E-Learning”, this paper describes the advantages of using this mobile application as a new tool to learn to recite the Qur’an. The use of this mobile application is expected to contribute to the attempt to overcome the obstacles facing millennial Muslims in learning to recite the Qur’an in proper ways.

Keywords: Alquran Learning; millennial Muslims; mobile application; Google Play

1 Introduction

Indonesia is the largest Muslim country in the world, in which around 12.7 % of the world’s Muslim population live in this country. Around 200 million or 88% of Indonesian population are Muslims. However, according to a report of Susenas BPS in 2014, around 54% of them cannot recite the Qur’an properly.

This is a serious problem for reciting the Qur’an is one of Muslims’ daily obligations. There are many factors contributing to this phenomenon. These include the facts that many Muslims do not start learning to recite the Quran at their early ages; they are busy with their daily business so it is difficult to find suitable time to learn how to recite the Qur’an; there are limited number of good teacher or credible learning resources; or adult Muslims are embarrassed to learn how to recite at the same place with children Muslims.

Therefore, there is a need for a private, flexible, accessible and credible learning resource. Some Qur’an publishers have responded to this need by producing e-pen version of the Qur’an which guides its users to recite the Qur’an properly. However, this product has two disadvantages: it is expensive and not mobile. Fortunately, a mobile application known as “Qur’an E-Learning” is seen to be able to overcome these weaknesses in that it provides mobile, interactive, and self-learning resource, which can be accessed easily and freely via smartphone.

2 Background Study
Nowadays, there are more than 500 Qur’an applications using android platform[1]. However, most of them provide only one way interaction, such as text, recital, translation and exegesis. Only few of them provide two-way interaction, so users can improve and evaluate their ability to read Qur’an[2].

Reading Quran properly is reciting Qur’an according to makhraj and tajweed rules[3]. The conventional process of learning Qur’an is highly depending to the guidance of an expert teacher. The teacher plays an important role, such as to make same examples, hear the student’s recitation and do some corrections. This process is called talaqqi and musyafahah[4]. The teacher will correct student recitation based on tajweed rules with respect to harakat, makhraj and sifat[5]. The weakness of this conventional method is the difficulty to find suitable time and teacher.

In conventional talaqqi and musyafahah method, the learning process divided into three steps. They are the teacher’s recitation as reference guide to read Quran, the student’s recitation following the guidance, and the corrections from the expert teacher[6]. The second and third steps usually repeated several times until student reach proper recitation according to teacher judgment. These three steps technically can be transformed into artificial intelligent process, so the student can practice and improve his ability as much as he please, anytime and anywhere, without the presence of expert teacher. It can be used as a pre-evaluation process before doing actual correction with the real teacher.

3 Related Work

There were some studies about Qur’an learning program based on mobile application, one of them is “Al-Qur’an Learning Using Mobile Speech Recognition: An Overview” which presented the design of Qur’an learning application using recognition speech ASR (automated recognition speech). This application serves as tutor which helps user to spell Qur’an properly and also correct the mistake of user spelling[7].

Another research is “Toward Designing And Modeling Of Al-Qur’an Learning Application For Android Devices.” This research present “Noor Al-Qur’an” application which equipped by some features such as recitation, translate, root words and tafseer in the form of audio, video and text. This application help users to recite, memorize and understand the Qur’an. The flaw of this application is the absence of tajweed features. The application fits for the users which have basic knowledge in reciting Al-Quran[8].

The next research are “iTajweed, to Enhance The Interactive Learning Modules For The User[9]”, “Membangun Aplikasi Berbasis Android Untuk Pembelajaran Dalam Membaca Lafadz Al-Quran Disertai Tajwid[10]”, “Aplikasi Pengenalan Ilmu Tajwid Berbasis Android [11]”. These researches attempt to build applications which help users learning to read Qur’an properly according to tajweed rules. These applications equipped by some features such as tajweed rule explanation, examples and voice over.

Another research is “Implementasi Google Speech Untuk Penentuan Level Pembelajaran Iqra [12]”. The research attempts to design an application using Google Speech which helps users learning to read Qur’an properly according to iqra method. This application equipped by some features such as voice over menu which explain the theories and the examples, and test menu to evaluate the result of the learning process.
4 System Development Method

The system development used in this research are three stages: (1) Users need determination, (2) making the design, and (3) implementation stage. The first stage generates three basic needs in learning to read Qur’an. They are teacher’s recitation as reference guide to read Quran, the student’s recitation following the guidance, and the facility to record and replay student’s recitation so the student can do self correction to his recitation. The second stage is conducting the architecture design and system interface. This design consists of several the workflows including registration phase, read phase, how to read phase, test phase, and play again-record phase. The third stage Implementation stage is to apply the design with Android Studio, Javascript, and DB Browser for SQLite and perform users acceptance test.

5 Result and Discussion

This research will present new method of learning to read the Qur’an using mobile application. This method will help users to know how to read Qur’an effectively and easily. Users can also record, delete and rerecord his own reciting as much as he wishes. Users can also compare between his recorded voice and voice over from the application or bring his recorded voice to the real teacher to be evaluated. The notations used throughout this paper and the proposed work flows are as follows:

Table 1. Workflow Notations

<table>
<thead>
<tr>
<th>Notation</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![User icon]</td>
<td>Actor</td>
<td>Stakeholder that calls on the system to deliver one of its services</td>
</tr>
<tr>
<td>![Sheath icon]</td>
<td>Use Case</td>
<td>Represents a user goal that can be achieved by accessing the system or software application</td>
</tr>
<tr>
<td>![Association icon]</td>
<td>Association</td>
<td>Actor and use case can be associated that actor participates in that use case</td>
</tr>
<tr>
<td>![Gateway icon]</td>
<td>Gateway</td>
<td>Determine forking and merging of paths, depending on the conditions expressed</td>
</tr>
</tbody>
</table>
This research has five phases:

1) Registration Phase
User must have an account to access this application. The user can get the account via email and password after filling out the form.

![Flowchart](image1)

**Figure 1. Registration Phase**

2) Read Phase
User can read Qur'an using mobile application

![Flowchart](image2)
3) How-to-Read Phase
User can select the text of a particular part of the Qur’an, and listen how to read that text section.

4) Test-Phase
In this phase, users can record their own voices and compare it with audio (voice over) from the application. The users can also skip this phase and continue to next phase (Play-Again-Record-Phase)

5) Play-Again-Record-Phase
User can play the record voice from the application, and user can bring the voice record to real teacher to fix the spelling and reading Al-Quran.
In accordance with the proposed scheme, users have six modules to learn read Qur’an. In use case diagram actor has association with six menus or modules.

**Figure 4.** Play-again-record Phase
Figure 5. Use case diagrams

5 Conclusion

Reciting the Quran is an obligation for Muslims. Yet, many Muslims cannot recite the Qur’an properly due to many factors, including lack of learning resources. The need of millennial Muslims for more private, flexible, accessible and credible Qur’an learning resource has increased. The traditional methods of Qur’an reciting do not fit anymore with the needs of millennial Muslims. In response, the Qur’an E-Learning application is found to be useful in helping those millennial Muslims how to recite the Qur’an as often as possible and repeat their recital without the presence of teachers. This application can be used as a pre-evaluation tool before the learners test their Qur’anic recital before offline teachers.

6 Future Work

The future research is needed to improve the capability of Qur’an E-Learning application in testing its users’ ability to recite Qur’an in proper ways. This can be conducted through the use of use the ASR (automated recognition speech). By doing this, it is expected that the application will be more useful as a learning resource for millennial Muslim generation to improve their skill of reciting the Qur’an.

Acknowledgements. This research was funded by Faculty of Ushuluddin and Center of Research and Publication (Pusat Penelitian dan Penerbitan - Puslitpen) UIN Sunan Gunung Djati Bandung.

References


Application of Geophysical Method to detect the Subsurface Environment Parameter

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Abstract. The subsurface environment is one important part of human life. People need the clean water from subsurface to fulfill their life. Therefore one needs to know the subsurface area that is free of contaminants to find sources of clean water. Geo electric is one geophysical method can be used to detect the clean water sources. Geo electric investigation done on the basis of the physical property of rock to electrical current. If the flow of direct current into the earth through the electrode currents A and B, then the measured potential difference caused by the current on 2 pieces of electrode potential on M and N, it will obtain the value of resistivity pseudo types. Electrode configuration used in the form of Schlumberger configuration to determine the subsurface clean water aquiver. Interpretation of the results of the formation resistivity shows four layers of formation, which consists of layer 1 with the resistivity of 117-1978 ohm meter (conglomerate), layer 2 with the resistivity of 23-93 ohm meter (sandstone 2), layer 3 with the resistivity of 1-10 ohm meter (clay), and layer 4 with the resistivity 17-65 ohm meter (sandstone 1). The possibility of formation that could serve as clean water reservoirs are sandstone1 and sandstone2.

Keywords: Geo electric; sanitation, clean water, human life, resistivity

1 Introduction

In the last decade there has been a growth in population very rapidly in the world, it can lead to exploitation of groundwater continued to increase rapidly. This phenomenon has led to impacts negatively affect the quantity and quality of groundwater, including subsidence in the groundwater, the groundwater quality degradation, and occurrence of sea water intrusion in some areas. Groundwater is a renewable natural resource currently has played an important role in providing water supply needs for a variety of purposes, so it is causing a shift in the value of the groundwater itself. Both individuals and community groups need water for daily and other needs. From a variety of those needs, then water for drinking is top priority, than all other purposes. This means that the function of water drinking should be pursued as well as possible in order to meet the requirements quality and quantity, as well as the best use for the needs of living things. Given the increasingly important role of groundwater, then utilization of groundwater in should be based on the balance and groundwater sustainability itself, or in other words the use of water land in environmentally sound and should be sustainable. The need for clean water can be overcome by using...
groundwater sources. Groundwater is water contained in the permeable layer, the water trapped in the cavities between the molecules of rocks, and the water can not come out by itself because it is very deep below the earth’s surface. Layer containing water is more commonly called aquifers. Water shortages in some caused by the limited areas where aquifers are typically shaped layers. East Suwawal Village has choosen as the study area because this Village will be developed as a center pilot development of technology by all development agencies both national and local technology called "Kampung Technology". "Kampung technology" will be developed as technology areas are divided into three regions, namely echopark, technopark, and agrotek area. The third region is very need a good supply of clean water for agriculture (irrigation) and land development of other technologies that require water to be kept continuously throughout the year.

2 Methods

Consider a single point electrodes which are at the limit of semi-infinite media, fictional homogeneous earth represented by electrically homogeneous. If the current I is transported by the electrode, and is calculated in amperes (a), then the potential that is at each point in the media or at the limit will be given by [1]:

\[ U = \rho \frac{I}{2\pi r}, \]

where: \( U \) = potential, in V, \( \rho \) = resistivity of the medium, \( r \) = distance from the electrode.

In geophysical books such as Keller and Frischknecht (1996) there are mathematical demonstrations that are used as derivations. in the pair between the electrode with the current I at the A electrode, and -I at the B electrode (figure 1), the potential at a point is obtained from the algebraic number and individual contribution [1]:

\[ U = \frac{\rho I}{2\pi r_A} - \frac{\rho I}{2\pi r_B} = \frac{\rho I}{2\pi} \left[ \frac{1}{r_A} - \frac{1}{r_B} \right], \]

where: \( r_A \) and \( r_B \) = distances from the point to electrodes A and B. Figure 1 illustrates the electric field around the two electrodes in terms of equipotentials and current lines.
Following the previous equation, the potential difference $V$ may be written [3]:

$$V = \frac{\rho I}{2\pi} \left[ \frac{1}{AM} - \frac{1}{BM} + \frac{1}{BN} - \frac{1}{AN} \right],$$

Where: $UM$ and $UN =$ potentials at $M$ and $N$, $AM =$ distance between electrodes $A$ and $M$.

The quantity is denoted $1/K$, which allows rewriting the equation as:

$$V = \frac{\rho I}{2\pi} \frac{1}{K},$$

Where $K =$ array geometric factor. Equation above can be solved for $\rho$ to obtain:

$$\rho = 2\pi K \frac{V}{I},$$

The resistivity of the medium can be found from measured values of $V$, $I$, and $K$, the geometric factor. $K$ is a function only of the geometry of the electrode arrangement. the ratio $s$ to $a$ is limited by the sensitivity of the instrument and stored in the boundaries of about 3 to 30. that is to use the distance of the electrode which is restricted and equation 2 to find the geometric factor value ($K$). Resistivity can be explained as follows [3]:

$$\rho_a = \pi \left[ \frac{a^2}{a} - \frac{a}{4} \right] \frac{V}{I} = \pi a \left[ \left( \frac{a}{a} \right)^2 - \frac{1}{4} \right] \frac{V}{I},$$

In usual field operations, the inner (potential) electrodes remain fixed, while the outer (current) electrodes are adjusted to vary the distance $s$. Also, the $a$ spacing may sometimes be adjusted with $s$ held constant in order to detect the presence of local inhomogeneities or lateral changes in the neighborhood of the potential electrodes. This array consists of four electrodes in line, separated by equal intervals, denoted $a$. Applying equation above, it will find that the geometric factor $K$ is equal to $a$, so the apparent resistivity is given by [3]:

$$\rho_a = \pi \left[ \frac{a^2}{a} - \frac{a}{4} \right] \frac{V}{I} = \pi a \left[ \left( \frac{a}{a} \right)^2 - \frac{1}{4} \right] \frac{V}{I},$$
Although the Schlumberger array has always been the favored array in Europe, until recently, the Wenner array was used more extensively than the Schlumberger array in the United States.

![Figure 2. Electrode array configurations for resistivity measurements [3].](image)

The dipole-dipole array (figure 2c) is one member of a family of arrays using dipoles (closely spaced electrode pairs) to measure the curvature of the potential field. If the separation between both pairs of electrodes is the same $a$, and the separation between the centers of the dipoles is restricted to $a(n+1)$, the apparent resistivity is given by [3]:

$$\rho_a = \pi an(n+1)(n+2) \frac{L}{T},$$

From the coordinate data obtained is then processed with software Mapinfo 8.5 to obtain the position of the map corresponding to the map East Suwawal Village topography. Apparent resistivity data is read by the tools used to determine rho and depth that is by entering the value AB / 2, MN and value pseudo rho, using the software IX1D be obtained rho value, depth, thickness, and elevation automatically [5,6]. In the following order: Opening IX1D program, then select the menu File New Sounding Resistivity / IP Sounding Determination of the cross-correlation Once known rho prices and depth of each point sounding then performed. This correlation is done for determine the form, distribution, thickness, and depth of rock layers. We use CorelDraw 12 software.

### 2.1 Data Collection Method

In compiling this thesis the writer will use the data collection method as follows:

a) Interviews

This method is done by conducting interviews to parts and Utilization Program Baitul Maal Hidayatullah, Mr Ade Syariful Allam regarding related problems. This is done in order to obtain complete information - details about the distribution of zakat funds terhdap Mustahik in Baitul Maal Hidayatullah as acuan in conducting this research. In this interview there are some questions about the assessment process for the selection of Mustahik ongoing and expected solution. The timing of the interviews were conducted at :

Place : Baitul Maal Hidayatullah
Day : Tuesday
Date : 5 April 2016
Addressed : Bapak Ade Syariful Allam
Title : Director of Programs and Reforms
b) Study Library

Researchers to study literature by reading and studying books related to the analysis and design of Decision Support Systems (DSS), web programming as well as books that support the method of Weighted Product and waterfall system development methods discussed in the preparation of this thesis. There are several books that may be referenced in this thesis such as turtles and for a list of books - books can be seen on the bibliography.

3 Results and Discussions

Geologically, East Suwawal Village, Pakis Aji District, Jepara including the area with the plain waved morphology, which is composed of some formations such as tuff and Muria alluvium. East Suwawal village is one of the villages in the Jepara regency. East Suwawal village is the village which is quite extensive, there are lands owned Perusda Jepara regency. Seen from topographic maps, this village is at the height of the lowest elevation of 30m above sea level and 72M of the highest sea level with a maximum height difference of 42 m. The maximum slope of 5.50 that is included in the area with undulating terrain morphology, as in the image below. Based on the geological interpretation of the results is known that the village Suwawal The east composed of several formations including; Tuff Muria and Alluvium [7].

![Figure 3. Province of Central Java and area of research [7]](image)

Muria composed by tuff tuff, lava and sandy tuff. Tuff color yellow to brown, poorly plated, pebble -grained lapilli up, less compact, partially weathered and brittle. Berkomponen lava fragments leusit rock - teprit, leusitit, basalt, andesite and trakit, local limestone and rocks trubah with future volcanic sand bottom, and structure intermittent stream. Sandy to clay - sized tuff lapilli up subtle, layered stacking structure as inserts in the tuff. Lithologies has spread quite widely. The estimated age of rock units together with Lava Muria, the Pleistocene - Holocene. Alluvium is composed by gravel, sand, clay, silt, remnant vegetation and boulders of rock mountain fire in the form of beach sediments, wetlands, and rivers. Sounding data processing has been done before, stages. The first correction to the data
obtained resistivity East Suwawal Village. The data is processed to obtain the 1D models by the IX1D software. At this process the result showed in the following table with the format of layer, rho value, kind of layer, height, and depth [8,9]:

Table 1. The Cross Section Correlation For Track 1

<table>
<thead>
<tr>
<th>Layer</th>
<th>Rho Value</th>
<th>Kind Of Layer</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer 1</td>
<td>15</td>
<td>Conglomerat</td>
<td>68 – 72</td>
<td>4 M</td>
</tr>
<tr>
<td>Layer 2</td>
<td>90</td>
<td>Conglomerat</td>
<td>59 – 68 M</td>
<td>9 M</td>
</tr>
<tr>
<td>Layer 3</td>
<td>2</td>
<td>Sand</td>
<td>13 – 59 M</td>
<td>46 M</td>
</tr>
<tr>
<td>Layer 4</td>
<td>10</td>
<td>Clay</td>
<td>4 - 13 M</td>
<td>17 M</td>
</tr>
</tbody>
</table>

Table 2. The Cross Section Correlation For Track 2

<table>
<thead>
<tr>
<th>Layer</th>
<th>Rho Value</th>
<th>Kind of Layer</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer 1</td>
<td>87</td>
<td>Conglomerat</td>
<td>58 – 62 m</td>
<td>4 m</td>
</tr>
<tr>
<td>Layer 2</td>
<td>20</td>
<td>Conglomerat</td>
<td>46 – 58 m</td>
<td>12 m</td>
</tr>
<tr>
<td>Layer 3</td>
<td>7</td>
<td>Sand 2</td>
<td>15 – 46 m</td>
<td>31 m</td>
</tr>
<tr>
<td>Layer 4</td>
<td>8</td>
<td>Clay</td>
<td>1 - 15 m</td>
<td>29 m</td>
</tr>
</tbody>
</table>

Table 3. The Cross Section Correlation For Track 3

<table>
<thead>
<tr>
<th>Layer</th>
<th>Rho Value</th>
<th>Kind of Layer</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer 1</td>
<td>32</td>
<td>Conglomerat</td>
<td>– 32 m</td>
<td>2 m</td>
</tr>
<tr>
<td>Layer 2</td>
<td>99 48 hm.m</td>
<td>Conglomerat</td>
<td>– 30 m</td>
<td>5 m</td>
</tr>
<tr>
<td>Layer 3</td>
<td>1 1 hm.m</td>
<td>Sand 2</td>
<td>– 25 m</td>
<td>22 m</td>
</tr>
</tbody>
</table>
Table 4. The Cross Section Correlation For Track 4

<table>
<thead>
<tr>
<th>Layer</th>
<th>Rho Value</th>
<th>Kind of Layer</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer 1</td>
<td>966 ohm.m</td>
<td>Conglomerat</td>
<td>8</td>
<td>42 m</td>
</tr>
<tr>
<td>Layer 2</td>
<td>482 ohm.m</td>
<td>Conglomerat</td>
<td>6</td>
<td>38 m</td>
</tr>
<tr>
<td>Layer 3</td>
<td>48 ohm.m</td>
<td>Sand 1</td>
<td></td>
<td>31 m</td>
</tr>
<tr>
<td>Layer 4</td>
<td>8 ohm.m</td>
<td>Clay</td>
<td></td>
<td>26 m</td>
</tr>
</tbody>
</table>

The next stage is to create a 2D model using CorelDraw 12 software. This 2D model by correlating rho and depth values obtained from the data processing previously. Then made a trajectory drawn by hand straight line either horizontally, vertically, or diagonally on the points adjacent, is shown in figure 4 for model cross section track 1, figure 5 for model cross section track 2, figure 6 for model cross section track 3, and figure 7 for the model cross section track 4. All of the models showed on the following figure:
Figure 5. The model cross section of track 2

Figure 6. The model cross section of track 3

Figure 7. The model cross section of track 4
The last step is to determine the elevation value of subsurface clean water flow direction. Based on the determination of the cross section-correlation of the above there are four models cross section track. Cross section tracks 1 consist of 4 layers of 2 layers of conglomerate, 1 layers of sandstone, and one layer of clay. Cross section tracks 2 consist of 4 layers of 2 layers of conglomerate, 1 layers of sandstone 2, and one layer of clay. Cross section tracks 3 consist of 4 layers of 2 layers of conglomerate, 1 layers of sandstone 2, and one layer of sandstone 1. Cross section tracks 4 consist of 4 layers of 2 layers of conglomerate, 1 layers of sandstone 1, and one layer of clay. Found in sandstone that is at a height of 13-59 m and the value of resistivity between 22-42 ohm-m. Soundings taken four points since adapted to the conditions territory uneven and bumpy. Clay layer having distorting sounding point slightly upwards which influenced by structural and morphological state at this point. This trajectory flow is relatively towards the north direction.

3 Conclusion

Based on the results of geoelectric data processing concluded as follows, there are four location of aquifers, namely:
1. Tracks 1: found in the sandstone aquifer which is at depth of 13-59 m and resistivity values 22-42 ohm m.
2. Track 2: The aquifers are found in 2 layers of them on the rocks sand 1 is located at a depth (-50) - (-14) m with value resistivity 17-35 ohm m and sandstone 2 which is at depth of 15-46 m with a price resistivity 37-86 ohm – m
3. Track 3: aquifer on this track are the sandstone layer 1 is located at a depth (-40) - 3 m and resistivity value 41 - 71 ohm - m, and 2 sandstone is at a depth of 3-25 m and value resistivity 17-65 ohm
4. Tracks 4: aquifer on this track are the sandstone layer 1 and 2 layers of sandstone. At 1 sandstone is at a depth (-75) - (-31) M with a value resistivity 16-95 ohm - m, while the sandstone is at a depth of 2 (-5) - 26 m the price of resistivity 36-48 ohm - m.

Direction of groundwater flow in the aquifer for the top and bottom relative to the north.

References


Social Media in Classroom: The Use of Facebook in Foreign Language Learning

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Abstract. It has been commonly and scientifically noticeable that today’s students are closely attached with internet, a cutting-edge invention of technology. They, who are so-called net generation, are progressively connected through social net-working sites such as Facebook. This condition should not be seen as the barriers but should be benefited as a chance to create attention-grabbing atmosphere of classroom, including foreign language class. It is true that social media has some downsides but there have been many studies revealing that Facebook can be utilized as learning media. In language instruction, it can be set in both native and foreign language. By Facebook, the teacher is able to facilitate discussion among students of target language equipped with culturally relevant materials. This paper attempts to comprehensively discuss some aspects of the use of Facebook in foreign language learning: method, material, and strength and weakness.

Keywords: Facebook, foreign language learning, social media

1 Introduction

The widespread of internet significantly affects almost all aspects of lives including in the field of education. The internet is a priceless source of information for students and a tool to enhance their productivity (Metzger, Flanagan & Zwarun 2003; Kirschner and Karpinski 2010). This has made students to be heavy users of the internet compared to the general public (Ni, Yan, Chen, & Liu, (2009); Judd and Kennedy 2010). In Indonesia, at least 30 million children and teenagers in Indonesia is internet users, and digital media today become the main choice of communication channels they use. The study found that 98 percent of children and teenagers are surveyed knew about the Internet and that 79.5 percent are internet users (Kemenkominfo, 2014).

In this globalized era, which is full of digital tools, learning can be done directly or through social media. For today’s young learners, so-called digital natives, social media is something very close and familiar with their everyday lives. This is in line with what Dermott (2013, p. 2) stated that the digital natives grow up and are surrounded by technology and became accustomed to using new media throughout their daily lives.

Despite the availability of technology and internet, there has been much debate over the use of computers and the internet in foreign language teaching over the past few years (Isisag, 2012, pp. 1-5). Thus, since there is a number of different social media, it is important to classify the social media tools according to their purpose, benefit and characters. Therefore, when it comes to use the social media in instructional activities, the teachers could select...
appropriate and effective tool. The classification of social media is illustrated in the following landscape taken from https://fredcavazza.net.

![Social Media Landscape 2017](https://fredcavazza.net)

Figure 1. Social Media Landscape 2017

The figure illustrates that social media has different and specific function. For example, blog and wordpress is used for publishing; instagram and youtube for sharing; zynga and playstore for playing and so on. Besides, facebook, twitter and google are the tools that cover some of the functions. Why do the teachers need to make it suitable between the social media and the students’ needs? Certainly because internet is not only beneficial but, in the same time, also disadvantageous. To illustrate, Kahari (2013, p.5) revealed that cell phone with the internet affects the academic related problems includes decline in study habits, drastic drop in grades, missing classes and poor integration in extracurricular activities. However, some others place social media, such as facebook (Vandoorn , 2013, pp.1-14), twitter (Bista, 2015, pp. 83-102), and youtube (Albantani & Madkur, 2017, p. 291), in a great value to instruction.

Facebook as stated by Terantino and Graaf (2011, p. 44) can stimulate teamwork through target language discussions, status updates, comments, and questions. Students can discuss a photograph or video or can ease an activity in which they depict in the foreign language a certain place, person, activity, etc., and other students try to presume what it is. Instructors can also create hypothetical events in the target language country and design a discussion around the students’ anticipation before, experiences during, and thoughts after attending the event. These types of collaborations can encourage a sense of relationship and community between the students allowing for a richer and more appealing learning experience. In this manner, Facebook allows for multi-dimensional conversation, both among students and between students and the instructor.

2 Methods

This qualitative study employed case study approach since it was focused on investigating certain phenomenon, in this case, the use of facebook as the media of foreign language
teaching. The data was collected by using documentation, observation and interview. Then, to analyze the data, Miles and Huberman’s interactive model was used. The study was carried out in the Arabic language classes at two departments, namely Physics Education department and Education Management department at Syarif Hidayatullah State Islamic University Jakarta.

3 Discussion

3.1 Facebook in Foreign Language Learning: The Implementation

Based on the observation conducted in the Arabic language classrooms, in facebook-based learning, the teacher created a fanpage or group related to the language that they teach. Here, the lecturer made the account “Belajar Bahasa Arab” (as can be seen in figure 2), which literally means “Learning Arabic Language”. Subsequently, the lecturer invited all of his students or others he considered suitable with his requirements.

![Facebook Fanpage](image)

Figure 2. A fanpage for Arabic language learning

What the students need to do was first to register to get into the account, then learners logged in through facebook account respectively. This step was for the students who had not yet had an FB account. Afterwards learners could already follow the online class on facebook and see Arabic language materials that had been provided in the fanpage. Furthermore, learners could access the new materials uploaded by lecturer each week. Furthermore, the students also could ask for questions about the materials that had not been understood and known through their facebook account. They could also share or discuss with other students to understand each other.

The implementation of learning Arabic language through this media is not much different from other medias like google classroom which is useful to facilitate the students and lecturers in the instruction process because of the direct and clear communication links, especially communication about the assignments and materials delivered (Rozak & Albantani, 2018: 100).

In the classroom, the instruction began with the lecturer's explanation of the semester lecture plan for students. Then, the lecturer divided the students into groups consisting of three to four students. Each group made their respective papers. At each meeting every week, groups that were scheduled for presentations would present to the class about their papers.
Usually, the speaker read a number of Arabic conversations and other students repeat the conversation. In addition to presenters who will read Arabic conversations, they also explain a little part of materials such as about fi’il, like fi’il madhi and fi’il mudair’. After enough, the lecturer took over the class and explained to the students about the material that had been conveyed by the group. The session continued by question and answer in which the lecturer would randomly call two to three students to come forward and answer the questions about the materials that was explained...

3.2 Teacher’s Role in Facebook-Based Instruction

Involving ICT in instructional activities need to pay a big attention to the teacher component. In fact, using FB is not always easy for some teachers. Therefore, a step-by-step learning to use the technology and integrate this application to curricula is necessary (Mundy, Kupczynski, & Kee, 2012: 1). Fortunately, the Arabic language lecturer in the two departments was already familiar with social media. He said that he had known some social media such as facebook, twitter, whatsapp, and, the latter one, instagram.

As the media that is expected to be part of a process of teaching and learning in schools, the internet with facebook facilities should be able to provide support interactive communication process between teachers with participants educate as required in a learning activity. Conditions that must be supported by the internet is mainly related to learning strategies that will be developed, can be interpreted as a communication activity conducted to invite the students to do the tasks given by the teacher.

Based on the observation in the Arabic class, the lecturer engaged the students to talk to Arabic native speakers. Needless to say, this was highly meaningful because one of the best way to learn a foreign language is by directly talking with its native speaker. Through the internet with facebook facilities, teachers and learners could communicate with native speakers, teachers can also participate in discussion forums, and so on (Alfaki & Alharthy, 2014: 1-10). As a result, they were able to obtain different learning and interesting and apply it to the students either in giving tasks, applied to learners.

Moreover, not only the lecturer and the students who were possible to be on facebook site, but also parents and friends even up with people who have more expertise in Arabic language and they also have facebook account and create a discussion group about learning Arabic language. By doing this so, parent also took a part in monitoring the learning process of children because they could also be a teacher who controlled and prevented their children from the inappropriate use of facebook. In other words, the role of parents and friends was also very necessary in the learning process of learners.

The other role of the teacher was maintaining the students’ motivation in their learning. As it is commonly known, when the students get bored with the atmosphere, media or materials in their classroom, they tend to be less motivated. Thus, facebook, as well as other social networking, inspired the teacher that learning was a dynamic action. He stated that today’s technology enabled him and other teachers to keep transferring their knowledge at anywhere and anytime. In observation of this study, in teaching the students through facebook-based learning, the lecturer was able to influence the learners in understanding the material that he gave. Facebook was proven workable to attract the students to learn and improve their Arabic skills. Their enthusiasm then led in their higher motivation in learning Arabic language.

3.3 Facebook-based Learning Materials
Based on the needs analysis on the students, the lecturer designed a foreign language learning model applying facebook as the media. The underlying reason was that the nuances of the model were directed to a computer system that interacts and the learner focuses on listening, noting, revealing, responding, doing the exercises, by themselves they would know for themselves the level of ability they have based on the score issued by the computer system, or based on facebook. The materials are related to listening ability, speech and reading skills equipped with audio that help learners to know how to pronounce, how to read and intonation was good and correct (Ritonga. Et.al., 2016: 6). In the case of this study, the materials of the instruction shared in facebook:

<table>
<thead>
<tr>
<th>Skills</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>- Pairing new words with appropriate context.</td>
</tr>
<tr>
<td></td>
<td>- Mentioning the new vocabulary that matches the image.</td>
</tr>
<tr>
<td></td>
<td>- Completing the existing sentence by selecting the words that has been provided with appropriate and appropriate.</td>
</tr>
<tr>
<td>Listening</td>
<td>- Identifying the sound of the vocabulary being played</td>
</tr>
<tr>
<td></td>
<td>- Identifying the sound of the sentence being played</td>
</tr>
<tr>
<td></td>
<td>- Selecting the available answers according to the questions that are played</td>
</tr>
<tr>
<td>Speaking</td>
<td>- Questioning in pairs by using the question word available.</td>
</tr>
<tr>
<td></td>
<td>- Questioning in pairs in conversation like the example provided.</td>
</tr>
<tr>
<td>Reading</td>
<td>- Reading letters as well as intonation correctly and precisely.</td>
</tr>
<tr>
<td></td>
<td>- Stating the true or wrong sentences that have been provided in terms of its meaning.</td>
</tr>
<tr>
<td></td>
<td>- Answering questions about reading text content</td>
</tr>
<tr>
<td>Grammar</td>
<td>- Differentiating forms of part of speech such as noun, verb, adjective, verb, conjunction and so forth.</td>
</tr>
<tr>
<td></td>
<td>- Making examples of basic structure of sentences such as subject, verb/predicate, object, adverb and so forth.</td>
</tr>
<tr>
<td></td>
<td>- Composing a sentence that contains the functions of the word.</td>
</tr>
<tr>
<td>Writing</td>
<td>- Putting words or random phrases into a perfect sentence.</td>
</tr>
<tr>
<td></td>
<td>- Completing the available sentences by choosing the appropriate phrases.</td>
</tr>
<tr>
<td></td>
<td>- Adjusting paragraphs or sentences provided with some pronouns in accordance with the rules</td>
</tr>
</tbody>
</table>
To match between the materials provided in Facebook and instruction topics, the materials given were suited with the topics discussed each week. To make an example, when the topic was about daily conversation, the materials provided in Facebook were also related to this discussion (e.g., figure 3).

3.4 The Students’ Perception on ICT and Facebook as a Learning Media

The development of information and communication technology (ICT) offers various things in many fields including education field. It gives many benefit for the teachers (Awaludin, 2016: 221). Based on the interview result, most of the students positively perceive of the use of Facebook in foreign language learning, in this case, Arabic language. A student of Physics Education department, YZ, said that:

“I think, the technology development must be utilized to support educational activities. Using FB in my opinion is very good because it can ease the students to access the materials”

As today’s generation, YZ was very aware of the benefit of ICT for supporting instructional activities. This was a very reasonable opinion since many studies approve that modern teaching is an effective way to teach a foreign language. It is in line with what (Shyamlee, et al, 2012: 150) states that technologies have become successful in replacing the traditional teaching.

Other student from the same department, SN, said that “if the lecturer teaches using FB, I feel that the class run more interestingly”. When the students feel interested in the material, they will be more motivated. In fact, the motivation is vital to improving student learning outcomes (Gbollie & Keamu, 2017). In line with the two students above, DA, a student of Education Management department, considered that FB increased her learning experience especially in having wider and more flexible interaction with her teacher and other students. In fact, technology gives positive implication to student-teacher interaction (VanDoorn & Eklund, 2013: 2).

The students’ positive perception on the utilization of Facebook strengthens the fact that this social media can be beneficially involved in foreign language teaching. What to do next is the teachers’ ability to take the benefit Facebook in their classroom.
3.5 Advantages of Facebook-based Foreign Language Learning

In the application of the use of Facebook as a learning media must be very effective in this era of globalization today, because it is very influential on teenagers who have a high curiosity about the utilization of this Facebook application. Learning by using Facebook media network today can freely choose the material that they want. Derived from interview and observation, there are some of the advantages of Facebook in foreign language class as a learning media namely:

1. With various methods of listening, reading, viewing videos distributed by friends or people who include an article, video or anything in the form of material containing foreign language material to Facebook, then as a Facebook user we will also be easy to learn the material.
2. Use of Facebook-based learning is very free to interact with other fellow friends to make a communication with fellow users Facebook and can conduct discussion activities that can add our insight about learning Arabic language and by turning the discussion forum created on Facebook then we will keep the relationship with friends that we do not know or friends who are already known in the Facebook application.
3. By Facebook so everyone has the same opportunity, anyone can access all the services on Facebook be it teenagers up to parents and we also can easily share the knowledge that we already know about various ways to learn foreign language.
4. Learning language by using Facebook is very influential also to our ability in learning to understand themselves or learn self-taught Arabic language but Facebook users who become the source or creator of the material must also provide instructional tutorials offered more creative and easy to understand and understood by every user Facebook.
5. Benefit of a group or discussion forum that has been made on Facebook then this is a good thing for all of us, because we know that the whole world using Facebook application that extends all over the world with the breadth of coverage of this Facebook network users then we can know the various methods Which is used in every country in understanding foreign language.
6. By using Facebook, teachers who provide material in the form of audio, video and so on Facebook can improve language skills by viewing video and listening with audio visual then learners can increase their insight about learning foreign language.

Unconsciously learners, their ability to access, analyze, increasing as time goes by, and can be seen learners have developed their abilities.

3.6 Drawbacks of Facebook-based Foreign Language Learning

Learning language through Facebook was very good and provided insight or information more widely, however, Facebook also has shortcomings (Renatalia, 2017). According to the lecturer, below was a lack of learning using Facebook:

1. Facebook makes lazy with the tasks that we should do exactly with the use of Facebook make people forget the task and not to do the task even Facebook used to chat alone or comment on the status of others only, then with the existence of things like this can make learners become free in the absence of supervision from various parties.
2. Facebook also makes us less socializing with the outside community because only using the virtual world that is not directly face to face then our socialization becomes decreased and consequently we are awkward when interacting with the community around the house, school and so forth.
3. By deliberately or unintentionally sometimes bring up sites that are not good for children or teenagers or not exemplary because children or adolescents have a high curiosity so that the sites that are negative to make teenage children vulnerable to have feel curious.

4. The absence of restrictions in the use of Facebook to make children or teenagers use Facebook for hours that have been a means of learning precisely a means to play so it is not good to improve the achievements of children or adolescents themselves.

5. The use of Facebook as a learning also complicate learners who are in remote areas that do not have internet access, so that learners become very unhelpful in learning the Arabic language given by teachers or lecturers.

Taking a benefit of Facebook for learning facilities outside of school activities is very good but, in its implementation, teachers and learners must be ingenious in using it. Therefore, the need for parties who can minimize any negative impacts arising from the use of Facebook, and in using Facebook as a learning facility should be a learning medium that is useful for learners.

4 Conclusion

Based on observations and interviews that have been done, it can be concluded that the process of learning foreign language by using Facebook is effective and will be more valuable if made as info graphics with simple lessons. In addition, the learning process by using Facebook will be more easily understood by the students, because they are required to understand it self-taught so as to build their seriousness in learning. On the other hand, learning foreign with Facebook will also be effective and efficient when multimedia (audio visual) is utilized. However, the teacher should make sure that the Facebook features are used properly and appropriately when learning foreign language.

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References

Social Media Usage for Long Distance Relationship Couple through Computer Mediated Communication

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Abstract. The role of social media is significant in long distance marriage relationship communications. Communication is a very important aspect for the survival of human life. Humans as social beings always want to establish relationships with other humans. There are various ways people establish communication, one of which is through social media including facebook. Facebook is the highest social media which used by indonesian society. This study used descriptive qualitative method. The results indicate that the social media of facebook is widely used by long distance couples as a place of outpouring, seeking attention to their partners and means to get a response from a spouse or friend. The status written by the couple is widely used by long distance couples as a place of outpouring, seeking attention to their partners and means to get a response from a spouse or friend. The status written by the couple and get many responses from their friends will be analysed by CMC. A sample of 20 LDMR couples (Long Distance Marriage Relationship) participated in this study. The data cover couple's status on their facebook wall. There are six categories of responses in CMC for interpersonal communication, and the results of the study showed that the dominant responses on the purpose of the social media is for investigating and evaluating their couple’s status.

Keywords: Computer Mediated Communication; Long Distance Relationship; Social Media

1 Introduction

Social media are growing rapidly and have many classifications and types that match the needs of today's modern people. Today's social media communication plays an important role in everyday life. Humans use social media for the entertainment needs of all, scientific interests such as learning tools, means of seeking coffers of wealth and much more [1]. The presence of social media is very helpful in everyday life, although there are also some people who are reluctant to use the tool for a reason. For users who are less wise in addressing the presence of social media, then social media will become opium. Because of its presence can bring the benefits or otherwise bring problems for its users.

This study discusses the role of social media for long-distance marriage couples, as this is a unique thing. Many couples today are married but because of something or other they must be separated. From a survey conducted in 2014 in the National LDR (Long Distance Relationship) Report, most of the causes of this long-distance relationship are due to work and schooling [1]. Jobs that require a person to leave the couple in some time. Schools are also a reason, for married couples are usually because the University is far from the area of
origin, thus requiring the couple to split the distance. Living a long distance relationship is one thing that is not easy. Of course, this is not just about the great distance between couples. This is actually a problem because the burden is quite heavy because it is located far from the loved ones. This kind of thing is very likely to cause a sense of loneliness and feeling very bored. If not resolved soon, then it is possible for the relationship to be bland and can even end up just like that. There are quite a lot of ways that LDR partners can make love relationships always feel good even though they are very far away with their beloved partner. The first thing that is easy enough to do is to maximize the use of technology in a long distance relationship that is currently in progress. In the present time, there are many forms of technology that can be used to keep feel close to the couple.

A long distance relationship requires a commitment that is maintained by two people who have a relationship even though they are physically separated from each other [2]. A long-distance relationship is when an individual lives with a minimum of fifty miles away from a partner within a period of at least three months due to school, career, or other affairs, and keeps in touch with his partner using telephone, email and other communications technologies [3]. One means of social media, which is widely used by long-distance marriage couples is video chat in app what's App. By using this video chat, they can still maintain the intimacy of the relationship. Because the sustainability of domestic relationships is determined by good communication between both parties [4]. The use of social media by means of the internet is an alternative media communication to maintain the commitment of long-distance couples romance [5]. Separate distance makes the relationship stronger. Indeed, for married couples who make long distance relationships is not easy to maintain relationships in order to stay in harmony. Some couples feel worried couples will have an affair with others [5]. But not everyone is the same in dealing with long-distance relationships, many also rely on loyalty and trust to the couple during the LDR. In keeping with intimacy and communication to stay good, LDR couples are using social media. Of the many social media that is used by the couple, researchers chose Facebook as research locus.

Current studies have not explored more on unmarried LDR couples, both married LDR couples or LDMR (Long Distance Marriage Relationship). Therefore, this study intends to identify the use of social media as the application of computer mediated communication in those couples. It focuses on one of the prominent social media in Indonesia namely Facebook. Facebook has long been in the ranks of social media, it turns out until now there are still many people who use this tool. According to the data from Kominfo, shows that the user of FB in Indonesia is the highest compared to other social media. The FB user reaches 62% than other social media. And according to the data from Compas.com that the FB user in Indonesia is number 4 from all countries in this world. For India the FB user is 12% and for United states in 11%, and in Brazil is the same as the FB user as Indonesian, they are 6%. This is the reason why researchers choose FB as the object of research. For couples, Facebook is a means to express feelings by writing status. Usually one of them writes status, then he tags the couple. This is a form of LDMR partner communication. So researchers interested to examine, go to what categories of responses contained in the status of LDMR partner which tagged the partner.

2 Literature Review
2.1 Previous Studies
There are several studies related to CMC, below are some research results: Communication activities through the internet can lead to communication satisfaction resulting from the maintenance of intimacy and positive enthusiasm in relationships. Long-distance partners use applications and internet features to communicate with each other, exchange photos, voice notes, and even videocall. In creating an atmosphere of pleasant communication the LDR pair uses emoticons as an embodiment of emotion to show a more sincere message. LDR couples create rules for communicating with online media such as sharing social media account passwords, controlling interactions with the opposite sex, and sharing intimate photos on social media. Rules created by LDR pairs can create security and trust in relationships. The satisfaction of communication and the happiness of relationships created through the internet can influence the couple's decision to remain in a relationship and maintain his love commitments [6].

The next research result of communication management is carried out by students undergoing long-distance romance with their partners is to make the best use of free time to establish communication. Each pair instills the importance of communication and maximizes self-disclosure. Their respective activities, making each partner also instill mutual trust, in addition to the strong commitment that is owned which does not lead to termination of relationships even though conflicts often occur. In conflict management, avoidance behavior occurs early in the conflict, and cooperative attitudes are also carried out by the partner when dealing with problems [7]. The next research results from other studies: Intimacy can be realized by providing emotional closeness can be created with intensive communication, mutual attention to the couple. In addition, with self-disclosure can be shown by exchanging thoughts with a partner. Intimacy can be realized by three categories, among others are emotional closeness to the couple, sharing experiences with couples and self disclosure with long distance marriage partner.[8]

<table>
<thead>
<tr>
<th>NAME</th>
<th>MEDIA</th>
<th>OBJECT</th>
<th>THEORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agneaya P, Sri B, Sri W, Agus 2014</td>
<td>internet</td>
<td>LDR Couple</td>
<td>CMC</td>
</tr>
<tr>
<td>Zamrud Khairani Z, 2015</td>
<td>-</td>
<td>LDR Couple</td>
<td>CMC</td>
</tr>
<tr>
<td>Shinta Rismia Ayu, 2017</td>
<td>video chat</td>
<td>LDR Couple</td>
<td>-</td>
</tr>
<tr>
<td>Muassomah, Penny</td>
<td>Facebook</td>
<td>LDR Couple</td>
<td>CMC</td>
</tr>
</tbody>
</table>

In the table shows that all the research above uses the LDR couples as objects, and two studies using CMC theory and two studies other using Internet and video chat. The title of this research is different from previous studies. This research talks about the communication of LDR couple and using CMC as a theory but in Facebook media.

2.2 Computer Mediated Communication

Computer mediated communication or communication mediated by a computer is any form of communication between individuals or individuals with the original group interact through a computer in an Internet network [9]. Herring said that CMC is seen as the integration of computer technology with everyday life. The CMC region examines how human behavior is maintained and altered by exchanging information through machines. CMC research focuses primarily on the social impact of computer-based text message communication technology [10]. There are three perspectives In the CMC theory that is Impersonal, Interpersonal and Hypersonal. From these three perspectives the researcher
focuses the study on the interpersonal perspective. Interpersonal communication is the communication between personnel with others directly without being separated by distance and face-to-face, in which everyone can capture the reaction of others both verbally and non verbally. While mass communication is a message that is communicated by many people through mass media or social media. The coverage of the CMC itself includes chat systems, world wide web (www), textual systems, graphics, photography, audio, and hyperlink videos, sharing videos like Youtube and social networking systems and friendship search systems like Facebook and so on [11].

Interpersonal communication is every form of a person's behavior both verbal and non verbal that responded by others [12]. Interpersonal communication involves at least two people who have distinctive characteristics, values, attitudes, thoughts and behaviors that are distinct and different. In addition, interpersonal communication also requires the act of mutual giving and receiving among actors involved in communication. In other words, communication actors exchange information, thoughts and ideas, and so on. Interpersonal communication is a special form of human communication that occurs when we interact with others and influence each other. The simultaneous interaction means that the actors of communication have the same actions towards an information at the same time. The mutual effect means that communication actors are affected by the interaction between them. Interaction affects thoughts, feelings and the way they interpret an information [13]. By using computer mediated social learningtheory that emphasize closeness between the partisipant of the CMC despite of their physical absence like in the personal communication does [14].

In reviewing the communication of interpersonal perspective, there are five things to give effect to the responses facebook status to be reviewed. First, advise and give judgment. The response of the communicant containing the advice and judgment is called evaluative. Second, analyze and interpret. The response of the problem solver communication solving to the status and in the form of interpretation of the problem is called interpretative. Third, affirm and provide support. The response of the communicant with convincing, motivating and sympathetic intentions is called supportive. Fourth, questioning and investigating. The response of the communicant who contains curiosity by asking questions is called investigating. Fifth, conduct and understand. The response of the communicant by showing empathy in the form of understanding is called understanding. In addition of to these responses there is also an alternative response called a combination response, which combines responses to one another [15].

2.3 Long Distance Marriage Relationship

Communication LDMR couples through social media can be called interpersonal communication (husband and wife), and can also be called mass communication. It is said interpersonal communication, because it is addressed to someone, in this case is the husband or wife who is apart distance. And called mass communication, because what is expressed and delivered in social media that intends to be known by all friends, family and others. There are two functions of communication that is to stay alive like physical salvation, self-awareness is increased, we can show ourselves to others to achieve personal desires and for the sake of our survival and family, and to establish good relationship with the social around. A person who has the ability to communicate can help, start and maintain healthy relationships with others. Everyone hopes to be recognized and appreciated. In a long distance relationship, there is an exchange of information made by the couple to maintain the quality of relationships that lived, either by looking for information about his partner or how individuals reveal various informations about him. In this case, romance is almost the same as friendship, where this
relationship has a stable exchange of information. It concerns with the four principles in the
dialectics of friendship, to manage communication among the individuals involved [16].

2.4 Social Media

Internet media is a new medium that has many advantages over the old internet media
[17]. Social media is a means of interaction used by all over the world. They can be connected
to each other even within a great distance. In wikipedia social media is an online medium.
Where users can interact with each other or otherwise called the virtual world. There have
been various- kinds of social along with their rapid development as well as the number of
users, calculated per August 2017. Facebook ranked first in the number of users is 2,047
million users. While the rank below is youtube with the number of users 1,500,000 people and
whats the app with the number of users 1,200,000 people. Communication media is more
inclined not affect the quality of marital relationship in LDMR. People use facebook for
communication and also as a medium for online shopping [18]. Cell phones are most often
used to communicate and express affection . Many couples geographically distantly use
Facebook and find it as a positive social networking site while other new couples tend to feel
pressured to promote their relationship status through Facebook [19]. There is a research said
that everything uploaded on Facebook turns giving positive and negative impacts for students
[20]. The presence of the internet has presented patterns of relationships between individuals
that are not the same as what happens in the real world [21]. The information and
communications technology has a very big influence to the learners [22]. Its mean we must be
wise in using facebook. The largest number of users is also a consideration for researchers to
choose facebook as research locus. Because facebook free to access anyone, as long as make
friends in the media interaction.

3 Methods

This research was conducted with qualitative descriptive with a phenomenological
approach [23]. The focus of this research is social media, researchers limit the media
Facebook, because Facebook media faster and the highest user all over the world. The data
collection used is documentation, that is by collecting the facebook friends of researchers who
are undergoing LDMR, and at the same time asking permission to them to be allowed to read
the status of married couple LDMR and the responses contained within the wall facebook. The
researcher determines the LDR pair in writing the status "are there any friends who are
undergoing LDR with their husbands? please comment here. I am permitted to analyze the
status of LDR couples on Facebook". Then there were 13 friends who commented and only 10
of them were undergoing LDR Then in the analysis, it uses an interpersonal perspective of
CMC theory. The data taken by the researcher is one of the status of husband and wife of
LDMR in January-June 2018. That is the status of one of the wife or husband tags his / her
partner with the aim of the couple to know and respond to that status. Whatever response is
analyzed is not just the response of the spouse, but the whole response contained in that status.
The analysis used is with data reduction, data organization and data interpretation. By
reviewing status and responses, then categorize them into the types of responses listed in the
interpersonal communication.
4 Finding & Discussion

Table 2. Responses Categories

<table>
<thead>
<tr>
<th>Couples</th>
<th>Status</th>
<th>Eval</th>
<th>Inte</th>
<th>Supp</th>
<th>Inve</th>
<th>Und</th>
<th>Comb</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ &amp; AN</td>
<td>11 June 2018</td>
<td>3 0 1 3 3 1</td>
<td></td>
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<td></td>
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<tr>
<td>EWA &amp; AN</td>
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<td>6 0 1 5 2 0</td>
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<tr>
<td>MH &amp; MH</td>
<td>11 July 2018</td>
<td>5 0 0 1 0 0</td>
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<tr>
<td>IR &amp; DS</td>
<td>6 May 2018</td>
<td>1 2 1 2 2 0</td>
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<tr>
<td>TS &amp; KH</td>
<td>7 July 2018</td>
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<tr>
<td>UM &amp; KR</td>
<td>11 June 2018</td>
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<tr>
<td>PCA &amp; RA</td>
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<tr>
<td>RK &amp; AB</td>
<td>26 May 2018</td>
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<td>AT &amp; WH</td>
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<tr>
<td>Sum</td>
<td></td>
<td>21 5 7 22 11 4</td>
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<td></td>
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</tr>
</tbody>
</table>

Table 2 shows five categories of response as stated in CMC theory of interpersonal communication. Interpersonal has five responses in the form of advice and assessment is called evaluative, the response in the form of interpretation is called interpretive, the response in the form of support is called supportive, the response in the form of investigating and responses in the form of understanding. Meanwhile, according to Carl Rogers add one category of combinations.

4.1 Couples NZ and AN

NZ writes the status on June 11, 2018 about the dense teaching schedule of 20 credits in the next semester "anyone will meet me Tuesday, Thursday or Friday". This is the outpouring of a wife's heart to her husband. Usually the credits charged to the lecturer are 12 credits of the semester, because NZ gets 20 credits means NZ gets the excessive teaching load. Meaning NZ complained this to her husband. Husband's response "full schedule of mothers" is a form of assessment and included in the evaluative category. The next response "What are the ammunition?", This is in the question category that is inquiring. The next response is "quick mutation", this is an advice and included in the evaluative category. Subsequent response in the form of a smile image that states that the communicant understand the intent of the response, it belongs to the category of understanding. The final response is "ready", meaning the husband understands the wishes of his wife and fall into the category of understanding. UDR response "20 credits ???” is a question entered in the inquiry category. Next response "beuuh warnyassaaaah !! Keep strong yaaah ... "is an assessment as well as support. This is categorized as evaluative and supportive. So that can also be entered into the combination category. The next response "chicken eggs" is an advice so that enter the category evaluative. Next is "snacking fruit aja ... little but often, healthy keep ya mama daffa n debay ...", this response into the category of advice, then support, enter the category evaluative and supportive. It can also include a combination category. The third response RH "3 days az ya?" He asked and this entered the category of inquire. The next response "I will meet this lecturer" means he estimates and analyzes, this is interpretative category.

4.2 Couples EWA and AN

EWA status marking her husband as well as EWA photo doing selfi in the car "Sorry sorry it is okay if the mother is idle selfi, while waiting passengers come, while mom does not bring baby aisyah, which surely mother will not mind for other but her. Wonder with the magic camera effect ". This status is written and tagged the husband because EWA wants the husband to know this status. this can be said to seek the attention of the husband. The first
response comes from the AD "monggo despite 10 times rapopo ... every open FB that appears always who have dimples". This is in the form of support and interpretation, enter the evaluative and interpretative category, as well as enter the combination category. The next response comes from WB "Do not be discouraged, let us realize if we crawl automatically to the older, enjoy fabiayyi aalaa irobbikuma tukadziban". This is an advice and included in the evaluative category. And WB responds again "hahahaha" meaning he understands the clarification of the EWA submitted and entered the category of understanding. WB response again "enjoy". This is an advice and included in the evaluative category. The next response IRR "watch out there paparazzi, then invite photos for magazine miscellaneous lho". This is an advice and included in the evaluative category. Next response OA "What camera use jin?". This is a question to enter the inquiry category. The following responses VF "free selfi ya no passangers, from all angel". This is a question and entered the inquiry category. VF replied again "hahaha" means he understands and is in the category of understanding.

The next response MM "Kakaaaka beautiful". This is the assessment of the communicant so that enter the category evaluative. The next response AG "eaa cosmetics ads just neng, while being natural hihiihi". This is an advice and included in the evaluative category. The next response SH "Right lho audiences, until now aijin cheek really smooth not because of camera effect". This is an assessment and evaluative category as well. DKA's next response "Ajiiiiiiin". This is difficult to categorize, but from the way this writing is a support, so that enter the supportive category. The response that JH "has become a mother still exists as well?". This is a question so that enter the category of inquire. JH's next response is a laughful teasing picture, so it explains that JH understands and agrees with EWA comments. This is categorized as understand. The last response DH "aijin gorgeous" means DH gives an assessment of the photo uploaded by EWA and it belongs to the evaluative category.

4.3 Couples MH and MH

Status written by MH for his wife by uploading a photo of their daughter that read "why this child yes, love you papa muach". This status implies that the father wants to show a photo of their cute daughter using glasses, and he adds a support later. The first response came from SZ "Fiqa ugly" this is a judgment even though it really means to tempt fiqa. Still, this is an evaluative category. The next response from AUM is "fiqa already girl?". This response contains a question and entered the inquiry category. The last response from S "like his mother when small fiqa". This is an analysis and interpretation so that it belongs to the interpretive category.

4.4 Couples IR and DS

IR uploaded a photo with her husband by spelling the words "hope only to Allah". This status tags the husband and expects the husband to know the status. It means she missed her husband by uploading photos of their memories. The response in that first status comes from RO "where is his son's tea? . This response is a question which means "where are the children kak?". So this response entered the category of inquire. The next response from ER "seeceeeer ... hahahah" which means ER upload photos that illustrate the harmony of IR and husband. This response contains support and is in the supportive category. The next response TF "like added thin?" Which means "like a bit thin". This is an analysis and interpretation of photos that appear and enter interpretative categories. Furthermore TF said "taper cheek" which means he gives an assessment of IR and this is in the category evaluative. And last TF's response was "wkwkwk" he laughed which meant he understood the IR answer and got into the understand category. The last response in this status is IS "lek now looks very much like youo ... whereas it
used to be unlike GP, hahahaha”. This response is an analysis and interpretation and interpretative category. Then JS adds “right teteh ... used to be normal” which means he gives an assessment of the similarity of IR partner and husband. This is an evaluative category.

4.5 Couples TS and KH

The researcher will then examine TS's status "Be grateful then you will be happy", TS wrote this status and uploaded photos together with family, he marked his wife, meaning he wanted to tell his wife that TS was longing for family togetherness. The first response comes from IR "Bilik where?", This response is a question, so it can be categorized as a search. The next response CDM "do not forget wrapped yo .. for me hehehe" This response contains the intentions of advice so that the category evaluative. After getting a response back from KH then CDM replied "ooo .. moh6 yach” which means "well I do not want". This response contains the intention that the CDM understands the answer and submits a rejection and it belongs to the category of understanding.

4.6 Couples of UM and KR

The next response responded to the status of UM's "Daddy KR how do we book to go to the house adek nindi after Eid?". The above status is an invitation from UM to KR's husband about booking a VIP train to visit relatives by ending a smile that sticks out the tongue, meaning like want to joke at the husband. The husband responded to that status with "the king size there is not? ha ha ha". This means that the husband answered with questions that contain elements of jokes, this entry into the category of investigation. The next response came from EF "immediately book yah dude before running out", it contains advice to immediately book tickets so that the category evaluative. The next response came from the MW asking if EF has departed? And EF replied "still getting packing into the car", meaning EF understands the question and answers. This is categorized as understand. The next response came from KR as husband addressed to EF "Be careful on the road". I t contains advice to be careful, so that the category evaluative.

4.7 Couples PCA and RA

The next status belongs to PCA "Lalaa .. yeyee .. come again" PCA Uploaded a picture of a sack of clothing that her husband sent from Jakarta. After reading the response below, the researcher understood that the courier package had twice delivered the goods to the PCA home. The first response came from the husband RA "lho wes nyampe arek e nda, hahaha" the husband made sure with the question, because he was not sure that the courier came again, so RA gave a laugh, this is in the category of inquire. Still with the husband's response "wahaha riwa riwi ae yo mas courier?", Meaning the husband gave a question at once laughed at the courier who had twice to the PCA home, this is in the category of inquire. IWO responded to the photo with the question "daster kah this kak?". The question above is in the inquiry category because IWO wants to know what is in the sack.

4.8 Couples RK and AR

Next is the RK couple who wrote the status of "masyaAllah tabarokalloh ... sholihah girls listening murottal" this status tags the husband by uploading a photo of their daughter, indicating that RK wants to report the growth of the child. The first response comes from NK "ya ampuun if I endorse psti will be many who want ya nduk", it contains the meaning of analysis and interpretation, so that enter interpretative category. The next response AR "funny anake wong iki", this response contains an assessment of the uploaded photos, so that the
category evaluative. RK's husband's response is "yes funny ta mother, putune haji yusuf kalipare", it contains support for the wife that the husband assures that their child is funny, so it is in the supportive category. The final response comes from AR "hihihi" meaning he understands the RK husbands' answers that provide support and emphasis. AR response is in the understand category.

4.9 Couples AT and WH

The latter status is AT property. She marked her husband and uploaded their first child photo with the status of "nih lho abi, your child's behavior, at 4.31 teteh wake up asking for feeding nasgor, in the middle of eating him KO again with mouth filled with rice". AT tags the husband with the intention of reporting the growth of their child's cuteness and want to share the cuteness with husband who currently husband is in Bangka and AT are in Lampung. The first response comes from the PA "masyaAlloh my grandson cute, maybe nglindur yo". The above responses contain two intentions, the first one being an assessment and the second one being analysis or interpretation. So in the category evaluative and interpretative, as well as enter the combination category. The next response AR "overslept so while eating hihihi ... more emaknya donk ngabisin". The above responses contain the intentions of questions and advice, so that enter the category of inquiry and evaluative. These belong to the combination category. The next response is a question from E "where is the side dish?" It contains the meaning of the question so that entering the category of inquiry, because E wants to know why eat but do not use side dishes. The data above shows that there are still many LDR pair who use FB facilities in communicating. Many of their friends responded and commented on the status of the LDR pair. The most are in the form of questions and investigations. Other people like to find out what happened to the lives of others. Interpersonal communication theory Johnson's perspective examines all of the comments on one of the FB statuses belonging to the LDR couples and is apparently dominated by question and investigations.

5 Conclusion

From an analysis of the status of nine couples undergoing LDMR, an evaluative feedback number of two to one responses, in the form of an interpretive response of five responses, in the form of a responsive response of seven responses, of twenty-two responses, there are eleven responses and in the form of additional categories of combinations there are four responses. This study concludes that the responses that many conveyed either by a partner or a friend in Facebook status is an inquiry in the form of questions related to the matter written in LDMR couple in Facebook status. In addition to inquiry and inquiry advice or assessment is a response that many appear to rank second after questions and investigations. This means that many responses are curiosity, or the current popular language is "kepo". With the following percentages: Evaluative 14.7%, interpretative 3.5%, supportive 4.9%, 15.4% probe, understand 7.7% and the last combination 2.8%.

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References


The Use Of Spirulina In The Development Of High-Protein Bioindustry In Order To Optimize Public Health

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Abstract. The potential of spirulina as a healthy biomass for food or skin healthcare products such as soaps and facial masks need to be maximized. This is because the proteins and vitamins that are required by human can be found within spirulina, which is why it is called “Superfood”. The cultivation and processing of spirulina in Indonesia is not often found, thus, the demands for spirulina are fulfilled through importing from China and US. Therefore, this program aims to cultivate, as well as to process spirulina into food and skin healthcare products. Cultivation products are made into a form of spirulina powder which is then used as an additional ingredients for shower soap products, facial masks, shampoos, fish/livestock foods, snacks or cookies, ice creams, and pastries. The purpose of the use of spirulina is so that a high-protein bioindustry can be developed within the campus, making it one of its source of income as well as that it would escalate campus’ business and competitive quality on the basis of lecturers’ and scholars’ intellectual product; healthy foods and natural skin healthcare products. Spirulina products’ marketing and promotion for this stage are limited to campus environment, campus cooperatives, and online media. Result shows that items sold within the first five months are 90 bars of soap, 1 bottle of shampoo, 13 bottles of mask, 31 packs of cookies, 133 units of ice cream, and 1350 pieces of pastries. The availability of cultivated spirulina powder is relatively small, which is 533,3 grams. Hence, there needs to be an expansion of lands for cultivation as well as the control for temperature, alkalinity, and light condition so that spirulina’s productivity increases, along with the evaluation for product prices that are less attractive to the public.

Keywords: spirulina, cultivation, masker, soap, shampoo, snacks, productivity

1 Introduction

Human desire to become healthy is one of the main factors that comes to play in life. Primary food intake which has balanced nutrition, healthy complementary foods, and physical health are the main factors for life sustainability. Spirulina is one of marine biota from cyanobacteria group named arthospira cyanobacteria or Arthrospira (Spirulina) platensis which have trade name of Spirulina is full of health benefirs to human as well as being known as superfood for having high nutritional value, high on vitamins, essential fatty acids, and...
pigments which makes it a practical food for astronauts that go to moon. Spirulina can grow well at limited indoor or outdoor area subtropic or tropic, warm, alkali condition [1].

Daily spirulina growth acceleration go around 25% of its original weight [2]. By consuming 30 grams of spirulina per day, the necessary amount of mineral and vitamin such as protein, iron, calcium, vitamin B12, antioxidants, and anti-allergy can be sufficed. Spirulina is spiral-shaped, but under various environmental conditions such as temperature, physical environment, and the condition of growth solution affects helix structure. Spirulina platensis has a blue pigment known as Phycocyanobilin and this type can inhibit HIV-1 [3].

The biggest spirulina cultivation in Indonesia is currently undergone by PT Neoalga Indonesia Makmur Sukoharjo, Central Java. Its yields are sold in the form of capsules for supplements, while the remaining spirulina needs are still imported from China and US. Which is why, there needs to be an effort to increase the production of spirulina powder and the development of spirulina-processing industries needed by public; shower soaps, facial masks, shampoos, and snacks. The cultivation of microalgae of *Chlorella Sp.* in photobioreactor as well as the study of its kinetics and calorie value using thermogravimetry analyzer shows a excellent result with high calorie value [4]. While the marine algae cultivation of green macroalgae *Caulerpa taxifolia* carried out by Poespowati [5] shows a significant growth result. In order for spirulina to grow, the temperature must be maintained with a minimum of 15°C and maximum of 38-40°C [6]. Despite having different algae media, but the obstacles and conveniences can be used as references in the proposed activity plan. Spirulina cultivation is suitable to be developed as an alternative to public who are interested in business requiring relatively small capital without needing a large land. Ponds with a size of 20 m² can produce 200 grams of spirulina per day, having enough additional nutritional intake for 150 children [7]. As for adults, they are only required to consume 5-10 grams per day of dry spirulina [2].

Spirulina has several benefits due to its high protein content [8][9] which is 63-68%, 18-20% carbohydrates, 2-3% fat [9]. Other fact about spirulina is that its protein content is 3 (three) times as many as meat, with iron levels 50 (fifty) times as many as those is spinach, vitamin A 15 (fifteen) times as many as carrot, as well as containing high levels of vitamin B12, anti-allergy, antioxidants, vitamin K, chlorophyll, phycocyanin, calcium, and magnesium [2], so that there is a possibility of it being used as an alternative food for people having autism.

Results from several reference studies stated that spirulina can cure various diseases like cancer, anemia, lowering cholesterol level, and it can be used as the raw material to make cosmetics and medicines [10][2][11].

The main activity that will be done is to cultivate *Spirulina Platensis* which will then be harvested, dried, and made into ready-to-use powder that can be directly mixed with breads or drinks and used as other food additives. Bioindustries that focuses on *Spirulina Platensis* will be developed from the beginning, i.e. the cultivation process itself, until the end which consists of processing the harvests into 4 variants of spirulina-based products.

If the daily spirulina consumption of children and adults is 5,6 gram then the total daily spirulina need is 4,938,046,4 gram. If 1% of Malang City population are willing to consume spirulina, then the proposed spirulina product of 400 grams per day is still not enough, in the event that public’s interest toward it has been awakened. The type of established business is spirulina cultivation and green-technology-based spirulina product diversification to support healthy living.
2 Methods of implementation

Activities that will be performed in this program is the procurement of raw materials, procurement of auxiliary materials for processed spirulina products, procurement of tools and equipments, production of processed spirulina, product analysis, and product marketing. The required raw materials during cultivation are spirulina seedlings or strains. Raw material quality is an important term in order for the cultivation process to occur perfectly. The process of cultivating spirulina requires cultivating place, secchidisk to observe spirulina density, spectrophotometer, pH meter to measure water alkalinity, refractometer to measure water salinity, lux meter to measure the intensity of light, and thermo controller to adjust the growth media temperature. During the production of processed spirulina, the necessary equipments are cupboard to keep the products, freezer, refrigerator, milling machine, packaging machine, oven, scales, grinder machine, stove, mixer, sealer, and ice cream machine.

3 Result and discussion

This research results Spirulina in the form of 533.3 grams of powder in the span of 8 months; a result far from what was originally proposed. This is due to various adjustments from the initial condition which required lengthy duration. Differences in temperature, alkalinity, air circulation, and light greatly affect spirulina growth. Which is exactly why, a different test located outdoor with a different condition is required.

Almost all processed spirulina products are sold with the exception of shampoos and livestock food which shows lack of interests. An interview result with product user shows that the product price are not expensive, thus people with moderate-to-low income are able to buy the products. Processed spirulina products can be seen on the table 1.

| Table 1. Processed spirulina products sold from march – august 2018 |
Figure 1 shows that pastries can be further developed by expanding marketing area and marketing media, especially promotional media. Public interest towards pastries are relatively larger than the rest, this is most likely due to its cheap price without compromising its nutritional value and its attractive appearance in comparison with similar pastries with conventional looks.

In order for sales to additionally increase, a better promotion with larger promotional area is required. Only then, pastry marketing will not only limited through booking, but also open up opportunities for collaboration with elementary and middle school canteens.

The second highest sale belongs to spirulina ice cream. Similar to pastries, marketing are ought to be expanded not only within campus, but hopefully there will be a cooperation between elementary and middle school canteens.

Shower soaps which can also be used as facial soap is proven to be suitable for use because it can moisturize the skin, though its quality and quantity can be improved for future productions. Analysis result indicates that its water content is 16.80% with its free fatty acid
content is 3.56%. As a result, longer curing duration is needed in order to it to conform to SNI 06-3532-1994 standard of maximum 15% water content and 2.5-7.5% free fatty acid content.

Facial mask product are, in fact, liked by most of the consumer after trying them on but due to its high price, a single product is often bought by multiple consumer (shared expense). Which is why a packaging model with less, but well-designed capsule is needed to produce so that it is not easily damaged. Unfortunately, cookies are only liked by certain people, so it is advised to be replaced with a cheaper snack alternative. The first five month are used to explore processed spirulina products in the market to find out the less-preferred products that will be replaced with another product.

4 Conclusion

Overall, processed of knowledge transfer regarding spirulina as a knowledge and products can become a source of income and knowledge improvement (since knowledge and technology transfer could improve the knowledge and the capability of its receiver) [12][13][14][15][16], on the basis of lecturer’s and university students’ intellectual product which will be able to motivate other students to become an entrepreneur. In order for spirulina products to reach the desired target, accurate promotional media and marketing, product price evaluation, as well as consumer evaluation is needed, bearing in mind that general public is not yet aware that spirulina can become a super food.

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References


QSoft 705 as a New Finder of Qur’anic Words

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Abstract. ‘Ulim al-Qur’an studies the Qur’an and its related complex issues such as asbab al-nuzul, mufradat, fawathi al-suwar, and tikrar. This has made ‘Ulim al-Qur’an a complicated subject to learn. Therefore, it requires a proper tool, which facilitates learners to study it. In this context, QSoft 705 is an application that is able to help Qur’an analysts obtain accurate and valid data about the Qur’an. This article discusses how this application works in search for repeated words (tikrar) in the Qur’an. It is a descriptive analysis on how QSoft 705 helps users search related data to the Qur’an. The result shows that Qsoft 705 is able to search tikrar of verses, sentences, and words. Furthermore, Qsoft 705 also helps users know how many repeated words both in verses and sentences in the Qur’an.

Keywords: ‘ulum al-qur’an, the sciences of the qur’an, data mining, tikrar, qsoft 705

1 Introduction

Data mining is defined as a process of finding data based on patterns or benefits that are intended to gain. In the process, data mining can be automatic or semi-automatic. Originally, it is an exploration and analysis of large amounts of data in order to find valid, useful, and easily understood data [1], [2]. It aims to find data patterns and relationship- ships by using data analysis tools and model building techniques. There are two main models in data mining: first, predictive model, which uses data with known results to develop a model that can be used to explicitly predict its value; second, descriptive model, which illustrates patterns of the existing data [2].

In practice, the purpose of data mining is to produce prediction and description. The main tasks for data mining are: (1) to classify data items (notes or examples) into one or several categories; (2) to provide input data that contain values for some unknown continuous variables; (3) to classify records according to predicted behavior or estimated value; (4) to determine which attributes or feature values are incorporated in data records; (5) to group data records or samples into a number of groups or subgroups; (6) to present data using technical visualizations in order to examine human patterns.

Looking at QSoft 705, which was designed by Budi Pracoyo of Datastudio Bandung, we found that this application has an epistemological base that has been built by scholars of ‘Ulimul Qur’an [5]. However, this application will not be meaningful if we cannot surf to do data mining creatively and accurately. Thus, it is necessary to disseminate data mining process...
2 Literature Review

Ullum al-Qur’an is understood as a (collection or anthology) of science which contains all knowledge (al-ma‘ārif) and the sciences (‘ulūm) relating to the Qur’an [6]. That is, it is a collection of "sciences" not a particular science. Because it is only a collection (anthology), then in fact position of each of these sciences is separated, although textually it is in a vast field of Islamic study. Hence 'Ullum al-Qur’an in this first definition, is intended as a science which encompasses all knowledge discussed in the Qur’an from various perspectives. On the other hand, it is the codified discipline (al-fann al-mudawwan) in one perfect study. The experts of 'Ullum al-Qur’an would usually explain the meaning of 'Ullum al-Qur’an ana-lytically from every lafadz idhâfi, ie outlining meaning of words "'Ullum" and "al-Qur’an". As-Suyuthi in his book Al-Itqan fi Ulum Al-Qur'an presents 80 objects of Ulum Al-Qur'an study. Among them, asbab al-nuzul, mufradat, fawatih al-Suwar, ismiayah, filiyah, tikrar and others.

One of applications that can search for data extracting is Al- Hadi desktop application provided by Hadis Study Center (PKH). This application is able to filter texts of verses based on thematic and selected verses. Besides that, searching meaning of tafsir is also available in this application. Never- theless this application has not been able to find words that have semantics relations with other words, repeated words (tikrar), and also semantic field. Among applications that are able to extract data related to semantics or 'Ullum al-Qur'an such as tikrar, qashsh al-Qur'an, fawatih al-suwar, asabab nuzul, harf nida, kata qad inna dan laqad is Qsoft 705. It is designed to be used by all user from amateur until expert.

Mohammad Khubeb Siddiqui, Shams Naahid, and Mohammad Nazrul Islam Khan conduct research on Qur’an web portal by applying data mining with title A Review of Quranic Web Portals through Data Mining [7]. Furthermore, this re- search examines the access patterns of some websites by us- ing classification-based data mining by describing ROC and AUC plots, then predicts which most appropriate portals. This research finds that the Alexa website is an effective tool for obtaining required data about each of these areas of web portal Qur’an. The next research related to data mining is the research of Saeed Albukhitan, Ahmed Alnazer, and Tarek Helmy with title Semantic Annotation of Arabic Web Re- sources using Semantic Web Services. Although this research is not on the Qur'an study, the focus of the study is Arabic, of course, bias made as references for analyzing Arabic as a sec- ond reference [2]. The research finds that data mining through Arabic semantic web site services is not as comprehensive as the Latin web site services, so they recommend to build a se- mantic web applications and semantic search engines for Arabic.

Another research related to ‘Ullum al-Qur’an is data mining Qur’an conducted by Hapikry Surya Permana and Elvi Citraresmana [8]. The research focuses pragmatics to describe the frequentative verb of directive illocutionary acts used in the English translation of the holy Qur’an by Muhammad Asad, with title Directive Illocutionary Acts Used in the Eng- lish Translation of the Holy Quran by Muhammad Asad: A Corpus Based Study. The research finds that commanding and requesting are the kinds of directive illocutionary acts oc- curred in the Qur’an. Commanding occurs 575 times in the English translation of the holy Qur’an by Muhammad Asad divided into five frequentative verbs.
3 Methodology

This research applies a qualitative research. According to Djadjasudarma, descriptive analysis method is a method that can descriptively provide characteristics, properties and image data through data selection, after the data is collected. In this research, there are the three stages to be done, namely: data provision, data analysis, and presentation or formulation of the analysis result [9].

This research also applies technique of data collecting of QSoft. QSoft is a Quran software structured in a data-base query, enabling users to get information on a wider Quranic data easily, quickly and accurately. Heretofore Data studio has developed Qsoft version 7.05 to 7.09 with amounts of data available is not less than 25 million data related to the Qur’an and Tafsir. This application is able to search, sift, sort, and calculate on all elements contained in the Qur’an, [5] from juz, verses, sentences, words, letters to thematic searches and objects of study discussed in ‘ulum Qur’an such as tikrar, idzaa word, innaa word, qad, laqad, nakirah makrifat, ashab nuzul, makki madani and others that can be explored carefully by the user.

In this research, the writers focus only repeated words (tikrār) occurred in Qur’an by taking some samples to show how Qsoft 705 works to search tikrar in ayah, tikrar in sentence, and tikrar in verses.

4 Result and Discussion

4.1 Tikrar in Verse

Tikrār fi Al-Qur‘ān is more than twice repetition of words, sentences or verses, whether literally or semantically with particular reasons and purposes [7]. In the following, we demonstrate how many times verse waylan yawma-idzin lilmukadz-dzibῑn(a) exists in the Qur’an and where the verse is placed.

There are three research technique to find tikrar in verse by using Qsoft 705 generally:

- Put the cursor on Repeating Column.

- Click Selection

- Then choose and click Does Not Equal Bank to show repeated verses in the Qur’an.

[Figure 1. Repeating Column]
The mark will appear on repeating column and we can see how many times the verse exists by looking at repetition column. Furthermore, by looking at Record column, we get information how many repeated verses exist in the Qur’an. According to the result that there are 282 repeated verses in Qur’an. There are 53 verses descended in Medina and 229 verses descended in Makah.

In the following table we show how many times verse waylun yawma-idzin lilmukadz-dzibῑn(a) exists in the Qur’an and where the verse placed.

| Table 1. Tikrar in Verse Waylun Yawma-Idzinlilmukadz-Dzibin(A) |
|-----------------------------|-----------------------------|
| Verse            | Frequentative               | Ayat                          |
| Al Mursalaat     | 10                          | 077.049, 077.047, 077.045, 077.040, 077.037, 077.034, 077.028, 077.024, 077.019, 077.015 |
| Al Muthaffifin   | 1                           | 083.010                       |

The result show that verse waylun yawma-idzin lilmukadz-dzibῑn(a) exists eleven times in the Qur’an. 10 times exist in Surah Al Mursalaat in 077.049, 077.047, 077.045, 077.040, 077.037, 077.034, 077.028, 077.024, 077.019, and 077.015.

Al Muthaffifin is another place where verse waylun yawma-idzin lilmukadz-dzibῑn(a) exists only one time. Furthermore, the repeated verse is descended in Makah.

The above paragraph describes how Qsoft 705 search tikrar in verse, how to calculate the frequentative repeated verses in Qur’an, where the repeated verses placed in Qur’an whether in Makah or Medina or both.

4.2 Tikrar in Sentence

In the Qur’an, sometime we find that one verse contains one or more sentences. Waylun yawma-idzin lilmukadz-dzibῑn(a) can be categorized as a verse and a sentence. Therefore, in this data we find the same result as we find in the first result above. Nevertheless, we apply another research technique to find data.

In the following table we show how many times verse waylun yawma-idzin lilmukadz-dzibῑn(a) exists in the Qur’an and where the verse placed.

1. Search verse waylun yawma-idzin lilmukadz-dzibῑn(a) by using search bottom or press CTRL+F on keyboard. Then write the verse and click find to get the verse.
2. Blocking the words without space before and after the words.

![Interface Search Words](image)

**Figure 3.** Interface Search Words

3. Click selection and contain “waylun yawma-idzin lilmukadz-dzibīn(a)

![Interface Blocking Words](image)

**Figure 4.** Interface Blocking Words

4. By looking at record column, we get information that there are 11 repeated words waylun yawma-idzin lilmukadz-dzibīn(a) in Qur’an

![Interface Selection Words](image)

**Figure 5.** Interface Selection Words

By looking at record column, we get information that there are 11 repeated words waylun yawma-idzin lilmukadz-dzibīn(a) in Qur’an

<table>
<thead>
<tr>
<th>Verse</th>
<th>Frequentative</th>
<th>Ayat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Mursalaat</td>
<td>10</td>
<td>077.049, 077.047, 077.045, 077.040,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>077.037, 077.034, 077.028, 077.024,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>077.019, 077.015</td>
</tr>
<tr>
<td>Al Muthaffifin</td>
<td>1</td>
<td>083.010</td>
</tr>
</tbody>
</table>

**Table 2.** Tikrar in Sentence

The result show that verse *waylun yawma-idzin lilmukadz-dzibīn(a)* exists eleven times in the Qur’an. 10 times exist in Surah Al Mursalaat in 077.049, 077.047, 077.045, 077.040, 077.037, 077.034, 077.028, 077.024, 077.019, and 077.015.
Al Muthaffifīn is another place where verse waylun yawma-’idzin lilmukadz-dzibīn(a) exists only one time. Furthermore, the repeated verse is descended in Makah.

The above paragraph describes how Qsoft 705 search tikrar in verse, how to calculate the frequentative repeated verses in Qur’ān, where the repeated verses placed in Qur’ān whether in Makah or Medina or both.

### 4.3 Tikrar in Ayat

In the following, we find how many times words lilmukadz-dzibīn(a) exists in the Qur’ān and where the verse is placed. There are three research technique to find tikrar in verse by using Qsoft 705 generally:

- **Search words lilmukadz-dzibīn(a)** by using search bottom or press CTRL+F on keyboard. Then write the verse and click *find* to get the verse.

![Figure 7. Interface Search Words](image1)

- Blocking the words without space before and after the words.

![Figure 8. Interface Blocking Words](image2)

- Click selection and contain “lilmukadz-dzibīn(a)”
Figure 9. Interface Selection Words

- By looking at Record column, we get information that there are 12 repeated words *lilmukadz-dzibῑn(a)* in Qur’an.

![Figure 10. Interface Filtered](image)

According to the result, words *lilmukadz-dzibῑn(a)* exists 12 times in the Qur’an. 11 ayat are began with word *wa*- and 1 ayah is began with word *fa*-. The twelfth words *lilmukadz-dzibῑn(a)* began with *wa-* is placed 10 times in Surah Al Mursalaat, 1 times in Surah Al Muthaffῑn, and one word *lilmukadz-dzibῑn(a)* began with *fa-* is placed in Surah Ath-Thuur. All of them are descended in Makah.

5 Conclusion

The study of data mining greatly influences the epistemology of the study of the sciences of the Qur’an (‘Ulum al-Qur’an). Studying the sciences of the Qur’an was complicated, but through Qsoft 705 has made this easy and quick to learn. It is able to show learners Qur’anic data more completely than traditional ways of search for Qur’anic terms. Moreover, it provides learners with a unique experience in obtaining information science. This information will form a systematic and comprehensive knowledge which is able to give birth to wisdom in understanding Qur’anic texts.

Furthermore, Qsoft 705 opens up a door to those interested in ‘Ulum al-Qur’an to develop research that contributes to the sciences of the Qur’an. It is able to bring back al-Qur’an as a source of thinking.

References


The Implementation of Indonesian Stemming System for Indonesian Translation of the Quran

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Abstract. Indonesian translation of the Quran (ITQ) is a translator documentation of Quran to Indonesian language containing Muslim guidance, so it is necessary to apply Indonesian Stemming System (ISS) to support learning and understanding ITQ contents. In the implementation of ITQ documentation stemming process, there were some errors including a little number of beheadings (understemming), non-beheading (overstemming), and that produces an incorrect base word. This paper focuses on the Indonesian stemming system implementation for ITQ to produce data training that can minimize errors in the application of the steaming process. The system development consists of 5 steps, including Empiricism in Algorithm Design, Implementation, Experimental Setup, Measure, and Conclusion. Porter algorithm is used in applying Indonesian Steaming System with the rule-based approach. The application of the text processing process starts from tokenization, stop word removal, stemming result token. The study and system development produce application system that optimizes the application of the tokenization process, stopword removal, and stemming ITQ. The result of this study enhances the application system that can support the researcher in understanding ITQ in developing advanced research in the field of text mining for ITQ and hadith.

Keywords: MSMEs; Seller Loyalty; E-Marketplace Indonesia; Metode SMART; Women

1 Introduction

Al-Qur'an is a holy book and a guide for Muslims daily life. Understanding the verses in the Qur'an requires a deep understanding of knowledge in Arabic, however, the interpreters and language experts have translated into various languages including Indonesian. To understand the translation of the Indonesian Qur'an (ITQ), understanding the basic words in each of the verses is necessary [1]. The stemming process in Natural Language Processing helps to transform words in documents into basic words. The process of stemming Indonesian text in the Al-Qur'an translation is more complex because there are some additions that need to be discarded to get the basic words. There have been many studies that apply the process of stemming on Indonesian documents, such as news, articles and several other Indonesian documents [2], but the fact is that no one has applied the stemming process to ITQ so that it
requires study and development of the Indonesian Stemming System (ISS) on ITQ to facilitate
learning and understand the contents of ITQ.

In applying the stemming process in Indonesian documents, there are three types of
errors, namely understemming, overstemming, and unchanged. Understemming is a lack of
beheading, overstemming is over beheading, while unchanged reminds the same word without
any changes [3].

The purpose of this study is to optimize the application of ISS to ITQ by using the Porter
algorithm and generate training data that can minimize errors in the application of the process.

The system development methodology consists of 5 stages, including Empiricism in
Algorithm Design, Implementation, Experimental Setup, Measure, and Conclusion. Indonesian stemmer application uses the rule-based stemming algorithm approach, by
applying the Porter algorithm for Indonesian [4].

The application of the text processing process starts from sentence boundary detection
[5], tokenization and stopword removal, and tokens after the results of stemming [6] and the
process of error identification analysis [3].

The system development uses the add-on rule-based stemming algorithm, the Porter
algorithm for Indonesian [4].

This research and development produces an application system that optimizes the
application of the Indonesian stemming process to ITQ including sentence boundary
detection, tokenization, stop word removal, stemming and training data.

In evaluating the application of this system there are evaluations of 3 types of errors in the
application of stemming the translation of the Indonesian Qur'an namely understemming,
overstemming and unchanged. Most of the errors occur in the type of Overstemming error.
The level of accuracy of the application of the algorithm in the system is 86.74% [3].

The results of the Indonesian stemming for ITQ system development can be useful for
users in understanding ITQ as a whole, quickly and accurately. Besides that, it can also be
used by researchers in developing advanced research in the field of text mining for ITQ and
hadith.

2 Methodology

To apply the ITQ stemming process using the Indonesian version of the ITQ dataset
which was downloaded from (http://tanzil.net/trans/) version of the Indonesian Ministry of
Religious Affairs. While the Stopword data used is 358 are common words that often appear
in Indonesian [4,6].

The research and development of the ITQ stemming system use Algorithm and
Experiments Methodology consists of 5 stages (Figure 1), namely: Empiricism in Algorithm
Design, Implementation, Experimental Setup, Measure, and Conclusion [7].

![Figure 1. The Development of Indonesian Stemming System](image_url)

During the empirical stage in algorithm design, the data collection and analysis on the
algorithm that will be applied to the research. The authors observed literature studies or
references on stemming algorithms, specifically on the Porter algorithm. At this stage, the author produces a path from the Porter algorithm.

In the implementation phase, the stemming for ITQ application system is designed. The author creates several system designs including flowcharts and system algorithms. In the next step, the experimental setup stage is completed by programming or coding activities to build the application. At this stage, the author produces the application stemming for ITQ.

The fourth stage is measurement where the results of this study are presented starting from the tokenization to the stemming process. The level of accuracy result is calculated by using an accuracy formula to calculate the number of errors generated.

The last stage is the interpretation result that discusses the results of the analysis. This formula below uses to calculate the Accuracy level that illustrates the level of proximity between the predicted value and the actual value [8-12]:

\[
\text{Accuracy} = \frac{\text{RW}}{\text{W}} \times 100\%.
\]

Where \( W \) is the number of words stemmed and \( \text{RW} \) is the number of words stemming correctly, accuracy is expressed in percent (%).

3 Result And Discussion

The study and development of ISS using the Indonesian-language Porter algorithm illustrates in Algorithm 1 concerning the flow of the Porter algorithm stemming algorithm.

The first step of the stemming process using the Porter algorithm is to enter the word to be searched for by the base word, then erases the particles. The next step is to delete the ownership pronoun or pronoun. The third step deletes the first prefix, if the token does not have the first prefix, it will delete the second prefix and proceed to the suffix deletion. On the other hand, if the token has the first prefix, the next step will be to delete the suffix, if it is not found, the token is assumed to be root word or root word. But if found, it will do the second prefix before the process is finally finished and the token is assumed to be root word.

Algorithm 1 The flow of the porter algorithm stemming process.

**INPUT:** a non stopword based word
**OUTPUT:** a base word
1. Input a non stopword based word
2. Delete particle
3. Delete pronouns
4. Check whether token has a first prefix
5. If “yes” then delete the first prefix, if “no” then delete the second prefix
6. Check whether token has a suffix word
7. If “yes” then do point 8, if “no” do point 10
8. Delete the suffix word
9. Delete the second prefix
10. Based word is created
11. Finish

3.1 Text Processing
In the ITQ algorithm implementation of ISS, researchers create some systems design for text processing that consists of tokenization, stopword removal process, the first phase of stemming process, the second phase of stemming process, and data training process.

1. **Tokenisation**
   The purpose of tokenization is to process ITQ document to be a piece of word or token. The user needs to input document for tokenization so the system able to change document’s word to lower case. The next step is the system separates the word from space as a result separated word or token shown to the users as the process output.

   Based on algorithm 2 regarding tokenization, the first step that will be carried out by the system is to read the document inputted by the user. Then the system changes the capital letters on the document to lowercase. After the process is complete, the system will break down the sentence in the document into pieces of words based on the space, so the system display output in the form of word snippets or tokens.
   
   **Algorithm 2 Tokenization.**
   **INPUT:** Indonesian Quran Translation Letter  
   **OUTPUT:** Token (a piece of word)  
   1. Read inputted letter  
   2. Change all the words to lower case character  
   3. Separate documents to space separated word  
   4. Become a separate word piece in lower case  
   5. Finish

2. **Stopword removal**
   The purpose of this phase is to process the resulting document from the tokenization process in the form of a word cut or token into a clean token from stoplist using filtering process.

   **Algorithm 3 Stopword Removal**  
   **INPUT:** Token (a piece of word)  
   **OUTPUT:** Non stopword  
   1. Read token  
   2. Check whether words is in a stoplist  
   3. If “yes” remove the words, if “no” kerjakan point 4  
   4. Become a collection of words that are not in the stoplist  
   5. Finish

   Based on algorithm 3 about stopword removal, the first step that the user will do is to check whether the word or token in the document is the same as the word in the stoplist. If "yes" the system filters the word, if "no" the system will skip and check the next word. So finally got a word or token that is clean from the words stopword.

3. **Stemming**
   The purpose of stemming is to process the output document from stopword removal process into a basic word. Stemming stage is divided into two parts, namely the stemming process of stage 1 (Algorithm 3) and the stemming process of stage 2 (Algorithm 4)

   a. **Stage 1 Steeming Process**

      **Algorithm 4 Stage 1 Steeming Process**
      **INPUT:** Non stopword token  
      **OUTPUT:** A piece of affix word
1. Read non stopword
2. Delete particle
3. Delete pronouns
4. Check whether token has a first prefix
5. If “Yes” delete the first prefix, if “No” delete second prefix
6. Check whether token has a suffix
7. If “Yes” then do point 8, if “No” then do point 10
8. Delete suffix
9. Delete second prefix
10. Finish

Based on algorithm 4 on stage 1 stemming process, there will be some remittance cuts such as pronouns, first prefixes, second prefixes and suffixes. After the process is completed, the place of the based word on the process of remedied is known.

b. Stage 2 Stemming Process
Algorithm 5 Stage 2 Stemming Process
INPUT: Piece of word remedial
OUTPUT: Word base
1. Read the number of letters in the word
2. Detect the location of the first letter and the last letter of the base word
3. Check whether the base word is the same as the word in the data training list
4. If “Yes” replace the word based with data training list, if “No” do point 5
5. Become a collection of underlying word token
6. Finish

After retrieving base word, the next step is to check whether the basic words obtained are the same as the words in the training data list. If "yes" then the basic word is replaced with the basic data in the training data list. And if "no" then the data replacement process is not carried out. This aims to minimize errors in the stemming process. Where the errors that have been detected before will not reappear in the next process.

Based on the algorithm on stage stemming process for stage 2 stemming process, it can be concluded that the system will read the amount of word to detect the location of the first word and the last word from the base word based on the stemming output process stage 1. Once the system obtains the basic word, the next step is to check whether the base word retrieved is the same as the word in the data training list. If "yes" the basic word is replaced with the basic data contained in the data training list, however if "no" then the process of replacing the data is not done. It aims to minimize the existing errors in the stemming process. Where errors that have been detected before will not reappear in the next process.

4. The Error Data Training
Based on algorithm 6 about the error training data, there are some data that must be inputted including words stemming errors, basic words, and types of errors. After the three data above is inputted when the user clicks the "save" button and the system will save the data and make it a list of error training data.

The purpose of error data training is to identify and classify the errors in the results of the stemming process so that in the stemming process the subsequent error will not reappear. This phase builds a training data that can help optimize the stemming process in ITQ.

Based on algorithm 6 about error training data, there are some data that must be entered into such as word stemming error, basic word, and error type. After the three data above is
inputted when the user clicks the "save" button and the system will store the data and make it list the data training error.

Algorithm 6 Error Data Training
INPUT: Stemming error
OUTPUT: Data Training
1. Input stemming error word
2. Input word base
3. Select a type of error
4. Click save button
5. Receive input
6. Finish

3.2 Indonesian Steming System (ISS) for ITQ

The first process in applying ISS is using Porter Algorithm for ITQ before applying stemming process namely dataset (Figure 2). In this application, the dataset used contains the translation of Indonesian language Qur’an texts from the Tanzil web page (http://tanzil.net/trans/) Indonesian language version, the Indonesian Ministry of Religious Affairs. This dataset is used as the input for tokenisation process.

Figure 2. Dataset system

Figure 2 shows dataset that contains the letter that will be processed. This dataset shows the details of letters as well as sentence with separated symbol “|”. For example the sentence “2 | 1 | Alif laam miim” that shows “Alif laam miim” contains in letter 2 of the first sentence.

In application home page (Figure 3), the user needs to click button “Login” to be able to enter to the main menu.

Figure 3. Home Page

After login to the main menu, there are 5 features in this application including tokenisation, stopword removal, stage 1 stemming, stage 2 stemming, and data training.

a. Tokenization
In tokenisation feature (Figure 4), users can input the dataset by clicking button menu “open”. Furthermore, the process of cutting the word by clicking “run” button so the system can produce the result of tokenization. The input included in the sentence "God will not deny his promise" after the tokenisation process, the word spacing is based on 5 words: "God", "no", "will", "deny", "promise"

b. Stopword removal

In the stopword removal form (Figure 5), the tokenisation processing is completed by clicking the “open” button. Furthermore, the filtering process is completed by clicking the “run” button. The purpose of filtering process is to eliminate meaningless words. In this process it is necessary to list a meaningless list of words (stopword list) to facilitate the filtering process. The examples of filtering on the stopword removal process are shown in Table 1. The input entered has 5 pieces of word (token) after the process of stopword removal or filtering from a word that is considered meaningless, the resulting output becomes 3 pieces of word (token) such as "god", "deny", "promise". Where 2 tokens token are “no” and "will” be deleted because it is considered a word that has no meaning (stoplist).

<table>
<thead>
<tr>
<th>Input</th>
<th>god</th>
<th>not</th>
<th>will</th>
<th>deny</th>
<th>promise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>god</td>
<td>deny</td>
<td>promise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c. Stemming

There are 2 steps in stemming, including stage 1 stemming (Figure 6) and stage 2 stemming (Figure 7).

1. Stage 1 Stemming Process
In stemming process form (Figure 6), the output of stopword removal process is inputted into the application by clicking button “open” then the process of removing the affix can be completed by clicking button “run”.

After that, the system will cut the affix based on the Porter algorithm path. The system will display output that describes the word in the process (word), many letters (act), the location of the base word (start Pos and endPos), number of letters in the basic word (length). Figure 6. shows the output of the stemming process for stage 1, for example "word = pikulkan, act = 8, start Pos = 1, endPos = 5, length = 5". Based on the example above, it can be seen that the word "pikulkan" has 8 letters, the basic word produced starts in the first letter to the fifth letter and the number of letters of the basic word is 5. So that it can be seen that the basic word produced is "pikul". However, this process has not directly displayed the basic words obtained, so it is necessary to stage 2 stemming (Figure 7) to be able to display these basic words.

1. Stage 2 Stemming Process

Stage 2 stemming menu interface illustrates in the Figure 7.

In the result stemming form (Figure7), user can input the output of stemming process result to the application by clicking “open” button before cutting the affix process is started by clicking button “run”. The last step is to determine the based word by reading the output of stemming process.

Figure 7 shows the output of stage 2 stemming process. In this process, letter, sentence, word, and base word is produced. For example the word of “keraguan” with a base word of “ragu” on Al-Baqarah letter and second sentence.

After completing all of these process, user will know the total number of token output (Table 2) from each process.

<table>
<thead>
<tr>
<th>Surat</th>
<th>Surat</th>
<th>Surat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>003: Al-Imran</td>
<td>005: Al-Maidah</td>
<td>018: Al-Kahfi</td>
<td></td>
</tr>
<tr>
<td>Tokenisation</td>
<td>4.039</td>
<td>3.195</td>
<td>1.796</td>
</tr>
<tr>
<td>Stopword removal</td>
<td>5.869</td>
<td>3.526</td>
<td>16.863</td>
</tr>
<tr>
<td>Stemming</td>
<td>4.039</td>
<td>3.195</td>
<td>1.796</td>
</tr>
<tr>
<td>Stemming Token</td>
<td>4.039</td>
<td>3.195</td>
<td>1.796</td>
</tr>
<tr>
<td>Inappropriate</td>
<td>328</td>
<td>233</td>
<td>125</td>
</tr>
</tbody>
</table>
Based on Table 2, the total number of token from each process is 16.863 token for tokenization process, after the stopword removal the number of token decrease to 9.030 token and 7.757 token from stemming process that exactly accordance with the base word.

Based on the token result above, the researchers do the measurement and analysis including the stemming error analysis and accuracy analysis (Table 3).

2. Stemming Error Type Analysis

After applying the stemming process using the Porter algorithm, three types of errors were found, including understemming, overstemming and unchanged. The highest number of errors in overstemming errors is 490 errors. The second most error is the type of understemming error with 181 errors. And lastly unchanged with 15 errors.

Overstemming is a condition where the beheading of an additive exceeds the one that is supposed to be. The researchers claim that this happened because the word resembled the prefix. For example, the word "suami" becomes "suam" because the algorithm process detects the "i" suffix is considered as an affix that is removed so as to produce an inappropriate word that is "suam" who should be "suami".

Understemming is a condition where the beheading of an affix has too little than it should. The researcher felt that this happened because of a lack of the existing pattern of additions. For example, the word "mengetahui" to "etahu" should "tahu".

Unchange is a word that does not change after the stemming process, but the word produced is not the right basic word. The researchers claim that this happened because of the lack of cutting rules on the Porter algorithm. An example of the error that entered the category of the Unchange error is the word "seibu" to remain "seibu" even though the word should produce the word "ibu". Due to the Porter algorithm process there are no rules for deleting "se" add-ins so that the system does not detect these additions to be removed.

Based on the stemming errors, it can be explained again the errors of the stemming process in each letter.

Based on Figure 8, the most common error is found in letter 003: Al-Imran with a total error of 328 errors. The second largest is letter 005: Al-Maidah with a total error of 233 errors followed by the letter 018: Al-Kahfi with a total of 125 errors.
The biggest mistake is in Letter 003: Al-Imran which is 328 errors. Researchers state that this is not an oddity, because the results are consistent with the recapitulation of the number of tokens of each letter that is used as a sample of the study. The recapitulation shows that the number of tokens in 003: Al-Imran is indeed more than other letters, which is 3,429 tokens.

3. Accuracy Analysis

The level of accuracy of stemming on each letter can be seen in Table 3.

<table>
<thead>
<tr>
<th>No</th>
<th>Surah</th>
<th>Number of Tokens</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Token Correct</td>
<td>Incorrect</td>
</tr>
<tr>
<td>1</td>
<td>Surat 003: Al-Imran</td>
<td>4,039</td>
<td>3,429</td>
</tr>
<tr>
<td>2</td>
<td>Surat 005: Al-Maidah</td>
<td>3,195</td>
<td>2,674</td>
</tr>
<tr>
<td>3</td>
<td>Surat 018: Al-Kahfi</td>
<td>1,796</td>
<td>1,730</td>
</tr>
</tbody>
</table>

The total number of tokens is 9,030, with 7,833 correct tokens and 686 incorrect tokens, resulting in an average accuracy of 86.74%.

Based on Table 3, it can be seen that the highest accuracy is found in Surah 018: Al-Kahfi with an accuracy of 96.32%, then the second highest Surah 003: Al-Imran with accuracy of 84.89%, and finally Surah 005: Al-Maidah with 83.69%. The final result of the accuracy analysis has shown that the accuracy of Stemming Porter in the translation of the Qur'an is 86.74%.

It can be interpreted that the correctness of the application of the Porter algorithm is 86.74% and the error rate is 13.26%.

Stemming Algorithm Porter is categorized into a heavy Stemming algorithm because it produced 490 inversion errors in this study, the results were more than the Understemming error which only contained 181 errors and 15 Unchange errors.

It has lower accuracy compared to Nazief and Adriani algorithm [9]. The Nazief & Adriani algorithm [9] has an accuracy percentage of 95.26%, however the training data in this application helps the Porter algorithm performs better.

Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersted’s. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
4 Conclusion

This study is successfully optimizing the application of the Porter algorithm stemming process by applying training data on the stemming application to Indonesian translation of the Qur’an specifically to the context of the letter on Trade and Industry.

The calculation of accuracy process obtained the percentage of accuracy of the stemming process using the Porter algorithm that is equal to 86.74% of the 9,033 words tested. There are 686 words whose output does not match the expected results. This is because there are words that resemble the additive word, causing an inversion, the lack of an affix pattern so that it causes Understemming and Unchange.

The ISS system developed for ITQ is to make it easier to get basic words, analyze errors and optimize the application of the stemming process to ITQ.

The further development can develop this system to the search engine system so that it can be easier to review and understand the contents of ITQ and the hadith.

References

The Overview of Summary Interpretation Verses In The Holy Qur’an Based On Knowledge Graph Method

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Abstract. To understand the texts in Qur’an, human are needed a good capability of language, linguistic and Tafseer al Qur’an. Why? Because understanding the verses the Qur’an could have much interpretation for each human. It depends on their knowledge. There the same verses of the Qur’an are still ambiguous meaning depending on how humans understand the verse fit their knowledge. Many methods are used to obtain effective and efficient results. This research, we analyze the summarization of text based on the knowledge graph concept. Knowledge graph method generates new knowledge gained from the summary text that has been grouped according to the type of relationship to each, using the concepts relate one word with another word in the parsing process, knowledge graph can decipher the ambiguity in interpreting a sentence. The output of this research is a summary of the verses interpretation in the graph formed.

Keywords: ontology, the summary of verses, concept, relationship, graph simplify, NLP, Text Summarization

1 Introduction

The Quran is the central religious text in Islam. Many aspects included in Quran, there are about linguistic, islamic law, devine direction and guidance and science and philosophy. All believers should learn text –translations and interpretations. To understand of texts in Quran, human is needed a good capability of language, linguistic and Tafseer al Qur’an. Why? Because understanding the verses Quran could have much interpretation for each humans. It is depend on their knowledge. There the same verses of the Qur'an are still ambiguous meaning depending on how humans understand the verse fit their knowledge. In computer science, recently, text manipulation is became the favorite researchers. Scienties muslim have a big concentration to do the deep digging recited of Qur'an research. Knowledge Graph is one of the ontology methods in NLP that it works how to summary text of verses in Quran to understand and interprete the meaning text to get a new knowledge. Basically, knowledge graph theory uses two basic terms, namely concepts (tokens and types) and relationships (binary and multivariate relations) and the output of knowledge graph theory is a graph formed.

Text summarization is a field of NLP, artificial intelligence, and linguistic concerned with the interactions between computers and human languages. Summarization is a very useful method for many fields that develop natural language processing tasks.
The overview of Artificial Intelligence (AI) and Natural Language Processing (NLP) are: an overview of how NLP works is NLP has input and output, which includes the input that can be texts that come from various sources, while the output is in the form of knowledge base and data storage.

However, there is quite less research about the use of text summarization of Islamic studies together with the technology in one of the artificial intelligence branch, which is the Natural Language Processing, especially summary of text. Quran is the main source of knowledge and has been a major source reference for all types of problems.

To overcome this problem, we conduct research to gain understanding in reading the intentions contained in the verses of the Qur'an. Therefore, the objectives we will do are:

1. To analyze whether knowledge graph can be used to identify words that have a one-word relationship with other words.
2. To build a mind map concept in repetitive verses to get new knowledge from a collection of related words between this ayat and previous/after it.

Furthermore, this work, could answer these research question:

1. How to get words that have interrelated relationships in one verse with the other verses trough preprocessing stage?
2. Does the Knowledge Graph method can be used to get words that are interconnected in the form of graphs?
3. What is the contribution given by using knowledge Graph concept in islamic studies?

2 Related Works

The summarization text system is used to summarize sentences based on certain criteria. However, the results obtained, sometimes still often experience loss of important information in it. Therefore, based on Dimas’s paper[1] that, a system is needed to get text abstraction, which represents all the information contained in the original text. Knowledge charts offer ways to build such systems.

Another research which has the same idea is how to get the abstraction summarization using the semantic graph reduction approach [2]. This study explains the process of making an abstractive summary for single document using semantic graph reduction technique. So, the step taken are to create a semantic graph according to the original document, then through several processes, a summary of the abstraction will be obtained, in the form of a graph that is simpler than the original graph.

Adopting a graph-based approach is used by Kavita, et.al. as well. This work has a novel graph-based summarization framework (Opinosis). They present a novel technique that produces brief abstraction summaries of highly redundant opinions.

In addition, there is the research of text mining for the processing text of the holy Qur’an. Al Hawarat paper [3] is to find an approach for analyzing Arabic text. It calculate the term of frequencies using both Term Frequency (TF) and Term Frequency-Inverse Document Frequency (TF-IDF) methods.

3 Text Summarization
Information Technology is a part of the advancement of computer technology in the field of information at this time. The computer as a tool that has the structure of the machine follows the analogy of the human senses. Output in accordance with the tongue and the human hand. Processor and memory in accordance with the human brain and controls as well as a program corresponding to the human brain. Thus the process of informatics in the computer is an extension to the thought processes in the human brain. A computer is just a tool that helps in the processing of information[4].

The core of this technology is text processing. The text is to be read, understood and processed in order to be useful information into a knowledge. Have the means to deliver human knowledge becomes wise. This is the pinnacle of human endeavor to be a perfect man, where's the journey of the man in this world moves from phase to phase as revealed in the Qur'an starting from the data, information, knowledge, and wisdom. ICT as al-Qalam assists Humans to reach the highest level of this hierarchy the which is Wisdom[5].

A Summary can be defined as text that is generated from one or more texts, which contains most of the information in the original text(s), and that is not more than half of the original text [6]. summary sources can be one document or a combination of several documents. According to [7] the summarization process must not remove important information from the original determination. when the process is done manually, the results may be better, but if the file must be summarized on a large scale, it certainly requires a text summarization tool using a computer, which is automatically. this is called automatic text summarization. The output of the summary system can be in the form of extracts (ie when the choice of the "significant" sentence of the document is done) or abstract, when the summary can function as a substitute for the original document [8].

In computer science, recently, text manipulation becomes the favorite researches. Scientists muslim have a big concentration to do the deep digging recited of Qur'an researches. One of them is how to summary text in Qur'an to understand the meaning of verses Qur'an. Why it can be? According to verse Ali-Imran; 7, that sound is: That in interpreting the verses of the Qur'an, sometimes they translate according to their own will. Then you must have a belief that no one knows the interpretation except Allah. we believe that all is from God.

Behold, there are verses of the Qur'an are still ambiguous depending on how humans understand the verse fit their knowledge

4 Theory of Knowledge Graph

Knowledge graph (KG) is a new theory in the field of text summarization. KG is used to describe human language abstraction and extraction understood by computers. the approach taken on this theory is more to the semantic aspect approach than the syntactic aspect. therefore the concept of ontology in text summarization using KG theory is indispensable, or in NLP, included in the semantic network category. in principle, the composition possessed by KG is a concept (vertices and types) and relationship. Knowledge graph method generates new knowledge gained from the summary text that has been grouped according to the type of relationship to each, using the concepts relate one word with another word in the parsing process, knowledge graph can decipher the ambiguity in interpreting a sentence.

Knowledge graph theory is a a new approach that can be used to express human language in graph formed. The fundamental difference between knowledge graph theory and other summarizing theories is that the theory of knowledge graph uses limited number of ontologies
or relations. Knowledge graph theory is able to describe or describe more basic semantic aspects, using a number of limited relations. This theory provides a new way of doing research to understand human language with the help of computers [9].

The development of information technology captures the phenomenon, that many things will be encountered if the individual has a different perception and interpretation of the existing texts, such as legal text or texts in the Qur'an. So scientists in the field of computer soft side trying to do research to create new algorithms to perform summary of the texts are ambiguous. This method is known as the knowledge graph, where the technique is trying to do an analysis of the text to interpret the meaning of the sentence.

Since the artificial intelligent development was carried out, computer technology has been so sophisticated, that many human works can be done by computers, including the introduction of natural language. Generally, human natural language is the method most widely used to express human ideas and convey information. However, between formal languages that are understood by computers differ from natural languages. There is a gap between formal language (used by computers) and natural language. Communication between computers and humans is only possible when a lot of research is aimed at bridging this gap. An approach to bridging the gap is often called natural language processing (NLP), natural language understanding, or computational linguistics [9].

Knowledge graph is one of the references in NLP to represent a new way of describing natural language and modeling, and also makes a big step forward towards semantic understanding “know it and know why”. Knowledge Graph means getting things not strings[10]:

The concept is important in shaping an understanding of specifically to the public or vice versa [2]. The concept can be divided into three types, namely token, type, and name Token is concept that are understood by one's way of view respectively, so this token is subjective. A concept relates to the meaning of the word; Type is a concept in the form of information general and objective because it is an agreement made beforehand. Examples of types such as fruits, animals and so on; and name is something that is individual.

4.1 Knowledge Graph Ontologies

An ontology is the naming and formal definition of types, properties, and reciprocal relationships of entities that are truly or fundamentally present for a particular domain of discourse. Thus the practical application of philosophical ontology, with taxonomy. An ontology squares the variables needed for several sets of calculations and establishes the relationship between them [11]. There is a philosophical review, ontology is the study of something real. Ontology is a theory that can explain the meaning of an object, the property of an object and the object relation that might occur in a knowledge domain. Ontology is based on two parts, the definition of concepts and the relations among them. Many ontologies aspect in the knowledge graph are token (concept) and 8 relationships of types.

Word graph ontology to date consists of tokens declared with nodes, 8 binary relationships, and 4 frame relationships. These eight binary relationships are [12]: Causality (CAU); Equality (EQU); Subset (SUB); Alikeness (ALI); Disparateness (DIS); Ordering (ORD); Attribution (PAR); Informational dependency (SKO).

5 Research Methodology
In this point several phases are discussed conducted in this research:

a. Literature Study Documents of the Qur'anic verses in Indonesian translation. This activity was carried out to collect the repeated verses needed in the study, we did a simulation on the recurring verse on surah Ash Shu’ara.
b. Determination of Nouns as Concepts, nouns are selected from each Indonesian text based on their characteristics. Then the nouns that have been selected are counted and grouped based on the similarity of the meaning of the word or the general word form. In this stage, we need the threshold.
c. Graph Making, nouns that have been determined as concepts will be labeled and used as a vertex to make a directed graph according to the intervertex relationship that occurs in each sentence based on the knowledge graph method.
d. Graph Analysis, at this stage an analysis will be carried out on each text by comparing all the graphs formed in each sentence and consider the relationships that occur between vertices which is there to determine the relationship between graphs.
e. Determining the Rules At this stage a rule will be used to summarize a translation of the text in the Qur'anic verse.

Overall the overview of Research Design is could see in figure 1.

**Figure 1.** The overview of research design

For the third step in the research design, we adopt knowledge graph method.

**The following od the knowledge process**

This paper will incorporate the concept of text summarization to perform the extraction text in verses. The process to obtain the summary of text that we use the KG Ontology approach. The following is the research design using Knowledge Graph method.

With KG, the texts are analyzed by:

1. Determine the concepts written in the text
2. Determine the relationships between the concepts mentioned above.
3. The concepts and relationships that are formed are translated literally in the form of graphs called text graphs.
4. In KG, it is also necessary to interpret the text based on the background information that someone has (background knowledge) and also translated in graph form into text graph as well.
5. From both graphs (literal graph and background graph), combined into a new graph (combined graph) into a new text graph.
6. The new text graph is certainly very complicated to read and understand because it involves many concepts, it is necessary to simplify the graph.
7. With the formation of a simplified graph, the most important concepts in the text can be identified, resulting in a conclusion.

The previous step before used knowledge graph is we collect repeated verses accompanied by the preceding and following verses. Furthermore, we do pre-processing to get the words. The following stages of preprocessing are in fig.2

![Figure 2. The Preprocessing Stages](image)

6 Discussion

6.1. Literature Study Documents of the Qur’anic verses in Indonesian translation

We took on example In the quran, there are repetitions up to 8 times in Surah 26 Ash-Shu’ara (Poets): 9, 68, 104, 122, 140, 159, 175, 191, that is:

\[
\text{ﻭَﺇِﻥﱠ ﺭَﺏﱢﻙَ ﻟَﻬُﻮَ ﺍﻟْﻌَﺰِﻳﺰُ ﺍﻟﺮﱠﺣِﻴﻢُ}
\]

Moreover, we analyzed based on the translation of the Qur’an (in Bahasa), to get a picture of the meaning of the repeated verse based on the context contained in the verses before and after it. The following are the ayah number 8, 9 and 10:

“\text{dan sesungguhnya Tuhanmu benar-benar Dialah yang Maha Perkasa lagi Maha Penyayang}”;

and the previous verse is “\text{sesungguhnya pada yang demikian itu benar-benar terdapat suatu tanda kekuasaan Allah. Dan kebanyakan mereka tidak beriman}”

next, for the verse after that is: “\text{Dan ingatlah ketika Tuhanmu menyeru Musa dengan firmanNya, datangilah kaum yang zalim itu}”

6.2. Determination of Nouns as Concepts

The concept used in this work is in noun words. The noun used is taken from each sentence by considering the meaning of the formed sentence structure.
Table 1. The List of Noun Groupings and Their Number of Occurrences

<table>
<thead>
<tr>
<th>Words</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuhanmu</td>
<td>2</td>
</tr>
<tr>
<td>Dialah</td>
<td>1</td>
</tr>
<tr>
<td>Maha Perkasa</td>
<td>1</td>
</tr>
<tr>
<td>Maha Penyayang</td>
<td>1</td>
</tr>
<tr>
<td>Tanda kekuasaan</td>
<td>1</td>
</tr>
<tr>
<td>Allah</td>
<td>1</td>
</tr>
<tr>
<td>Mereka</td>
<td>1</td>
</tr>
<tr>
<td>Tidak beriman</td>
<td>1</td>
</tr>
<tr>
<td>Musa</td>
<td>1</td>
</tr>
<tr>
<td>firmanNya</td>
<td>1</td>
</tr>
<tr>
<td>Kaum zalim</td>
<td>1</td>
</tr>
</tbody>
</table>

6.3. Graph Making

Before creating the graph, we first determine the vertices:

Table 2. Vertices

<table>
<thead>
<tr>
<th>Vertex</th>
<th>Word</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>v1</td>
<td>Tuhanmu</td>
<td>2</td>
</tr>
<tr>
<td>v2</td>
<td>Dialah</td>
<td>1</td>
</tr>
<tr>
<td>v3</td>
<td>Maha Perkasa</td>
<td>1</td>
</tr>
<tr>
<td>v4</td>
<td>Maha Penyayang</td>
<td>1</td>
</tr>
<tr>
<td>v5</td>
<td>Tanda kekuasaan</td>
<td>1</td>
</tr>
<tr>
<td>v6</td>
<td>Allah</td>
<td>1</td>
</tr>
<tr>
<td>v7</td>
<td>Mereka</td>
<td>1</td>
</tr>
<tr>
<td>v8</td>
<td>Tidak beriman</td>
<td>1</td>
</tr>
<tr>
<td>v9</td>
<td>Musa</td>
<td>1</td>
</tr>
<tr>
<td>v10</td>
<td>firmanNya</td>
<td>1</td>
</tr>
<tr>
<td>v11</td>
<td>Kaum zalim</td>
<td>1</td>
</tr>
</tbody>
</table>

Furthermore, after obtaining vertices resulting from grouping nouns, concepts and vertices will form graphs. Firstly, a word graph will be created from each noun in sentences based on noun phrases. Then the formed word graph will be matched with a predetermined vertex. In the formation of graphs will be considered inter-fetish relationships, as well as the conjunctions that exist in each verses (before or after).

The previous verse is:
“dan sesungguhnya Tuhanmu benar-benar Dialah yang Maha Perkasa lagi Maha Penyayang”. From this sentence the phrase is obtained objects as follows: (a) Tuhanmu; (b) Dialah; (c) Maha Perkasa; (d) Maha Penyayang

The recurring verse is:
“sesungguhnya pada yang demikian itu benar-benar terdapat suatu tanda kekuasaan Allah. Dan kebanyakan mereka tidak beriman”. Then, for the object of sentence phrases are: (a) kekuasaan; (b) Allah; (c) Mereka; (d) Tidak Beriman

And the last verse is:
"Dan ingatlah ketika Tuhanmu menyeru Musa dengan firmanNya, datangilah kaum yang zalim itu". The object of sentence phrases are: (a) Tuhanmu; (b) Musa; (c) FirmanNya; (d) Kaum zalim

After obtaining the concepts of each word of sentence object, we made the words graph form. See in figure 3

![Figure 3. Words Graph](image)

6.4 Graph Analysis

Then, these three verses, we are looking for important words that provide information about the meaning of the verses by going through the preprocessing process. For the main ayah, we got the result of preprocessing the related words, namely: *tuhan, dia, maha perkasa, maha penyayang*; for the previous ayah, namely: *tanda, kekuasaan, allah, mereka, iman*; and next the after ayat, namely: *ingat, tuhan, musa, kau, zalim*

If noun phrases are described in the graph, it is obtained:

![Figure 4. The enhance for the phrase of “kaum zalim”](image)

The result is a description of the words related to the recurring verse as follows in fig. 5

![Fig. 5. The result of Preprocessing Step](image)

The procedure for transforming text into KG to get a combined graph, you must go through preprocessing first. The follows is:
1. Text analysis, the text is read carefully to identify concepts and relations literally according to the text, to text concepts and relations
2. Adding knowledge background to background concept and relations.
3. Both texts (literal text and background text) are combined to form a combined graph.
4. The combined text is implemented into the software created.

![Figure 6. Combined Graph](image)

Simplify step One of the most fundamental things in making graphs is how to make problems that have been translated into graphs, become easier to understand or easier to read. Therefore the next step is to simplify the graph (Simplified Graph) Simplification of graphs is not only useful in limiting the number of concepts and relationships, but also helps solve problems related to synonyms and specialization of these concepts [9]

Simplification process of graphs, which includes:
1. Formation of general concepts (general concept)
2. Identification of constructs (identifying constructs)
3. Establishing an independent subgraph (identifying identity subgraphs)
4. Removal of causal chains (reducing causal chains)

To identification of construct, KG have eight binary relationship. The 8 binary relationship describe: equ, sub, ord, cau, par, ali, dis, and sko concepts.

Finally, we find the result of the simulation of summary verses interpretation, as shown in fig.6

![Figure 7. The Result of the simulation of summary verses interpretation](image)

7 Conclusion
The conclusion of this work are:
1. This research is still at the level of analysis whether the preprocessing stage and knowledge graph method can be used to build a database with mind map concepts that can be used as a reference in facilitating understanding of the relationship of a verse with the preceding and following verse.
2. This research is still not perfect, because the results obtained have not been compared with other techniques, so it cannot be said as optimal results.
3. Allah commands to read and write, is the foundation of man's exploration and in-depth research on the phenomena of the universe for the sake of human survival. With the provision of reasonable and mind, then human knowledge continues to grow, accompanied by the advances in technology that can help answer the question of what happened.

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References

Parking Application Using Dual-Layered Geofencing (Circle and Polygon) and Activity Recognition (Case Study: UIN Syarif Hidayatulllah Jakarta)

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Abstract. The information of available parking lot in UIN Syarif Hidayatullah is not provided. It becomes a problem because when the rider wants to park his vehicle but does not know which parking area is still available then the driver will waste his time by searching for available parking even though not necessarily he will find it. The purpose of this research is to develop the application that can solves the problem so that students or other campus residents can easily find available parking. The application design uses dual-layered geofencing and activity recognition to identify the user's parking activities without the use of sensors in every parking area. The results of this study is an application parking management android-based with a server that uses PHP programming language and MySQL database. Detected parking success was 70% with the average distance required for detection was 8.71 meters.

Keywords: parking, geofencing, activity recognition, android

1 Introduction

One of the most widely used transportation today is motor vehicles. Motor vehicles become one of the important factors supporting human mobilization and logistics of human needs goods itself. Thus, motor vehicles are able to influence economic development in an area.

Every year the number of motor vehicles continues to increase [1]. Although it has many benefits for human life, the increasing in the number of vehicles will cause problems. And the problems that can be caused by the increasing number of motor vehicles are air pollution, traffic jam, and difficulty of finding parking space.

Problems that occurred in UIN Syarif Hidayatullah result from the increase of motor vehicles is the difficulty of finding parking space. Although there are already some parking areas, there are still drivers who park their vehicles in any place. In addition, the existing parking management system has not been able to provide information of parking area availability directly to the driver so that the driver has difficulty and takes more time to just look for the parking space.
In this journal, geofencing and activity recognition is used to detect driver who park their vehicles through their smartphones. Geofencing used in this study will combine the circle geofence and polygon geofence. Circle form as the area where the user will get the parking information and the polygon form signifies the parking area where the system will reduce the parking slot when there are users who parked in the area.

Geofencing is a virtual boundary or geographical or virtual perimeter line around a point with a pre-defined set of boundaries in a mapped geographical area either using a GPS (Global Positioning System) or RFID (Radio Frequency Identification) or beacons or other technology [2]. This research uses Geofencing API from Google.

And the activity recognition used in this research is Activity Recognition API which is also from Google. Activity Recognition API is one of the features of Location API owned by Google Play Service. The Activity Recognition API can tell you the latest type of activity performed by smartphone users [3].

This solution is expected to help the campus residents to know which parking area is still available in UIN Syarif Hidayatullah.

2 Related Work

In previous research [4] applied geofencing as a means of monitoring children by parents by utilizing the GPS contained in the smartphone. The coordinates of the child's location are captured by the GPS and then sent to the server. And when a child enters or leaves a designated area, the parent gets a notification of the child's location immediately.

Another study conducted by [5] monitoring parking in an apartment using RFID technology and Atmega16 microcontroller. Monitoring results will be displayed on the display of available parking slots in the apartment. That way apartment residents can know the condition of the parking area when passing the available display.

Based on these studies, geofencing can be used to track someone by utilizing the existing GPS on their smartphone. That way, the authors try to implement the geofencing in detecting users who parked. Activity recognition is used as a support so that detection is expected to be more accurate because through activity recognition can be known whether the user using the vehicle or not.

3 Basic Theory

3.1 Parking

Parking is a state of vehicle that does not move and temporarily due to leaved the driver. Parking by the side of the road is generally allowed. But parking in the middle of the highway is prohibited by the law in force in Indonesia. Other circumstances included in the definition of parking are the state of every vehicle that stops at certain places whether expressed by traffic signs or not, and not only to raise and / or decrease people and / or goods [6].

3.2 Parking Management System

Parking management system is a system that is able to monitor the condition of the availability of parking location of vehicles in a parking lot and make the information available
to riders and parking officers in the place. The rider can use the information as a guide to select a parking location. As for the parking attendant, the information is useful for the development of parking areas for the future [7].

3.3 Geofencing

According to [8], geofencing is a technique that allows applications to provide information in a more precise way, at the right time and in the right place. This geofencing technique requires 2 main physical components namely the physical area that is limited by digital fences and devices capable of receiving the information provided through the geofencing technique. And when the device passes one of the geofence areas (entering or exiting the area) then there will be alerts or notifications sent to the device.

Geofencing combines the current user's location with the user's distance to the specified location. To mark the desired location requires latitude and longitude of the location. And to adjust the user's distance to that location a radius is required. Then latitude, longitude and radius will create an area of geofences, which the area can be a circle or polygon [9].

There are 3 user conditions that can be known when geofencing is applied:
1. Arriving
   Arriving is the condition when the user enters a predetermined location.
2. Dwelling
   Dwelling is the condition where the user is still within the specified location.
3. Leaving
   Leaving is the condition when the user has been within the specified location then he exited from that location.

3.4 Activity Recognition

According to [3], Activity Recognition API is one of the features of Location API owned by Google Play Service. The Activity Recognition API can tell you the latest type of activity performed by smartphone users.

Activities that this API can detects are as follows:
- In Vehicle means the device is in the vehicle
- On Bicycle means the device is on the bike
- On Foot means that the device is on a user who is walking or running
- Running means the device is in the user who is running
- Still means the device does not move at all
- Tilting meaning that the position or angle device changes with gravity significantly
- Unknown meaning the activity can not be detected
- Walking means the device is in the user who is walking

4 Research Flowchart

The flow that describes the processes occurring in this study is as follows:
5 Results and Discussion

5.1 Proposed System

The proposed system has 2 levels of geofencing, level 1 is a circular geofencing that surrounds UIN Syarif Hidayatullah. The area is the area where the user will get parking information notification. Furthermore, the geofencing area will be referred to as the notification area. Then level 2 is a polygon-shaped geofencing that signifies as parking area in UIN Syarif Hidayatullah. Furthermore the area will be referred to as the parking area.

Here is the proposed schemes:
1. User Enters Notification Area
   If a user is detected has entered the notification area then the system will send parking information.

![Figure 3. Enter Notification Area](image)

2. User Enters Parking Area
   If a user enters the parking area by driving then the system will store the area. If the user re-enter the parking area by walking then the system will note that the user will finish parking.

![Figure 4. Enter Parking Area](image)
3. User Exits Parking Area

If user exits the parking area on foot and previously enters by driving then the user is declared to have parked in the area. And if the user exits the parking area by driving and in the condition will be completed parking then the user otherwise completed parking in the area.

4. User Exits Notification Area

If the user has left the notification area and has been parked on that day then the user is declared to have been out of campus.

Figure 5. Exit Parking Area
5.2 Testing Result

In unit testing, the scope tested is the function used to communicate with the server is correct in sending and receiving data in JSON format. The unit testing results state that all the functions associated with it pass the test.

In the previous black box testing it is known that there is an unsuccessful test case passed by this design. Test case is located on Parking Entrance in point j. When there are 2 or more passengers in 1 vehicle entering the system should reduce the parking slot based on the number of vehicles parking is 1. But what happens is the parking slot is reduced according to the passengers in the vehicle.

To handle that, the authors apply the confirmation of the license plate of the vehicle being used. The user will receive a parking confirmation message when the user enters the notification area. With this, then the user with the license plate of the vehicle being used and confirmed it will be declared parking.

And for accuracy testing, Accuracy to be measured in this research is accurate detect geofencing event and activity recognition accuracy in detecting user activity. Geofencing event detected is when the user entered the notification area, exit the notification area and exit the parking area. Meanwhile, user activity is detected when the user is driving a vehicle and walking.

a. Accuracy of Activity Recognition
   • Users Driving Vehicle

   The results of detection when the user puts the smartphone in a trouser pocket there are 19 of 20 records accordingly with the expected. The percentage of success is 95%.
And the result of detection when the user put the smartphone in the bag there are 15 of 20 results accordingly with the expected. The percentage of success is 75%.

Walking User

There are 7 of 20 detection results that do not match the results of detection when the user puts the smartphone in a trouser pocket. The percentage of success is 65%.
Furthermore there are 5 of 18 incorrect detection results when the user is on foot and using smartphone simultaneously. Then the percentage of success is 72.22%.

**Figure 9. Smartphone is in Trouser Pocket While User Is on Foot**

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Distance (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
</tbody>
</table>

**Tabel 1. Enter Notification Area Accuracy**

- **b. Accuracy of Geofencing**
  - Enter Notification Area
The average user gets a notification after entering 12 meters from the geofence boundary.

- Exit Notification Area

{Tabel 2. Exit Notification Area Accuracy}

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Distance (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Average distance 12

The average user is declared out after exiting 14.2 meters from the geofence boundary.

c. Geofence Parking Area

Because the detection of parked users is when the user exits the parking area and the user is in On Foot condition the accuracy tested is accurate when the user exits the parking area. The tested parking area is the parking area in front of the student center building.

{Tabel 3. Success Parking Detection Accuracy}

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Distance (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Not detected</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>
Detected 70% parking success with the average distance required to be detected is 8.71 meters.

6 Conclusion

The application is able to detect the driver who parked without needing sensors at all in the parking area. Then the system has 2 levels of geofence. Level 1 is the circle geofence as the area where the user will get parking info notification. And level 2 is the polygon geofence as the boundary of the parking area which is within the geofence level 1. This is implemented when the admin determines the boundaries for the parking area.

Accuracy of activity recognition in detecting users who are running and put the smartphone in a pocket reaches 65%. And when the user is running at once using the smartphone reaches 72.22%. For geofencing accuracy, the enter notification area event required 12 meters in average to be detected. And at exit notification area event required 14, 2 meters in average to be detected. And for the detection of parking, parking success detected 70% with the average distance required is 8, 71 meters. Accuracy of the built system depends on the weather and connectivity of the user's smartphone.

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References

Settlement Growth Prediction Using Cellular Automata Model (Case study Lowokwaru District, Malang City)

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{januardhs@gmail.com1, gunawan_uin93@yahoo.com1, awhasyim@yahoo.com1}
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Abstract. Land use change in urban areas is a necessity. Populations increase both naturally (birth and death) and unnatural (migration) encourages increasing demand for land. The city of Malang, one of the major cities of East Java province, is also facing the problem of land use change. The attraction of Malang as a major city and educational city in East Java could potentially drive change in land use, from agriculture to non agriculture, specifically to the use of settlements. From 2010 to 2015, the population grew by 7.7% and farmland decrease by 23%. The Lowokwaru district was chosen as part of this study because several universities are located in this district, so the demand for land for settlement is higher than in the other districts. The research objective is to predict the growth potential for settlement in 2035 using cellular automata by Landusesim application. The analysis shows that the planned settlement demand for 2035 is 1,433.62 hectares, while the available area is 682.15 hectares (sum of agricultural land and vacant land). On the basis of this forecast, if the policy is not implemented, Lowokwaru District of Malang City will not be able to provide land by 2035. The analysis show that the available land can only satisfy 47.58% total land demand.

Keywords: land use change, cellular automata

1 Introduction

Land in urban and regional areas has a fixed and limited trend. While the demand for human activities, whether for settlement, trade and services, as well as other needs, continues to increase as the population grows. Present theories state that there is a value difference for lands in the city center and the suburbs. Land value is an assessment of land that is based on the ability of the land economically in relation to its productivity and economic strategy [1]. The value of land is the space value horizontally (distance decay principle from the center) based on Urban Growth Model [2]-[3].

The high value of land (expensive) in the city center is generally inaccessible to low-income people, thus making the community shift to the suburbs. Thus the suburban area is an alternative to residential and other activities. Besides having an affordable price for middle-income residents, the suburbs is also an ideal place to live because they are far from the city crowd [4]-[5].

Changes in land use in the suburbs will lead to land conversion, primarily from agricultural land to other uses, more specifically settlements. This will continue to occur from...
time to time following human demand in supporting their life activities. Sprawling will continue to occur with increasing activities and human population in the region. Irawan and Friyatno [6] stated in the micro level, the process of changing agricultural land (land conversion) can be done by the farmers themselves or carried out by other parties.

Malang City as one of the big cities in Indonesia also faces this problem. The absence of an obligation to establish Sustainable Farming Land (LP2B) eases the change from agricultural land to non-agricultural land. Based on the data, the growth rate of Malang City population is an average of 3.7% per year [7]. The high rate of population growth also causes the demand for settlement land to be quite high. One of them is Lowokwaru District, where several universities are located. The existence of these universities encourages inward migration which in turn also increases demand for settlement areas. In Malang city, Prayitno and Sasongko [5] found that there is the gap between adequate shelter and affordable home in Malang City.

Lowokwaru District is one of the areas in Malang City that shows an increase in the population growth rate by 7.7% and the degradation of agricultural land in 2010 to 2015 by 23% or around 70.42 hectare [8]-[9]. The potential for increased settlement use and reduced agricultural land and green open space in Malang City is a problem due to the limited availability of vacant land, which may also increase Malang’s temperature. According to Hasyim [10], the surface temperature of Malang City has increased due to the reduction of green open space.

Prediction of the potential increase in settlement land from agricultural land use is one of the efforts to anticipate the settlement increase that exceed the available land and can be a reference for decision-makers in managing the area. This research was conducted to provide preliminary information on the projected increase in settlement land demand over the next 15 to 20 years, allowing the government to take precautionary measures by developing appropriate policies or rules.

2 Research Methodology

Research on land use change modeling has become a major theme in the literature on urban and regional planning today. The current geospatial data is of high quality and combined with fast computer processing time, facilitate the management of land use.

Early land-use research, such as the classical use of land by Christaller (1933), Von Thunen (1826), Weber (1909) and Lösch (1940) were replaced by new models, econometric models, transport interaction model (LUTI) in Torrens [11], agent-based model [12] and cellular automata (CA) model, which interacts with the effects of parameters in use lands. This new model can develop better because of the availability of map data at different scales that exist in a city or region that builds sustainability and can be managed.

Cellular automata (CA) can be understood conceptually as a "cell-based" approach for dynamic modeling of the gravity process at the micro level [13]. Besides in land use modeling, it is also used to make a model for deforestation [14], forest fires [15], social phenomena [16] and other uses.

Cellular Automata (CA) is a powerful tool for dynamically modeling land-use changes and is a common tool for viewing spatial interactions. This has been implemented in land use models and can simulate different types of land use. This study adopted the concept of spatial evolution integrated in CA and applied to land use and land cover change.
Research Location

The area that will be the object of research is Lowokwaru District, Malang City, East Java. Lowokwaru District is located in the western part of Malang City with an area of 2,089.51 Ha. Regionally, Lowokwaru District is influenced by the geographical conditions of Malang City which is located at coordinates 112° 0′ 34.0948" EL - 112° 0′ 41.3493" EL and 7° 0′ 54.522" SL - 8° 0′ 30.05" SL. Administratively, the Lowokwaru District consists of 12 Sub-Districts shown in Figure 1.

Overall, the Lowokwaru District area is a built-up area (69% or 1,578,176 Ha). Most of these are residential areas, covering an area of 1,234.9 Ha or 53%, the rest is for services, education, and so on. This built-up area tends to develop in areas with relatively flat topographic conditions, namely in Lowokwaru, Mojolangu, Ketawang Gede, Sumbersari, Dinoyo. The rest are no building areas which are dry agricultural land (moor / fields) and wet agricultural land (rice fields) with an area of 579.78 Ha or 25% in Merjosari Sub-district and Tlogomas Sub-district, while wet farmland (rice fields) are found in Merjosari Sub-district, Tlogomas Sub-district, Tunggul Wulung Sub-district, Jatimulyo Sub-district, Tunjung Sekar Sub-district and Tasikmadu Sub-district (Figure 2).
Data Collection and Processing
The data used are secondary data, including the 2015 Lowokwaru District RDTR map, Malang City transportation network map, 2016 Lowokwaru District population, and the number of government programs that support land conversion.

Data processing in this study is done using spatial analysis with the help of Landusesim to determine the extent of land change and predictions of urban development (sprawling).

1. Cellular Automata Land Modeling Analysis
In modeling land development, researchers use cellular automata (CA) methods. CA is shown as a new branch of discipline (Wolfram, 2002). CA implementation has been carried out in various fields in the fields of transportation, human interaction, and urban development. The implementation of CA in modeling land use changes, in general, has been demonstrated [17-20].

In this study LanduseSim based on Cellular Automata was used as a spatial planning model software which describes the growth of settlement land in the research location.

2. Population Projection
The projection calculation for the population of Lowokwaru District is 20 years in the future using the exponential method (Equation 1).

\[ r = \left( \frac{P_n - P_0}{P_0} \right)\% \]

Where is Po as the base year population, Pn as the number of population in year n, r as the ratio of population growth.

3. Projection of Home Demand
The occupancy rate can identify the home demand in the next 20 years. Equation 2 calculates House demands.

\[ R_{tp} = \frac{P_n}{T} \]

The above area can obtain the formula to determine the allocation of the amount and area of housing land needed for the next 20 years.

Big House = 0.1 x the need total of houses x 120 m²
Medium Houses = 0.3 x the need total of houses x 600 m²
Small Houses = 0.6 x the need total of houses x 2000 m²

3 Result

The extent of Agricultural Land in Lowokwaru District
The area of agricultural land in Lowokwaru District is dominated by technical irrigated rice fields with the main crop being rice. Based on data from 2010, the figure was 311.62 Ha with the amount of rice production being 3.918 tons, while in 2015 the area of rice fields was reduced to 241 hectares with a total production of 3,538.0 tons [8]. Table 1 shows data on agricultural land (rice fields and non-paddy fields) in Lowokwaru District from 2010 to 2015.
Table 1. Area and number of agricultural land production in Malang City

<table>
<thead>
<tr>
<th>ears</th>
<th>Agricultural Land (Ha)</th>
<th>Paddy Field</th>
<th>others</th>
</tr>
</thead>
<tbody>
<tr>
<td>010</td>
<td>11.62</td>
<td>02.44</td>
<td></td>
</tr>
<tr>
<td>011</td>
<td>95.0</td>
<td>964.35</td>
<td>649.64</td>
</tr>
<tr>
<td>012</td>
<td>46.0</td>
<td>799.0</td>
<td>14.29</td>
</tr>
<tr>
<td>013</td>
<td>41.0</td>
<td>666.0</td>
<td>932.34</td>
</tr>
<tr>
<td>014</td>
<td>41.0</td>
<td>6.0</td>
<td>0.0</td>
</tr>
<tr>
<td>015</td>
<td>41.0</td>
<td>7.0</td>
<td>932.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ears</th>
<th>Production (Ton)</th>
<th>addy</th>
<th>orn</th>
<th>assava</th>
<th>weet potato</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.918,0</td>
<td>3.0</td>
<td>.0</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>011</td>
<td>.933,0</td>
<td>01.0</td>
<td>.134,0</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>012</td>
<td>.943,0</td>
<td>37.0</td>
<td>28.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>013</td>
<td>.872,0</td>
<td>82.0</td>
<td>.606,0</td>
<td></td>
<td></td>
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<tr>
<td>014</td>
<td>.754,0</td>
<td>91.0</td>
<td>.420,0</td>
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<td></td>
</tr>
<tr>
<td>015</td>
<td>.538,0</td>
<td>.00</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Population Projection
To find out the demand for settlements in Malang City, population projections were analyzed. The projection of population growth shows an increase every year from 2016-2035. The average population growth rate of Lowokwaru District is 4.7% per year so that the projection in the year 2035 has a population of 561,599 people (Table 2)

Table 2. Projection of the people 2015-2035

<table>
<thead>
<tr>
<th>District</th>
<th>016</th>
<th>017</th>
<th>018</th>
<th>019</th>
<th>020</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>District</th>
<th>016</th>
<th>017</th>
<th>018</th>
<th>019</th>
<th>020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klojen</td>
<td>55494</td>
<td>58747</td>
<td>62069</td>
<td>65460</td>
<td>68922</td>
</tr>
<tr>
<td>Blimbing</td>
<td>71375</td>
<td>71184</td>
<td>70993</td>
<td>70802</td>
<td>70612</td>
</tr>
<tr>
<td>Lowokwaru</td>
<td>34163</td>
<td>45196</td>
<td>56749</td>
<td>68846</td>
<td>81513</td>
</tr>
<tr>
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<td>92311</td>
<td>94172</td>
<td>96051</td>
<td>97949</td>
</tr>
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<td>78366</td>
<td>79023</td>
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<td>80343</td>
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<td>76064</td>
<td>79748</td>
<td>83509</td>
<td>87349</td>
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<tr>
<td>Blimbing</td>
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<td>70232</td>
<td>70042</td>
<td>69853</td>
<td>69664</td>
</tr>
<tr>
<td>Lowokwaru</td>
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<td>08666</td>
<td>23210</td>
<td>38438</td>
<td>54384</td>
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<tr>
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<td>01799</td>
<td>03752</td>
<td>05724</td>
<td>07715</td>
</tr>
<tr>
<td>Kedungkandang</td>
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<td>81674</td>
<td>82342</td>
<td>83014</td>
<td>83687</td>
</tr>
</tbody>
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<thead>
<tr>
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<th>027</th>
<th>028</th>
<th>029</th>
<th>030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klojen</td>
<td>91269</td>
<td>95271</td>
<td>99357</td>
<td>03528</td>
<td>07786</td>
</tr>
<tr>
<td>Blimbing</td>
<td>69475</td>
<td>69286</td>
<td>69097</td>
<td>68909</td>
<td>68720</td>
</tr>
<tr>
<td>Lowokwaru</td>
<td>71082</td>
<td>88566</td>
<td>06874</td>
<td>26045</td>
<td>46119</td>
</tr>
<tr>
<td>Sukun</td>
<td>09725</td>
<td>11755</td>
<td>13804</td>
<td>15873</td>
<td>17963</td>
</tr>
<tr>
<td>Kedungkandang</td>
<td>84364</td>
<td>85042</td>
<td>85724</td>
<td>86407</td>
<td>87094</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District</th>
<th>031</th>
<th>032</th>
<th>033</th>
<th>034</th>
<th>035</th>
</tr>
</thead>
</table>
Projection of Home Demand for 2015 to 2035

Based on the results of population projections of the data, it can be seen (Table 3) that the area of land needed for the overall development of housing in Malang years is 4.124 Ha in 2035

<table>
<thead>
<tr>
<th>District</th>
<th>031</th>
<th>032</th>
<th>033</th>
<th>034</th>
<th>035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klojen</td>
<td>12134</td>
<td>16572</td>
<td>21104</td>
<td>25730</td>
<td>30453</td>
</tr>
<tr>
<td>Blimbing</td>
<td>68532</td>
<td>68345</td>
<td>68157</td>
<td>67970</td>
<td>67783</td>
</tr>
<tr>
<td>Lowokwaru</td>
<td>67138</td>
<td>89149</td>
<td>12196</td>
<td>36329</td>
<td>61599</td>
</tr>
<tr>
<td>Sukun</td>
<td>20072</td>
<td>22202</td>
<td>24352</td>
<td>26524</td>
<td>28716</td>
</tr>
<tr>
<td>Kedungkandang</td>
<td>87782</td>
<td>88474</td>
<td>89168</td>
<td>89864</td>
<td>90563</td>
</tr>
</tbody>
</table>

Table 3. Projected area of land needed housing in Malang

Backlog of 2035

The House Backlog is one of the indicators used by the Government as stated in the Strategic Plan (Renstra) [21] and the Medium Term Development Plan (RPJMN) related to the housing sector to measure the number of housing needs in Indonesia. The home backlog from the perspective of occupancy is calculated by referring to the concept of ideal calculation: 1 family occupies 1 house. Equation 5 is used to calculate the home backlog from the perspective of occupancy. Residential backlogs in Lowokwaru District can be seen in Table 4

\[
\text{Backlog} = \sum \text{Number of Family} - \sum \text{Housing} \ldots \ldots (4)
\]
Table 4. Projected number of housing by type of house in 2035

<table>
<thead>
<tr>
<th>District</th>
<th>Houses Type 2035 (Unit)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ig</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klojen</td>
<td>2,116</td>
<td>6,353</td>
<td>9,270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blimbing</td>
<td>2,288</td>
<td>6,433</td>
<td>14,336,160</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowokwaru</td>
<td>2,228</td>
<td>6,686</td>
<td>3,372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sukun</td>
<td>2,288</td>
<td>6,433</td>
<td>14,336,160</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kedungkandang</td>
<td>2,116</td>
<td>6,353</td>
<td>9,270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2,116</td>
<td>6,353</td>
<td>9,270</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The housing backlog is calculated for Lowokwaru District, where the calculation shows there is the need for small, medium and large houses. Based on calculations, the backlog of 66,381, consisting of small houses (39,828), medium houses (11,948) and large houses (1,194). The comparison for medium, small and large houses is 1: 3: 6. This means that the provision of 1 large house must be accompanied by 3 medium houses and 6 small houses.

Table 5. The demand of land area for lowokwaru district settlement in 2035

<table>
<thead>
<tr>
<th>Years</th>
<th>Backlog</th>
<th>Houses Type (Unit)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Big</td>
<td>Medium</td>
<td>Small</td>
</tr>
<tr>
<td>2035</td>
<td>66,381</td>
<td>39,828</td>
<td>11,948</td>
<td>1,194</td>
</tr>
</tbody>
</table>

Projection of Lowokwaru District Settlement Land Area in 2035

The area of settlement land in 2035 is obtained from the number of projections based on the proportion of housing 1: 3: 6 for large, medium and small houses. Furthermore, the projection based on the type is multiplied by the lot area per each type of house that is specified in the Development Plan and Development of Housing and Settlement Region (RP3KP) Malang (22). Prediction of the need for settlement area of Lowokwaru District in 2035 can be seen in Table 6

Table 6. The demand of land area for lowokwaru district settlement in 2035

<table>
<thead>
<tr>
<th>Land Area Needed</th>
<th>Land Area Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>ig</td>
<td>edium</td>
</tr>
<tr>
<td>77.94</td>
<td>1.433.62</td>
</tr>
<tr>
<td>14</td>
<td>336,160.00</td>
</tr>
</tbody>
</table>


Euclidean Distance Analysis

This analysis is a measurement of horizontal distance that is measured based on raster data, which calculates the distance of a center of pixels past the center of the other pixels towards the object / phenomenon specified. Based on the driving factors in the development of settlement land in poor cities, 3 factors were determined, namely the existing settlement land (Figure 3.a), the primary road (Figure 3.b), and the secondary road (Figure 3.c).
**Figure 3.** (Figure 3.a), the primary road (Figure 3.b), and the secondary road (Figure 3.c)
Fuzzy Membership Analysis

Standardize each mapping distance of the driving factor using the linear method. Fuzzy membership sets monotonical decrease. At this stage, the distance value (Euclidean distance map) will be converted into real numbers, valued between 0 (farthest distance) and 1 (closest distance). This assessment is carried out by providing the best potential development value when approaching the driving variable.

In this analysis, several factor groups influencing the accession of settlement land development are (1) proximity to the existing settlement land; (2) proximity to the primary road; and (3) proximity to secondary roads. Linear method of fuzzy set membership monotonical decrease is applied to change the Euclidean distance value of all variables in the factor group. The results of the linear analysis of the method of fuzzy membership set monotonical decrease can be seen in Figures 4.a, 4.b, 4.c and 4.d.

![Figure 4. Fuzzy Set Membership Land Use in Lowokwaru District (a), Settlement area (b), Primary Road (c), Secondary Road (d) Year 2015](image)

Prediction of Settlement and Land Change

The land change prediction inserts the map that has been made in the previous stage. Parameters in this stage include but are not limited to; projections, initial land use maps, transition map rules, neighborhood filters, and CA-Time Step. The base year of this study is 2015, while the land growth prediction is set in the year 2015. Thus the CA-Time Step used is 20 years with iterations per year. Next is filtering the neighborhood using a low pass filter. The low pass in question is that land growth has the same value and facilitates data ensuring no edge or boundary in this case. The results of the prediction of the growth of settlements per 5 years in Lowokwaru District can be seen in Figure 5.a to 5.d.
The Prediction map per five years above shows the growth of the settlement land. Settlement land growth is predicted to occur with the same visualization from 2025 to 2035. This is due to projected simulated settlement land over the available land in Lowokwaru District. Land that can change its function to settlements as explained in determining the set transition rules, namely the use of agricultural land and use of vacant land. The projected settlement area in 2035 is 1,433.62 hectares, while the land available for land conversion is the sum of the agricultural land use and vacant land which is 682.15 hectares. The land availability significantly decreases land reduction, regarding the settlement, the land demand is higher than the supply for settlement land. The extent of land use change and simulation of land use change can be seen in Table 7 and Figure 6.

Table 6. Changes in land use per year

<table>
<thead>
<tr>
<th>Land Used</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Agriculture</td>
<td>519.07</td>
<td>460.3</td>
<td>403.1</td>
<td>343.73</td>
<td>286.15</td>
</tr>
<tr>
<td>Build Land</td>
<td>332.53</td>
<td>332.53</td>
<td>332.53</td>
<td>332.53</td>
<td>332.53</td>
</tr>
<tr>
<td>Open Space</td>
<td>142.29</td>
<td>142.29</td>
<td>142.29</td>
<td>142.29</td>
<td>142.29</td>
</tr>
<tr>
<td>Empty Land</td>
<td>76.16</td>
<td>63.25</td>
<td>48.77</td>
<td>36.46</td>
<td>22.36</td>
</tr>
<tr>
<td>Settlement</td>
<td>1203.05</td>
<td>1274.73</td>
<td>1346.41</td>
<td>1418.09</td>
<td>1489.77</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Land Used</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Agriculture</td>
<td>229.06</td>
<td>164.72</td>
<td>93.47</td>
<td>21.79</td>
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</tr>
<tr>
<td>Build Land</td>
<td>332.53</td>
<td>332.53</td>
<td>332.53</td>
<td>332.53</td>
<td>332.53</td>
</tr>
<tr>
<td>Open Space</td>
<td>142.29</td>
<td>142.29</td>
<td>142.29</td>
<td>142.29</td>
<td>142.29</td>
</tr>
<tr>
<td>Empty Land</td>
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<td>0.43</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Settlement</td>
<td>1561.45</td>
<td>1633.13</td>
<td>1704.81</td>
<td>1776.49</td>
<td>1798.27</td>
</tr>
</tbody>
</table>

Table 7 shows the total number of land use changes up to 2024. Agricultural land will be exhausted by 2024 (even before 2035). Industrial built-up land, green open space, and waters are assumed to be fixed because this is fixed and we do not project it. Whereas vacant land will change to zero in 2022, or only eight years after the projection is carried out. Based on this analysis, an analysis can be carried out on a map where land use change is more visible from 2015 to 2024 (figure 6). We can see that the open space in 2015 runs out in 2024. This prediction can be used as inputs for the local government in preparing policies for the development of settlement areas in Malang City, especially in the Lowokwaru District.
4 Conclusion

Settlement growth projections for 20 years from 2015 to 2035 requires a land area of 1,433.62 hectares. In the simulation of regional settlement growth, the land conversion from agricultural use to settlement is evident in Merjosari Sub-district, Tasikmadu Sub-district, and Tunggulwulung Sub-district, while in some areas Mojolangu Sub-district, Jatimulyo Sub-district and Tunjungsekar Sub-district, a small portion of the area is converted at the same stage.
The settlement growth simulation shows that the need for settlement land cannot be fulfilled until 2035, the simulation shows that by 2024, the available agricultural land for settlements has been exhausted. As for the vacant land, it will be exhausted in 2022. The simulation of Sub-District settlement growth shows Sub-Districts with the slowest growth, namely Merjosari Sub-District and Tasikmadu Sub-District, this shows that the current availability of agricultural land in the two Sub-Districts is higher than other Sub-Districts in Lowokwaru District.

References


[10] Hasym A.W., Urban Climate: Poor Land Use Management As A Factor on Urban Heat Island (UHI) a Case of Klojen Sub District in Malang City, 2008


[22] Regulation, the Minister of Public Housing, the Republic of Indonesia Number 10 year 2012 concerning the Organization of Housing and Settlement Areas with Balanced Residential. Jakarta

Application of E-Marketing Concept to Analyze Distribution Channel Optimization (Case Study: Frisian Flag Indonesia)

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Abstract. Milk is one of the essential products for human kind in livestock. Demand of milk products in Indonesia is increasing time to time. Meanwhile, milk supply has not met its requirements. Distribution system in PT Frisian Flag Indonesia is indirect distribution. PT Frisian Flag Indonesia uses intermediary company, namely Yap Cwee Hock (YCH) as Main Distribution Center (MDC). According to level of distribution channel, PT Frisian Flag Indonesia uses distribution channels of Producer-Distributor Industry-Customer. PT Frisian Flag Indonesia has four main Plants, i.e. Plant Pasar Rebo, Plant Ciracas, and MDC Cibitung with its two Plants (MDC for powdered milk and MDC for condensed milk). To optimize product and marketing distribution and integrate each division, so e-marketing system is implemented.

Keywords: Distribution, Distribution Channel, E-Marketing, PT Frisian Flag Indonesia

1 Introduction

Demand of milk products in Indonesia is increasing time to time. Meanwhile, milk supply has not met its requirements. This situation opens the challenge for milk products in Indonesia to increase the growth of industry to meet the requirements of milk products both in regional and national scale. Milk industry in Indonesia is one of the strategic and potential food industries for entrepreneurs. PT Frisian Flag Indonesia is one of milk producers in Indonesia.

Distribution is marketing process that aims to produce added value of products through marketing purposes in achieving utilizations, forms, time and ownership, as well as products distributions or services from producer to consumer [1].

PT Frisian Flag Indonesia uses indirect distribution system, namely distribution or products sell/service through intermediary company, which leads to quite expensive cost of distribution. PT Frisian Flag Indonesia has two factories, i.e. Plant Pasar Rebo and Plant Ciracas. In optimizing distribution channels and minimizing distribution costs, the company is supposed to optimize distribution channels and minimize distribution cost to maximize products transported. This research aimed to: 1) Discover actual distribution systems in PT Frisian Flag Indonesia. 2) Analyze the distribution channel allocations and the optimal product volume in PT Frisian Flag Indonesia, from origin to destination. 3) Analyze the managerial...
implications on milk distributions in PT Frisian Flag Indonesia, based on the optimization of distribution channels.

2 Theoretical Framework

Marketing is the process of social and managerial, which includes individual and groups to achieve their needs by creating, offering, and exchanging valuable products with other parties [2].

E-marketing strategies need utilizing existing and emerging communication and data networks to give personalized and uninterrupted communication between the firm and its customers and to provide value above traditional networks [3].

According to [5], distribution channel is a product of distribution that used by producer to distribute products from producer to consumer or industries.

Optimization is a series of process to achieve the best result in certain circumstances. Normative approaches may discover optimization to identify the best solution in solving problems, which involve maximization or minimization objectives through the objective function [6].

According to [7] transportation model is a part of Linear Programming that is used to organize and distribute sources in delivering products to the needy places to achieve the efficiency of transportation cost.

According to the table above, total cost needed to distribute a unit of product or goods from origin 1 to 1 destination (X11) is C11.

Objective function on formulation of transportation model is to minimize the total supply and distribution costs from production areas to various destinations by observing various

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Total Demand</th>
</tr>
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<tbody>
<tr>
<td>Oigin</td>
<td>1</td>
<td>C11</td>
<td>C11</td>
<td>C11</td>
<td>C11</td>
<td>C11</td>
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<td>X13</td>
<td>X14</td>
<td>X15</td>
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<tr>
<td>Area</td>
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<td>C11</td>
<td>C11</td>
<td>C11</td>
<td>C11</td>
<td>C11</td>
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<td>X33</td>
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<td>b1</td>
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<td>b3</td>
<td>b4</td>
<td>b5</td>
<td>b6</td>
<td>ai = bi</td>
</tr>
</tbody>
</table>
constraints, such as delivered products problems, the amount of received products and non-negative variables.

E-marketing uses the internet as a platform that allows firms to adapt to the needs of customers, reduces transaction costs, and allows customers to move from time- and location-based behaviors toward non-temporal and non-locational behaviors [3].

There are three main components in Linear Programming, i.e. decision variables, objective function, and constraints. Decision variables are the components of problems that can be handled by decision makers. Objective function is the function to illustrate the objective in linear programming problems that is linked with the optimum arrangement of sources to achieve maximum benefit or minimum cost that will be used. Meanwhile, constraints are mathematical function to limits either minimum or maximum objective value that will be optimally allocated in various available activities or constraints on available alternative actions.

In general, Linear Programming can be illustrated as follows:

Objective Function:
Maks/Min \( Z = C_1X_1 + C_2X_2 + \ldots + C_jX_j \)

Contraints Function:
\[
\begin{align*}
& a_{11}X_1 + a_{12}X_2 + \ldots + a_{ij}X_j \leq \text{ or } \geq b_1 \\
& a_{21}X_1 + a_{22}X_2 + \ldots + a_{2j}X_j \leq \text{ or } \geq b_2 \\
& a_{i1}X_1 + a_{i2}X_2 + \ldots + a_{ij}X_j \leq \text{ or } \geq b_i \\
& X_1, X_2, \ldots, X_j \leq \text{ or } \geq 0
\end{align*}
\]

Where:
- \( Z \) = scale value of decision making to maximize/minimize objective function
- \( C_j \) = parameter as the optimal criteria and coefficient of decision making change in objective function
- \( X_j \) = coefficient of change in decision making or activities that will be found
- \( A_{ij} \) = technology coefficient of change in constraints –i.
- \( b_{ij} \) = limited resources that limit related activities or businesses are constanta or right value of constraints –i

Optimization problems of distribution channels were formulated into Linear Programming model by determining preceded decision variables.

3 Research Method

Data were processed through qualitative and quantitative methods. Qualitative analysis was needed to observe distribution cost, the amount of demand, and available supply. Data obtained was formulated in transportation model and processed to be some activities, which will put into Linear Programming. Further, equality and inequality were processed in computer by using a LINDO (Linear Interactive Discrete Optimizer) software program.

Quantitative approach is done by choosing randomly and structured. Samples must be representative of the population, where the conclusions from data collection to obtain statistical calculations.
4 Research Findings and Discussions

Linear Programming is chosen to solve problems in optimizing demand and supply allocation to achieve optimal marketing level and to discover optimal distribution that will maximize profit. Based on that method, primal analysis, dual analysis, and sensitivity analysis are conducted.

Dual analysis is done to discover either rare or frequent resources in production process. Sensitivity analysis is linked with the change of discrete parameter to observe the change that can be tolerated before optimal solution losses its optimization.

Distribution system in PT Frisian Flag Indonesia is indirect distribution. PT Frisian Flag Indonesia uses intermediary company, namely Yap Cwee Hock (YCH) as Main Distribution Center (MDC). According to level of distribution channel, PT Frisian Flag Indonesia uses distribution channels of Producer-Distributor Industry-Customer, illustrated as follows:

![Figure 1. Level of Distribution Channel in PT Frisian Flag Indonesia](image)

Transportation model of milk products in PT Frisian Flag Indonesia consists of objective function and some constraints, as follows:

1. Objective Function (Minimized Cost)

   \[
   \text{MinZ} = 348X_{11} + 0X_{12} + 311X_{13} + 0X_{14} + 340X_{15} + 165X_{16} + 155X_{17} + 0X_{18} + 385X_{19} + \\
   0X_{110} + 415X_{111} + 0X_{112} + 0X_{21} + 350X_{22} + 0X_{23} + 313X_{24} + 0X_{25} + 342X_{26} + 0X_{27} + \\
   157X_{28} + 0X_{29} + 387X_{210} + 0X_{211} + 417X_{212} + 360X_{31} + 0X_{32} + 323X_{33} + 0X_{34} + 353X_{35} + \\
   0X_{36} + 164X_{37} + 0X_{38} + 400X_{39} + 0X_{310} + 427X_{311} + 0X_{312} + 0X_{41} + 362X_{42} + 0X_{43} + \\
   325X_{44} + 0X_{45} + 355X_{46} + 0X_{47} + 166X_{48} + 0X_{49} + 402X_{410} + 0X_{411} + 429X_{412} + 0X_{51} + \\
   0X_{52} + 0X_{53} + 0X_{54} + 0X_{55} + 0X_{56} + 0X_{57} + 0X_{58} + 0X_{59} + 0X_{510} + 0X_{511} + 0X_{512}
   \]

2. Constraints

   1) Constraints of Supply in Pasar Rebo
   \[
   X_{11} + X_{12} + X_{13} + X_{14} + X_{15} + X_{16} + X_{17} + X_{18} + X_{19} + X_{110} + X_{111} + X_{112} \leq 19282
   \]

   2) Constraints of Supply in Ciracas
   \[
   X_{21} + X_{22} + X_{23} + X_{24} + X_{25} + X_{26} + X_{27} + X_{28} + X_{29} + X_{210} + X_{211} + X_{212} \leq 33024
   \]

   3) Constraints of Supply in MDC Cibitung for powdered milk
   \[
   X_{31} + X_{32} + X_{33} + X_{34} + X_{35} + X_{36} + X_{37} + X_{38} + X_{39} + X_{310} + X_{311} + X_{312} \leq 175048
   \]

   4) Constraints of Supply in MDC Cibitung for condensed milk
   \[
   X_{41} + X_{42} + X_{43} + X_{44} + X_{45} + X_{46} + X_{47} + X_{48} + X_{49} + X_{410} + X_{411} + X_{412} = 541460
   \]

   5) Constraints of Dummy Sources
   \[
   X_{51} + X_{52} + X_{53} + X_{54} + X_{55} + X_{56} + X_{57} + X_{58} + X_{59} + X_{510} + X_{511} + X_{512} = 19631
   \]

   6) Constraints of Demand in SP Medan for powdered milk
   \[
   X_{11} + X_{21} + X_{31} + X_{41} \geq 7098
   \]

   7) Constraints of Demand in SP Medan for condensed milk
   \[
   X_{12} + X_{22} + X_{32} + X_{42} \geq 19512
   \]

   8) Constraints of Demand in SP Semarang for powdered milk
   \[
   X_{13} + X_{23} + X_{33} + X_{43} \geq 2738
   \]

   9) Constraints of Demand in SP Semarang for condensed milk
   \[
   X_{14} + X_{24} + X_{34} + X_{44} \geq 7529
10) Constraints of Demand in SP Surabaya for powdered milk
\[ X_{15} + X_{25} + X_{35} + X_{45} \geq 22246 \]

11) Constraints of Demand in SP Surabaya for condensed milk
\[ X_{16} + X_{26} + X_{36} + X_{46} \geq 55675 \]

12) Constraints of Demand in Modern Trade for powdered milk
\[ X_{17} + X_{27} + X_{37} + X_{47} \geq 11913 \]

13) Constraints of Demand in Modern Trade for condensed milk
\[ X_{18} + X_{28} + X_{38} + X_{48} \geq 77392 \]

14) Constraints of Demand in General Trade 1 for powdered milk
\[ X_{19} + X_{29} + X_{39} + X_{49} \geq 124082 \]

15) Constraints of Demand in General Trade 1 for condensed milk
\[ X_{110} + X_{210} + X_{310} + X_{410} \geq 346727 \]

16) Constraints of Demand in General Trade 2 for powdered milk
\[ X_{111} + X_{211} + X_{311} + X_{411} \geq 30809 \]

17) Constraints of Demand in General Trade 2 for condensed milk
\[ X_{112} + X_{212} + X_{312} + X_{412} \geq 82724 \]

\[ X_{11} \geq 0 \quad X_{21} = 0 \quad X_{31} \geq 0 \quad X_{41} \geq 0 \]
\[ X_{12} = 0 \quad X_{22} \geq 0 \quad X_{32} = 0 \quad X_{42} \geq 0 \]
\[ X_{13} \geq 0 \quad X_{23} = 0 \quad X_{33} \geq 0 \quad X_{43} \geq 0 \]
\[ X_{14} = 0 \quad X_{24} \geq 0 \quad X_{34} = 0 \quad X_{44} \geq 0 \]
\[ X_{15} = 0 \quad X_{25} \geq 0 \quad X_{35} \geq 0 \quad X_{45} \geq 0 \]
\[ X_{16} = 0 \quad X_{26} \geq 0 \quad X_{36} \geq 0 \quad X_{46} \geq 0 \]
\[ X_{17} = 0 \quad X_{27} \geq 0 \quad X_{37} \geq 0 \quad X_{47} \geq 0 \]
\[ X_{18} = 0 \quad X_{28} \geq 0 \quad X_{38} = 0 \quad X_{48} \geq 0 \]
\[ X_{19} = 0 \quad X_{29} \geq 0 \quad X_{39} \geq 0 \quad X_{49} \geq 0 \]
\[ X_{110} = 0 \quad X_{210} \geq 0 \quad X_{310} \geq 0 \quad X_{410} = 0 \]
\[ X_{111} = 0 \quad X_{211} = 0 \quad X_{311} \geq 0 \quad X_{411} = 0 \]
\[ X_{112} = 0 \quad X_{212} \geq 0 \quad X_{312} \geq 0 \quad X_{412} = 0 \]

Coefficient in each variable is distribution cost per unit (ton) for each variable that has to be paid to distribute milk from plant sources to various destinations. In Variable X31, the cost needed is 360, which means that product transportation from MD source to Supply Point Medan for powdered milk is Rp 360,000 per ton.

The Results of primal analysis, dual analysis, and sensitivity analysis lead to the difference of actual circumstance with optimal circumstance in distribution channel of Frisian Flag Indonesia, which illustrated in Fig 2 and Fig 3.
In actual circumstance, Plant Pasar Rebo and Plant Ciracas distribute 19,282 tons of powdered milk and 33,024 tons of condensed milk to Supply Point Surabaya.

In optimal circumstance, 19,282 tons of powdered milk and 33,042 tons of condensed milk are distributed from Plant Pasar Rebo to General Trade 1. In optimal circumstance, Plant Surabaya receives 22,246 tons of powdered milk and 55,675 tons of condensed milk. It is different with actual circumstance where SP Surabaya received powdered and condensed milk from 3 sources. It is caused by the difference of total cost that will be paid.

The difference between actual distribution and optimal distribution in area from MDC to Supply Point Medan is 332 tons of powdered and 854 tons of condensed milk. There is allocation difference in Supply Point Semarang, i.e. 130 tons of powdered milk and 358 tons of condensed milk. There is distribution allocation difference in Modern Trade, i.e. 567 tons of powdered milk and 3692 tons of condensed milk. Meanwhile, there is lack of distribution to General Trade 1, i.e. 18,719 tons of powdered milk and 25,514 tons of condensed milk.

Total product difference leads to cost difference. Total cost in actual circumstance is Rp 285,663,972,000 while in optimal circumstance total cost is Rp 293,832,106,000, so there is Rp 1,831,866,000 cost difference. The difference is caused by the difference of milk product allocation that is distributed from areas to various destinations.
These data procedures have been used in past surveys and have been shown to be effective ways of collecting research data about firm practices [8]. Based on research previously that Database Marketing and Network Marketing were found to be antecedents to e-Marketing. E-Marketing and Transaction Marketing were found to be positively associated with performance.

In testing the robustness of the proposed model, we first tested whether Database Marketing and Network Marketing directly influence performance rather than being mediated via e-Marketing.

5 Conclusions

1. Distribution channel used by PT Frisian Flag Indonesia is indirect distribution. PT Frisian Flag Indonesia uses intermediary company, namely PT Yap Cwee Hock (YCH) as Main Distribution Center (MDC).
2. Plant Pasar Rebo and Plant Ciracas distribute their products to General Trade 1 for distribution allocation in optimal circumstance, i.e. 19,282 tons of powdered milk and 33,024 tons of condensed milk. Meanwhile, other destinations receive all products only from MDC and it leads to increasing product. However, total product that will be distributed to General Trade 2 is decreasing, i.e. 3,089 tons of powdered milk so that milk distributed is 26,253 tons. Total product of condensed milk is decreasing, i.e. 14,041 tons so milk distributed is 67,647 tons.
3. Distribution costs include some costs, such as transportation cost, handling cost, porter cost, etc. Total cost that has to be paid by PT Frisian Flag Indonesia in actual circumstance is Rp 285,663,972,000, while total cost in optimal circumstance is Rp 283,832,106,000. There is the difference of total distribution cost that has to be paid. This circumstance leads to the difference between actual and optimal circumstance, i.e. Rp 1,831,866,000 due to the difference of product volume distributed between actual and optimal circumstance.

6 Suggestion
1. An observation on distribution channel is necessary to consider total cost that has to be paid. According to research result through Linear Programming, Plant Pasar Rebo and Plant Ciracas distribute the products to General Trade 1 instead of Supply Point Surabaya.

2. Further research has to be conducted to study other factors that cause the difference of distribution of Frisian Flag milk from each area to each destination.

References

Innovative Way of Indonesian Muslim Millenial to Memorize the Qur’an: (Qur’an-Memo Community and the Making of Virtual Social Network)

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Abstract. This study aims to answer important questions on the new phenomenon of memorizing the Qur'an practiced by Indonesian Muslim millennial who make use of android based application as tools to preserve the Qur'an i.e. Qur’an-Memo Community; can this app’s features accede to their demand to memorize the Qur'an in the current context? And how do the app's methods of memorizing the Qur'an (tahfiz) guide them to learn by heart effectively? By applying a qualitative and descriptive-analytical approach, I found that the Qur’an-Memo Community seems to be able to fulfill the demand of Indonesian Muslim millennial to memorize the Qur'an in today's context. This app comes to innovate several aspects of the Qur'an memorizing tradition in Indonesia; (1) Integrating the tradition of memorizing the Qur'an with information technology, is the prominent reason to create this app to be compatible with "digital literate Muslims generation" who desire to commit the Qur'an into memory, (2) Method, this app offers new method of memorizing the Qur'an which called as linear method, recording, and puzzles, (3) Social networking, this app provides a service connecting all users which possibly would like give comments and corrections each other over their each own memorization (4) Corrections, in addition to services to provide feedback among fellow memorizers, there is also a corrective service guided by an ustaz who has mastered the Qur'an memorization in monthly paid mode. This correction service shows that although the way of memorizing the Qur'an seems new and innovative, it still holds the basic principle of the tradition of memorizing the Qur'an; the direct correction addressed by the experts of the Qur'an to users who perform the Qur'an memorizing.

Keywords: Qur’an-Memo Community; Memorizing the Qur’an (Tahfiz); Indonesian Muslim Millenial; Social Network.

1 Introduction

Memorizing the Qur'an is the practice of preserving the authenticity of God's most authentic revelation that Muslims have made since the Prophet's period to the present day. In the study of
Qur'an (Ulamul Qur'an), the tradition of memorizing the holy book of Muslims is called tahfiz or hifz, and tahmil or hamalah. That is why a person who has memorized 30 Juz of the Qur'an given the title as al-hafiz or hamilul-Qur'an.

There are various methods to memorize the God’s sound (kalamullah), which is pursued by Muslims. The methods have been being developed dynamically and varied throughout the lifetime following the demands of their contextual situation. It means that the methods undertook by Muslim communities in a particular place and time may not be the same as the methods carried out by other Muslim communities in culturally diverse circumstances. Among the existing methods for example; talaqqi, tasmi', 'arad, kitabah, taqhim, qira'ah fi as-shalah, self memorizing and memorizing per five verses in Indonesia [1]; Khatam 10, Chi method, Zor Pismis, Kolay Pismis, Tekrar, Tekrar Hepsı Seypa, Hasdan [2], Sabak method, Sabak, Anmokhtar and Halaqah Dauri [3] in Malaysia, and much more in some other countries. Each method has advantages and disadvantages. However, principally, all of the developed methods require the existence of an authoritative teacher (hafiz) who serves to provide corrections in case of mistakes of recitation on memorizing of a student during presenting his memorization of the Qur'an.

The emergence of these methods could be inasmuch as that Hifz is a complex, complicated, tough, and memory-based task. Hifz involves many memory enhanced practices. To memorize each and every word of Quran, exercises such as elaboration, visual imagery of the words, self-referent encoding of the text of the Quran, sequencing, chunking, and mnemonic coding are in practice today [4].

In Indonesia today, along with the rapid development of the world of information technology, has been born a generation called millennial generation. Most of these generations have transitioned into the adult phase, and are graduated from college. Some have started careers or family building [5].

Demographically, they are a generation born from 1981 to 1999. Shelina Janmohamed [6] reveals the character of "Generation M" is belief and modern life, both as two things run in tandem without contradiction. They display the face of religion consistently but at the same time do not close themselves from the rapid progress of information technology. Their daily activities are always connected to the internet.

In order to answer the needs of this generation, an Android-based application developer in Indonesia launched a Quran application in September, 2017, which functioned as a tool to memorize Al-Qur'an combined with social network. This app is named "Qur'an-Memo Community" which can be installed via Play Store on Android-based gadgets. This application is attractive, due to its presence is warmly welcomed by Indonesian Muslim. This app has been downloaded by more than 50,000 times in one year.

2 Research Question

Therefore, this study is dedicated to uncovering; how does the experience of Indonesian Muslims millennial make use this application to memorize the Qur'an? Do this app’s services and features work properly and effectively to guide users to memorizing the Qur'an? And, most importantly, what are the methods of memorizing the Qur'an offered through this application?
there any correction addressed to one's rote error? Also, is there an authoritative teacher (hafiz) who provides the correction? And how are the outputs and outcomes generated by this app?

3 Literature Review

Various academic literatures that have done the study which covers Qur’an memorization and Android based API is very rare, and so far I have found it in several journals merely as follows:

A Framework for Designing Mobile Quranic Memorization Tool Using Multimedia Interactive Learning Method For Children, in Journal of Theoretical and Applied Information Technology [7]. This article aims at providing a unifying framework for developing Quran memorizer application using multimedia interactive method and learning theories for mobile learning for children. It is quite different with my study which focuses on API to memorize the Qur’an in networked Muslim community in Indonesia.

Other recent notable work in the area of Quran studies on memorization using the cutting edge technology, e.g., “Pembangunan Aplikasi Bantu dalam Menghafal Al-Qur’an Berbasis Mobile [8] and “Aplikasi Pembelajaran Menyusun Ayat Sebagai Metode Menghafal Al-Qur’an (Juz 30) [9].

The first article proposed the application of Android-based applications to memorize Al-Qur’an with existing methods, which can read and listen to repeated (muraja’ah). While the second study, presents a design that has been tested in the manufacture of API to memorize the flash-based Qur’an that is destined to the students of “Rumah Qur’an-Nurul Hidayah”. The method is not much different from the first article, e.g. muraja’ah. Muraja’ah has a meaning of listening activity to murattal that has been recorded in the application, and repeat or follow the reading. This is different from the methods carried by the Qur’an-Memo Community.

3 Method

To answer research questions, I employ qualitative approach and digital ethnography theory. While the exposure of this study I accommodate analytical descriptive approach. I apply this qualitative one over the object of this study which materially does not refer to a certain quantity. This approach will also be useful for outlining the app content that comprehend features and services comprehensively, as well as analyzing materials that imply the method of memorizing the Qur’an offered by this app to its users.

Then, I enable digital ethnography theory to be a tool in breaking aspects related to application services that present social network for the users. Applying digital ethnography, demographic data of users, e.g. age, sex and experience of memorizing the Qur’an accommodating this application will be described.
4 Result and Discussion

A. Qur'an Memorization (Tahfidz al-Qur'an)

The phenomenon of memorizing al-Qur'an in the community is experiencing significant increase. This can be seen from the number of activities memorize al-Qur'an facilitated in tahfidz's home or activities tahfidz pesantren which has grown before. This phenomenon is not apart from the needs of the Muslims associated with the Qur'an memorizers felt more and more days, less and less. Indeed, memorizing al-Qur'an activities is not new.

However this activity has existed since the Prophet was still there and continued during the time of Khulafa' al-Rashidun until now. On that time, the Qur'an was not printed in a book form. Al-Qur'an is revealed by God by being written on leaves, stones, skin, or in a whisper directly by Angel Gabriel to the Prophet Muhammad. Because of this reason, people who can read the Qur'an mean those who can memorize the Qur'an properly and correctly.

During the Prophet's time, the memorization of the Qur'an was performed on a regular basis natural. That is, the Qur'an revealed by Allah through the angel Gabriel was then infused and understood by the Messenger of Allah until he himself memorized texts and their meanings and are then practiced. The Messenger of Allah then conveyed the revelation (Al-Qur'an) to his companions directly (mubasyarah) and teaches the verbal words (talaqqi).

Memorizing the Qur'an in Arabic term is Tahfidz Qur'an, it consists of two syllables, namely Tahfidz and the Qur'an, both of which have meaning different, namely tahfidz which means memorizing. Memorize from the memorized basic words from Arabic hafidza-yahfadzu-hifdzan, which is the opposite of forgetting, that is always remember and forget a little [10].

While according to Abdul Aziz Abdul Rauf the definition of memorize is "the process of repeating something good with read or hear." Any work if often repeated, must be memorized [11].

Someone who has memorized the Qur'an in a way overall out of the head, can be called juma' and huffazhul Qur'an. Collection of the Qur'an in a way memorizing (hifzhuhu) this was done in the early days of preaching Islamic religion, because the Qur'an at that time was revealed through the method of hearing. The preservation of the Qur'an through this memorization is very accurate and accountable, given that Rasulullah SAW belonged to the ummi, as illustrated by QS. Al-A'raf: 158.

The Messenger loves the revelation, He always waiting for the decline of revelation with a sense of longing, then memorize and understand it, just as promised by God. Therefore, he is the first hafidz of the Qur'an and be the best model for the companions in memorizing it. Every time a verse had been revealed then it's memorized in the chest and placed in the heart, because of the Arabs naturally has a strong memorandum of understanding. It was due to they are generally illiterate, so deep writing stories, poems and their genealogies done with their heart note [12].

Imam Nawawi as a great scholar in Islamic studies has described various ethics in the study of Al-Qur'an discussed in his book At-Tibyan Fi Adabi Hamalatil Qur'an. Imam Nawawi said that the essence of the book begins in chapter IV which contains the ethics of teaching and learning the Al-Qur'an presenting very long discussion. As a hafidz, his thoughts which are contained in At-Tibyan conceptualized through his experience as the memorizer of Al-
Qur’an. In general the concept the ethics of Imam Nawawi can be a concluded into two categories, namely personal ethics and social ethics of memorizer of the Qur’an.

Individual ethics talks about actions or behavior humans as individuals. In this case personal ethics explains about human obligations to themselves as participants learners in the learning process. In the activity of memorizing the Qur’an, there are several manners or ethics that need to be considered as a guide in behaving as students who have dependents for complete memorization of the Qur’an. There are three personal ethics noted Imam Nawawi's emphasis on the ethics of memorizing the Qur’an includes: concentration, purification of heart, commitment.

The social ethics has a meaning that in the process of communication and interaction with the environment surrounding both physical/psychological and social environment, people who memorize the Qur’an need guidance regarding how to act well. In the learning process, he does not only involve himself but is also involved with other people in the learning environment. In this case, Imam Nawawi formulated several social ethics in learning (memorizing the Qur’an) into three parts, namely: obligation to teachers, obligations to learning friends, and obligations towards literature.

B. Qur’an-Memo Community: Accessing Features

This study observes and examines the most popular and downloaded application of Qur'an for memorization in Indonesia, i.e. Qur’an-Memo Community. Even there are actually more than this application in the App Store of Android device system. The big number of downloader and user of this application becomes a certain consideration for me. In this section I will outline and describe this application for the provided features, how to operate and run it, and designed display. I will proceed by capturing screen so as to make it design imaginable and this research easier to digest by readers and become obvious.

Qur’an-Memo Community is an application developed by UBK Plus¹ which can be operate and access after creating an account by filling in queries contain information that shows name and identity accompanied by email used as username account. This APK is different from the number of APKs, as it requires the complete identity of the account of user. So the accuracy of user’s identity represents his or her factual identity.

After the registration has succeeded, user can access this application by log in. Successful log in will bring user to access available features. These are based on menus appear include (1) Memorizing (Menghafal), (2) Reading (Membaca), and (3) Learning the Qur’an (Belajar Al-Qur’an). But the first and second menu seems to be the most frequently accessed by the user among the three, due to user’s purpose of downloading this APK is none other than to memorize the Qur’an and read it, and in addition, because the feature of "Learning the Qur’an (Belajar Al-Qur’an)" which contains makhraj, tahnis, and murattal, is only provided on a paid mode.

Every user of this APK can enjoy the general features provided free of charge and features with special facilities that can only be enjoyed by paying. General features that can be accessed freely ranging from the new memorization that users want to do, the list of memorized users (not memorized and already memorized), users who need correction, and digital manuscripts of the

¹ This developer is located at Mutiara Jingga Residen No.3, Pondok Cabe Ilir  Tangerang Selatan Banten.
Qur'an that gives the option to display only Arabic text or its translations for reading purposes (there is a last page marker read) and memorized. This free feature has facilities restrictions; 1x save recording, 3x save memorize, *tafsir* only Juz 30, memorize only Juz 30 and Al-Fatihah, and *murattal* only from Sheikh Alfasy.

While the application is designed for the purposes of reading and memorizing the Qur'an, it also provides the feature to share the activities of memorizing via social media.

Paid mode of this app provides 3 kinds of packages; (1) Package of *Islam* (10,000 per month), (2) Package of *Iman* (20,000 per month), and (3) Package of *Ihsan* (50,000 per month). This mode serves the same features as free of charge mode, but users can enjoy additional distinctive facilities. For example, it can save the recording of memorization from 10 times to unlimited, listen to all *murattal* of all *Qari’,* memorize all Juz, learn all the *tafsir* of 30 Juz, access the content of learning the Qur'an e.g. *makhraj* and *tahsin,* and the most significant facility is the intensive correction facilities toward memorization, *murattal* and *tajwid* by ustaz who are directed by APK. Unfortunately, it is only for package of *Ihsan.*

C. *Millennial Muslim’s Methods to Memorize the Qur’an*

There are three methods of memorizing the Qur'an built into this application system. Each method has a functional interconnectedness that mutually support each other in directing user activity while memorizing the Qur'an, i.e.:

1. Linier, which consists of several stages of the process of memorization:
   a. Memorizing verses of the Qur'an and its translations. In this first model, user is allowed to listen to *Qari’s* reading provided by the API by clicking on the “play” icon. There is a counter icon of how many times the user has listened to the recording. Similarly, the user can also count the number of times he has read the verses he memorized and the translations. Therefore, the Arabic text of the verses of the Qur'an is accompanied by a translation. Apparently, this API wants to direct the user to repeat in listening to *Qari’s* recitals of the Qur'an recitations and to read the Qur'an verses which are printed by imitating the *Qari’s* reading as in the available recording. This model is actually often done by many Muslims today in memorizing the Qur'an independently. This model includes the activity of listening and reading in adventurous or known as *muraja’ah.*
   b. Memorizing the Arabic text of the verses of the Qur'an. In this second model, the provided features are equal to the first model except the removal of the translated text display. This is so that the user can focus only on memorizing Arabic texts from the verses of the Qur'an, in contrast to the first model that recommends the user to not merely memorize Arabic verses of the Qur'an, but also the translation.
   c. Memorizing the translation of the Qur'an verses and studying its *tafsir* (commentary). Therefore, the displayed text is only translation of the verses of the Qur'an without Arabic text of the Qur'an verses. In addition, the interpretation of the verse is also displayed by clicking on the commentary icon. The interpretation is expressed in Indonesian. When I carefully observed, the commentary may be included as *ijmali* (general commentary), since the description given tends to be as simple as the definition of interpretation of *ijmali.* Yet, the source or reference of its commentary is not mentioned whether it is copied or quoted from a certain book or *mufassir.* This lack should be fixed because it is very fundamental academically.
2. Recording, it is the second method done by reading every omitted word. The omitted word sometimes is on the beginning of the verse, the end, the middle, the beginning and the end, and the random. When user has perfectly memorized, he/she can begin recording for rote tests, then the recording will be corrected by another user or ustaz of the Qur'an-Memo. This recording method seems eager to improve the rote generated after the first method (linear). Because user possibly know the smoothness and precision of memorization by recording it, and corrected by professional corrector i.e. ustaz (hafiz). At this stage, this digital memorizing tradition retains the tradition of memorizing the Qur'an in Indonesia, where social network built through memorizing the Qur'an in the Javanese context which is known as "sema'an" has been successfully transformed into digital based social network. The tradition of "sema'an" as a practice of reciting the Qur'an bil ghaib (without reading the text of mushaf) done by user of the Qur'an is played by other user with the intention of launching rote and obtaining correction. This social interaction process digitally is element forms the social network among the memorizers.

3. Puzzle, this method is intended to test the quality of memorized verses through the process of randomizing the sequence of words forming a verse from a particular letter (surat), then user is asked to match the missing target words in sequence.

D. The Making of Virtual Social Networking Through Online Qur'an Memorization

This app which is released on September 19, 2017, can be considered as a tool to memorize Al-Quran that combining the method of self-memorization with social networks. Because, it connects the memorizers of the Qur'an one another, where they are given an opportunity to interact and give feedback to each other among themselves regarding their own memorizing. The tagline displayed by this APK "The Assembly Memorizing the Qur'an" also describes the function of this APK which is not merely to memorize the Qur'an but also as a container for the interaction of the Qur'an memorizers digitally. This can be reviewed in the feature which shows comment field that can be filled with an input either suggestions or corrections to other APK users who want get correction. The user's identity is also seen in this service. For example, the user named as Muhammad Suthon Alfatih can be observed as someone who get 2 corrections from fellow users of this APK, which is specifically marked with red in 2 words. In the meantime, notes containing comments and suggestions provided are only visible to accounts that receive such comments and suggestions privately.

E. Digital Observation on User's Demographic, Digital Activities, and Experiences

I did a digital observation by a community approach that could represent the demographics of users of this APK which I assume are young religious Muslim. My digital observations on user’s identity generated some points describing any answers of the above research questions, i.e. These APK user’s age is ranging from 15 years old to 35, this is based on majority population view, and they are male and female. The youngest is such as Siti Hanima (15, F), while the oldest is Dody Yuwanto (35, M).

Those who are in the range between 15 and 35 years old are as Fadilah Ramadani (16, F), Andini Fatuh Robby (17, F), Aditya Nugraha (18, M), Dita Silviani (20, F), Hijrawati Herman Umar (22, F), Ahmad Alqodri (23, M), Syahnaz Ulfa Nurzanah (24, F), Ahmad (25, M) and Erwin
Sutisna (28 old, M), Saharul Nizam (29 old, M), Novita Arisandi (30, F), Muhammad Sulthon Alfatih (31, M).

As users, they are given the option to upload an avatar in a jpeg photo formatted as an icon on its account. Only, not many who take advantage of this service. The vast majority of them do not use a picture of themselves, but only standard avatars. So it becomes difficult to accurately recognize the people behind a particular account exactly. Because, someone may have a similar names with another that make difficult to recognize each of them. In my opinion, this aspect indicates the inconsistency of this APK in carrying the vision to be an app for community-based Qur'an memorizing

Nevertheless, this APK still shows its efforts to facilitate the making of social interaction among the memorizers of the Qur'an thoroughly, although they will still have difficulty recognizing accurately one another's identity. The social network that can be built between the users, at least is that they can see an update memorization activities performed by each of them, and they can say hello to each other while giving comments either suggestions or corrections to this APK fellow users. Because this APK displays 3 online activities of all users; (1) who are memorizing (displaying user names, letters and verses being memorized, age of user along with profile photo, and when last online to memorize), (2) who already memorized (same with the first activity, but in this activity show the letter and verse that has been mastered through memorize), (3) need correction, this activity indicates reading other user who want to get correction from APK fellow user. The number of comments that have been shared and on what part of the correction is given may also be reviewed directly by clicking on the posted account in this part of activity.

F. Indonesian Millennial Muslim and the Survey toward Qur'an-Memo Users

The report results of a recent study noted that internet users in Indonesia reached 82 million. The figure is of course very fantastic and become soggy fields to spread the ideas of all kinds. The issue becomes so complex because 80 percent of that number is from the children and adolescents in the age range 15-19 years. The data is the result of a study entitled "Digital Citizenship Safety Among Children and Adolescents in Indonesia" which made the UN agency for children, UNICEF, with its partners, including the Ministry of Communications and Information Technology and Harvard University, USA[https://kominfo.go.id]

While the other results of a survey conducted by Indonesian Internet Service Provider Association in 2015 stated that the number of internet users in Indonesia in 2014 as many as 88.1 million people or 34.9 percent of the total population of Indonesia. This figure also implies an increase in the public internet use from the previous year. The survey results also suggested by category of age 49 percent of internet users in Indonesia is dominated by the younger generation aged 18-25 years old.

The fact surely indicates positive developments of the young generation of this nation to follow the dynamics of such modern world. With a large percentage of young people who access the Internet, certainly more wide open the potential for the spread of any ideas to them and change their tradition of being human as citizen in real to be netizen in digital or new media world [http://tekno.kompas.com]

Considering the above total percentage of internet users report, and relates it with Qur'an-Memo application could actually result in a conclusion that the real users of digital Qur'an applications more dominated by the user from young people where are no more than 40 years old.
As for the old man tend to be restricted to those who are still in contact with the internet for jobs in very small number. There are many factors why it could be happening, for example, the skill to use a smart phone or internet devices is quite complicated to them.

Therefore, young people are those who engage and colour the discourse and content of digital world, whether as user or designer of the Apps, including Qur'an-Memo. They are a new generation of so-called digital generation in which if associated with a digital Qur'an they could be termed as “digitally literate Muslims generation”.

In this section, I report the result of my survey toward a community which makes a use of this digital Qur'an-Memo. This community is student of Qur'anic studies department at State Islamic University (UIN) Walisongo Semarang. They represent the most active of internet users in Indonesia who are relevant to this application, among Indonesian millennial that reached 82.8 % of wholly internet users. I did a way of this survey by purposive sample of 100 students. This survey aims to discover their satisfaction as users of this application. 73 % of them are satisfied to use this application to memorize the Qur'an, even though 89% of this percentage stated that they would only use this app as a complement tool when practicing Qur'an memorizing, the main way of their own memorizing activities are decided in traditional way of memorizing Qur'an such as by accessing printed mushaf and delivering the memorized verses to their teachers. Then, the rest stated that they don’t need to memorize the Qur'an in traditional mode, they feel enough by using this application. So, there are merely 27 % of purposive sampling who stated are not satisfied enough to use this application due to theological reason i.e. the lack of barakah, and technical reason such as it is its compatibility to their situation.

Then, reviewing this APK’s page on Google Play, I see various comments stated by this app’s users. Their comments reflect how they feel the experience in using this APK. Their responds are very varied, ranging from simply praising the presence of this APK to expressing criticism and advice for this APK, for instance, to give “separator” between male and female users to avoid possibility of their misusing to this APK to do dating, and to provide an open access to view any corrections which are addressed to any users. Similarly there are those who deliver questions and complaints because they still do not understand well how to take advantage of this APK features perfectly and how to run it technically.

In my view, after observing comprehensively the APK and the responses of users who are representing the Indonesian Muslim millennial, this App is generally able to fulfill the needs of Indonesian Muslim millennial to do interaction with the Qur'an in the way of memorizing. Because it also provides features to memorize, it also provides a feature to read and understand the meaning of the Qur'an through its translation and commentary in Indonesian. It is in accordance with statement of Tahraoui Ramdane and Merah Souad “Muslims regarded the forms of interaction with the Qur'an by way of recitation, memorization, analysis and interpretation as a key part and prerequisite for learning and spiritual salvation”[13].

5 Conclusions

This study remarks that Qur'an-Memo Community App is able to accede to the demands of Indonesian Muslim millennial in memorizing the Qur'an. They can memorize the Qur'an without having to enter a class, living in a boarding school (pondok pesantren), meet with the teacher
(setoran hafalan or ngaji), and hold the mushaf printed by publisher of the Qur'an. They as this app’s users can memorize the Qur'an while doing other activities. In my view, it becomes the challenge for them to be able to complete memorizing 30 Juz of the Qur'an. Because, they must carefully manage their own schedule to memorize independently. It could be the reason why no user has been announced, graduated, and certified yet, has completed (khatam) memorizing 30 Juz of the Qur'an.

References

Student’s Perception of E-Dictionary
Arabic Indonesian in IR 4.0 Era

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Abstract. Dictionaries Arabic-Indonesian take pivotal roles in the learning and teaching process for the teacher and the students of Arabic Education Department to comprehend and interpret the meaning of texts. Firstly, popular with the printed version for Arabic Foreign Language (AFL) classrooms in Indonesia, the Arabic-Indonesian dictionaries have rapidly evolved to be electronic dictionaries that are much widely functioned by the Millennial through websites or mobile applications with online and offline modes. This industrial revolution 4.0, consequently, initiates research problems on how the use of Arabic electronic dictionaries in Indonesian context, what kinds of printed and e-dictionaries students employ and how the positive and negative implications of its utility in AFL classrooms. Under quantitative design by distributing online questionnaire with Google Form to 120 respondents comprising the students majoring Arabic education at Faculty of Tarbiyah and Teacher Training in Maulana Malik Ibrahim State Islamic University of Malang who enroll Shinaat al-Mu’jam (lexicography) and the teacher of the course, the respondents admit that they have operated e-Arabic-Indonesian dictionaries to assist them in searching the meaning of the text due to the effectiveness, efficiency and variety of related vocabulary. In addition, al-Munawwar and Google Translator have received many attentions in AFL classroom. Finally, this research highlights that in the vast growth of e-Arabic-Indonesian dictionaries that have multifunction on the text translating, the teacher and the students should selectively choose the one that has high accuracy of meaning interpretation. By these considerations, the electronic dictionaries are relevant media for blended learning that is being implemented in Islamic Higher Education (IHE) in the 21st century.

Keywords: e-Dictionary Arabic Indonesian; Industrial Revolution; e-learning

1 Introduction

The Industrial Revolution (IR) 4.0 marked by Cyber Physical Production System (CPPS), Internet of Things (IoT), Cloud Computing and predictive data analysis has provided new impetus for the educational transformation that encourages the teachers and students to find innovations in instructional classrooms [1]–[5]. These innovations can create new learning ecosystem with appropriate content, pedagogy, media, assessment and management of education that are borderless and independent of time and places. These shifts in education can be in the form of books, libraries, management, and others into e-books, e-libraries, website pages and mobile-based
applications, for instance Moodle, Edmodo, Google Classrooms and other media that support flipped classrooms or blended classrooms.

Therefore, the higher education should set a curriculum that can strengthen the graduate quality with the future workforce and technologies [2], [6], [7]. One of which is by promoting software applications in the instructional classrooms of Arabic Foreign Language (AFL). In the context of translating first language into foreign language, including Arabic, the students in Indonesia have started to utilize electronic dictionaries rather than printed dictionaries. Similarly in English Foreign Language (EFL) classroom, it is argues that the current growths in digital technologies have shaped students’ dictionary ownership and preferences within which the electronic dictionaries have been more vital than that of the paper dictionaries due to its portability, mobility and efficiency [8]–[11].

This switch of conventional learning style to the modern one in foreign language classrooms requires the teachers and the students to have literacy skills in the field of educational technology [12]. Reflected in AFL classrooms, literacy skills deal not only with teaching materials and curriculum development, but also in the aspects of language programming, development models of language device and periodic evaluations to scrutinize the positive and negative aspects of the effect of IR 4.0 in Arabic education. One of literacy skills in Arabic lexicography course is searching for meaning in a dictionary.

Nowadays, a lot of dictionaries have adopted Oxford dictionaries as a Western product to be a role model in designing dictionary, without any exception the Arabic dictionary. However, the father of Arabic lexicographer al Khalil ibn Ahmad al-Farahidi (719-791 A.D.) is famous for envisioning an original and a formal description of Arabic by an accounting for the underlying skeletal structures of Arabic, based on their phonetic features, that are realized in the derivations according to the permitted measures of the language, such as [k, t, b] as a possible structure would have the permutations [k, b, t], [t, k, b], [t, b, k], etc [13].

Another way of paper dictionary of Arabic based on Imel Badi Ya’qub consists of 5 aspects, namely phonetic system (shauthi), letter system (hija’i), literary system (adabi), alphabet system (alfaba’i), and the articulation system (nuthqi).[14] These five systems have been used for several centuries in the field of lexicology-lexicography and implemented in printed versions of Arabic dictionaries before electronic dictionaries have been developed. Each systematics has a special character and way of searching vocabulary, explaining and understanding meanings, and translating it from one language to another. In fact, recent electronic dictionaries and printed versions are mostly different from the traditional versions. After electronic dictionaries were found, the five systems printed versions of the Arabic dictionary system began to be abandoned.

Considering the issue of the technology integration in AFL classrooms of Indonesian context, this research is aimed at revealing the Arabic-Indonesian dictionary ownership and preference of the students majoring Arabic education at Faculty of Tarbiyah and Teacher Training in Maulana Malik Ibrahim State Islamic University of Malang enrolling Shinaat al-Mu’jam (lexicography). Secondly, this research investigates what kinds of dictionary that highly support the students’ needs. It is because of the different effectiveness and efficiency of both electronic dictionaries and paper dictionaries that the students favor in Arabic course. A study exemplifies that students at Qassim University tends to choose bilingual dictionaries over monolingual dictionaries particularly when finding meaning of unknown words [15]. The third focus is on the (dis)advantages of the Arabic-Indonesian dictionaries.
Examining these foci is not only expected to explore the students' abilities to use dictionaries but also how capable the students in measuring the strength and the weakness of dictionaries that suitably proportionate with their needs in translating language and in learning on how to be a professional lexicographer that meets the high demands of society in this fast-changing era. The results of the study on dictionary use by Saudi EFL students at Qassim University show that Saudi students do not take full advantage of the different dictionaries available, and that they are not trained on how to make full use of the dictionaries so that most of them are not aware with the pragmatic aspect of the word, collocations as well as word formation knowledge and just focus on the definition or meaning of a word while neglecting [15].

A dictionary is a book or reference that contains a large number of vocabulary which are generally arranged according to a particular systematics in alphabetical order, or thematically, or other systems according to the purpose of composing a dictionary [16]. A complete and perfect dictionary is a dictionary that is able to collect all of the language vocabulary, equipped with meaning and interpretation of its meaning, providing a word pronunciation system and explaining word derivation, to the example of the use of words in sentences so that users of dictionary can understand each meaning of word in context [17].

Dictionary can serve a lot of purposes especially in providing the definition of words and terms, it can improve students' learning ability, it does not only improve students' proficiency in second language but also helps to increase the command of their mother language and the dictionary can also boost self-learning activity and would motivate the students to read more materials according to their interest [18]. In conjunction with learning Arabic, studies of dictionaries are studied in lexicology and the art of composing dictionaries are studied in lexicography. Lexicology is a part of pure linguistics, while lexicography is part of applied linguistics. Thus, lexicology and lexicography are branches of linguistics as pedagogy-linguistics or language education is also part of applied linguistics [19].

Why are the Arabian late in codifying languages and composing dictionaries? According to Ahmad Amin it is because of three factors, namely the nomadic tradition of the Arab nation, fond of fighting, and prioritizing spoken language rather than written language [10]. Now, in the era of the industrial revolution 4.0, the Arabs also lag behind in the field of composing an electronic dictionary. This is because the direction of digital technology remains in the Western power. Therefore, innovation and new research are related to the development of Arabic dictionaries along with the development of science, science and technology.

Electronic dictionaries as an innovation are dictionaries that can be accessed through electronic devices such as computers, computer networks, cellphones, and so on [22]. Nowadays, electronic devices have developed into digital one that starts leaving analogues system. Databases stored in electronic devices also use Big Data technology and Cloud technology. In addition, almost all dictionary applications have been mobile-based which can be taken anywhere and accessed anytime via a mobile device.

In the past, the researcher divided electronic dictionaries into 3 parts, namely computer software-based dictionaries, website page-based dictionaries, and mobile application software-based dictionaries [23]. Recently, almost all electronic dictionary applications can be accessed on all devices, both computers, websites, and mobile applications [24]. One of the most popular electronic dictionaries is Google Translate. This dictionary is not only based on websites, but also in the form of mobile applications that can be accessed via a computer and a smartphone.
From a systematic aspect, electronic dictionaries are designed so that users can simply type the word they want to know the meaning of, press the enter button, and the meaning of the word directly come up. A research investigating the effectiveness between the electronic dictionaries and paper dictionaries perceived that benefit of electronic pocket dictionaries is the speed with which students can look up entries [15], [25]. Thus, it is different from the printed dictionary version that requires users to learn first the systematics of each dictionary they use. They have to open dictionaries based on the alphabetical order of the derivation or root of the words.

In terms of language, almost all electronic dictionaries today are multi-lingual. Every electronic dictionary produced by developers has been able to translate from one language to several other languages with unlimited amounts of data, while the printed version dictionaries are almost impossible to contain more than 3 languages due to paper limitations. For example, the use of Computer Assisted Translator (CAT), one of translator software can offer ease for translators in translation industry. CAT shares beneficial aspects in refining text consistency and terminological coherence which help to save time by recycling previously translated strings (leveraging) [26].

In terms of content, in explaining the meaning of words, electronic dictionaries not only display text, but also sounds, images and videos so that users become more aware. Therefore, electronic dictionaries are multimedia because they have fulfilled 5 multimedia elements (text, images, sound, video, animation). A research portrays that students used the mobile dictionary mostly in pronunciation, spelling, writing, and most importantly in finding the meaning of new vocabulary. They had fun, and interesting experience in applying this such kind of technology in language learning [27]. This is clearly not possible to be filled by printed versions of conventional dictionaries.

A typical electronic dictionary is operated with battery, lightweight and portable which is designed with a full keyboard in the main unit and a display in the lid, while current high end dictionaries consume more power due to its smartness to display language instruction videos and multimedia language training games because of the design that is equipped with backlit color and touch sensitive displays [25].

2 Method

Researchers distributed questionnaires by using Google Form links through WhatsApp applications to 120 respondents. They are 100 students and 20 teachers at the Department of Arabic Language Education, Faculty of Tarbiyah and Teacher Training, Maulana Malik Ibrahim State Islamic University, Malang. These students enroll the Shinaat al-Mu’jam (lexicography) course. This questionnaire contains questions about the Arabic dictionary they use in learning Arabic.
3 Results and Discussion

Of the 120 respondents, 118 people (93%) state that they own an Arabic dictionary, while 2 people (7%) claim that they have no Arabic dictionary. The reason they have an Arabic dictionary is because: (1) they need an Arabic dictionary to understand the meaning of the word, (2) It can make them easier to learn Arabic and translate it into Indonesian, (3) Owning an Arabic dictionary is a requirement in the lexicography course by their teacher. The data can be seen in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Dictionary Ownership of The Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dictionary Users</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Have a dictionary</td>
</tr>
<tr>
<td>Have no a dictionary</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The respondents report that some of them have more than one dictionaries for learning foreign language. The data on the ownership of more than one dictionary are presented in Table 2.

<table>
<thead>
<tr>
<th>Table 2. Ownership of Dictionary Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Owned Dictionary</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>1 Dictionary</td>
</tr>
<tr>
<td>2 Dictionaries</td>
</tr>
<tr>
<td>3 Dictionaries</td>
</tr>
<tr>
<td>4 Dictionaries</td>
</tr>
<tr>
<td>5 Dictionaries</td>
</tr>
<tr>
<td>More 6 Dictionaries</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Because the printed versions of Arabic dictionary are variously published in Indonesia. More students have more than one dictionaries. Data in Table 3 show that al-Munawwir Arabic-Indonesian translation has been mostly chosen by the respondents, while the Indonesian-Arabic is in the fifth position. It can indicate that the students tend to learn from second language to the first language.

<table>
<thead>
<tr>
<th>Table 3. Paper Dictionaries Possessed by The Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Dictionary</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Munawwir Arab-Ind</td>
</tr>
<tr>
<td>Mahmud Yunus Arab-Ind</td>
</tr>
<tr>
<td>Arabia Baina Yadaika</td>
</tr>
<tr>
<td>Al-Ashri Arab-Ind</td>
</tr>
<tr>
<td>Munawwir Ind-Arab</td>
</tr>
<tr>
<td>Al-Bisri Arab-Ind Ind-Arab</td>
</tr>
<tr>
<td>Al-Ashri Ind-Arab</td>
</tr>
<tr>
<td>Al-Munjid Arab-Arab</td>
</tr>
</tbody>
</table>
Table 3 shows that there are 303 dictionaries of Arabic-Indonesian and Indonesian-Arabic versions that are preferred by the respondents in learning Arabic. Then, this research scrutinizes the best version of printed dictionaries that support the respondents' teaching and learning process. The data are shown in Table 4.

Table 4. Preference of Paper Dictionary

<table>
<thead>
<tr>
<th>Mostly preferred dictionary</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munawwir Arab-Ind</td>
<td>42</td>
<td>35%</td>
</tr>
<tr>
<td>Al-Ashri Arab-Ind</td>
<td>29</td>
<td>24%</td>
</tr>
<tr>
<td>Al-Wasith Arab-Arab</td>
<td>16</td>
<td>13%</td>
</tr>
<tr>
<td>Al-Munjid Arab-Arab</td>
<td>14</td>
<td>12%</td>
</tr>
<tr>
<td>Mahmud Yunus Arab-Ind</td>
<td>10</td>
<td>8%</td>
</tr>
<tr>
<td>Lisan Arab</td>
<td>4</td>
<td>3%</td>
</tr>
<tr>
<td>Arabia Baina Yadaika</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>No Answer</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4 presents that dictionary of Munawwir Arabic-Indonesian version is mostly functioned by the respondents. Of 120 respondents, 42 respondents categorize the dictionary of Munawwir Arabic-Indonesian as the best version. It indicates that this dictionary is relevant to use in lexicography course.

Different from paper dictionaries, the questionnaire presents that there are some electronic dictionaries that can be exerted by the respondents. Table 5, 6 and 7 display the range of the electronic dictionary that assists the students to search and interpret meanings. Some include bilingual dictionaries and other involve multilingual dictionaries that can be connected online or offline modes with website-based or software application that are assessable in computer or mobile phone.

Table 5. The Electronic Dictionary (Computer-Application)

<table>
<thead>
<tr>
<th>E-Dictionary (Computer Application)</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Al-Wafi Arabic Translator</td>
<td>4</td>
<td>33%</td>
</tr>
<tr>
<td>Al-Mufid 1.0</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Kamus Bahasa Arab 2.0</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Effel's Arabic</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Arab VerbAce Translation</td>
<td>2</td>
<td>17%</td>
</tr>
</tbody>
</table>
Table 5 exemplifies that Golden *al-Wafi* Arabic Translator as bilingual dictionary becomes mostly selected. This dictionary is available in online website and software installation.

<table>
<thead>
<tr>
<th>Electronic Dictionary Website-Based</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Translate</td>
<td>12</td>
<td>46%</td>
</tr>
<tr>
<td>Global Translate</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td>101language.com</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>Ajax Trans</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>All Word</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>Foreign Words</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>IniTranslator</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Translator Base</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Word Reference</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Table 6. The Electronic Dictionary (Website-Based)**

Based on Table 6 and Table 7, it can be analyzed that the respondents mostly favor Google Translate as a tool for translation. This translation tool needs internet connection to translate word(s), phrase(s), paragraph(s) and document(s).

The reasons the respondents function the electronic dictionary vary: (1) it is easy to find words, (2) it is faster in the search for the meaning of words, (3) it utilizes the functions of smartphones owned, (4) the dictionaries of the printed version are difficult to carry while electronic dictionaries are more practical, (5) the vocabulary in the printed dictionary is relatively incomplete, (6) the electronic dictionary features are more complete and various, (7) the electronic dictionaries are cheaper, even free.

<table>
<thead>
<tr>
<th>Mobile Phone Dictionary</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Translate</td>
<td>42</td>
<td>53%</td>
</tr>
<tr>
<td>Indonesia Arabic Translator</td>
<td>8</td>
<td>10%</td>
</tr>
<tr>
<td>Offline Dictionaries</td>
<td>6</td>
<td>8%</td>
</tr>
<tr>
<td>QuickDic Offline Dictionary</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td>English Arabic Translator</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>English Arabic Dictionary Free</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Gamooos Arabic English Dict</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Arabic English Dictionary</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Arabic English Dictionary Box</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Kamus Indonesia Arab Ristek Muslim</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>ArabDict Dictionary</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Identified on how many times the students function the electronic dictionary of Arabic-Indonesian or Indonesian-Arabic, 112 respondents (100%) claimed to have used electronic dictionaries, both through computers and smartphones; 76 people (63%) admitted frequently, 32 people (27%) admitted sometimes, and 4 people (10%) claimed to rarely use electronic dictionaries.

<table>
<thead>
<tr>
<th>Use frequency</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very frequent</td>
<td>35</td>
<td>29%</td>
</tr>
<tr>
<td>Frequent</td>
<td>48</td>
<td>40%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>24</td>
<td>20%</td>
</tr>
<tr>
<td>Rarely</td>
<td>11</td>
<td>9%</td>
</tr>
<tr>
<td>Never</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100%</td>
</tr>
</tbody>
</table>

Based on the results, it is found out that electronic dictionaries of Arabic-Indonesian and Indonesian-Arabic have been rapidly developed and utilized in Arabic Foreign Language (AFL) classrooms in Indonesia. Electronic dictionary application developers vary from overseas with large companies of mobile applications, the Indonesia localizers or individuals. This is because the Android-based application is indeed open source, giving anyone the opportunity to compete to create electronic dictionaries [28]. Accordingly, everyone can access the bulk of words in dictionaries either from online or offline connections with any gadgets that are compatible with such electronic dictionaries.

The development of this open source Android-based electronic dictionary in many numbers has provided positive aspect because it is capable of producing many dictionaries with various advantages and features that continue to innovate and creatively modify [10], [22]. However, teachers and students in Arabic education department should meticulously select which electronic dictionaries they have to use in the language instructional classrooms. The vast spread of the application in Playstore is considered lack of meaning or truth validity. The users should have lexicography skills to reproduce certain meanings when translating texts. One of which is by recognizing whether the products are developed by individuals or companies without the linguistics experts in the field of language and research.

The problem of truth accuracy in Arabic electronic dictionaries must be a crucial concern because dictionaries are positioned as learning resources and references for students [10], [22], [27]. It can also improve student’s vocabulary mastery [29], [30]. When there is an error in the dictionary contents, then the dictionary misleads its users. Therefore, [31], [32] have promoted the use of Machine Translation (MT) to obtain significant meaning in a text. In [33], there is a wide attention to all the Arab scientists as well as administrators and thinkers to the important nature of Arabic Machine Translation (AMT) by introducing translation machine criteria that consist of completeness, correctness, and stylistic criteria, which were defined in terms of the lexicon, grammar, and the mapping rules. These are intended to measure translation correctness.

When viewed from the features in the application of electronic dictionaries, researchers found a very prompt advance compared to a few years ago. Electronic dictionaries are currently able to translate words, texts, sentences to phrases. Users can choose multiple languages simultaneously.
By one clicking, they have got their meaning. In addition, the electronic dictionary has been able to translate sounds, listen to translations, voice input and output, copy translations (clipboard), designing attractive graphics, creating artistic color themes, supporting multiple languages in the electronic dictionary [8], [18], [22], [27], [28], [34].

One of the fundamental drawbacks of electronic dictionaries, according to researchers, is the translation of text or sentences from one language to another, including Arabic.[17] According to the results of the research, it is found that the text translation feature in the Arabic electronic dictionary was unable to produce good and correct translations. Researchers found many grammatical errors in the translation of Arabic. Those comprise the translation of single and plural words, the words mudzakkar (masculine) and muannas (feminine), the use of dhomir (pronouns), the words ma’rifat and nakirah, and others.

Furthermore, researchers have not found an electronic dictionary that is able to translate text or sentences properly and correctly so that text translation features in electronic dictionaries can cause a lot of errors for dictionary users. Similarly, the main difficulties faced in English Foreign Language (EFL) classroom are incomplete definitions, lack of credibility on some bilingual e-dictionaries’ developers, and lack of definitions and examples [15], [35]. Regarding to this phenomenon, the majority of students should be critical on the use of electronic dictionaries as a part of technology advance in digital era. It can assist them to learn language independently.

From the hardware aspect, all mobile-based electronic dictionaries can be installed on various brands of smartphones, both cellphones that use Android, Apple, Blackberry, and so on [28]. Among electronic dictionaries, there are dictionaries that need an internet connection (online), some of which can be deployed without an internet connection (offline). In addition, a Wifi or Hotspot connection supports users for free electronic dictionaries without spending internet data payment. This ease and flexibility encourage students to use electronic dictionaries through smartphones in their hands.

From the obtained data, there were several printed dictionaries in Indonesia which began to be developed into electronic versions such as Indonesian-Arabic al-Munawwir dictionary and Arabic-Indonesian dictionary. This fact shows that the enhancement of Arabic dictionaries in Indonesia has followed the trend of digital technology. Therefore, the study of dictionaries (lexicography) in the Arabic education curriculum should not be limited to the analysis and evolvement of printed version dictionaries, but also should lead to the current trends of digital-based electronic dictionaries and mobile applications.

4 Conclusion

The use of electronic dictionaries in Arabic Foreign Language (AFL) classrooms have attracted more interests than that of paper dictionaries due to its effectiveness and efficiency of use. This fact supports the demand of students needs in this fast changing era because they are categorized as digital natives who are able to operate technology and other social media for language instruction [36]–[38]. Electronic dictionaries are more accessible, various, complete,
inexpensive, easily updated and revised. Besides, it and can be developed by anyone and at any time, both by companies and individuals.

Systematics in the preparation of Arabic electronic dictionaries is much better and is not limited to the five-traditional systematics that have been set by classical Arabic lexicologists. In addition, the text translation feature in the electronic dictionary is still unable to translate text correctly according to Arabic grammatical rules.

Therefore, the lecture material in the Arabic lexicology-lexicology course needs to be developed by including teaching materials that examine electronic dictionaries. Educational institutions or language institutions, both public and private, need to produce qualified and credible Arabic electronic dictionaries so that they can be used by the educational users (lecturers, students, researchers, and the community). In so doing, they can find a highly recommended and correct electronic dictionary application in Arabic translation.

Acknowledgment. The researchers would like to thank to Faculty of Tarbiyah and Teacher Training Universitas Islam Negeri Maulana Malik Ibrahim Malang-East Java, Indonesia for facilitating the researchers in conducting this research. This paper in conjunction with the 3rd International Conference of Islamic Education (ICIED) who have shared more constructive feedbacks on this research.

Reference

The Discourse of Ambiguity of Modern Drone Warfare in “Eye in the Sky”

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Abstract. Modern warfare is one of popular themes in Hollywood and western films especially after the discourse of “war against terror.” This British-production film, “Eye in the Sky” narrates war against terrorism in a unique and detailed way, instead of in black and white perspective. This paper argues that modern war presents many levels of ambiguity. It is aimed at discussing the discourse of ambiguity of modern drone warfare in the film “Eyes of the Sky.” This study applies Fairclough’s Critical Discourse Analysis, covering three levels of analysis, micro, macro, and mezzo. Micro level deals with language devices such as words, specific terms, metaphors. Macro level relates with social, political context, and mezzo level deals with the discourse bridging the language in use and social political context. The discourse of ambiguity can be found in many ways, ambiguity of modernness of the warfare devices and weapon when it counters the simplicity of real life of the people in Kenya that becomes ‘collateral damage.’ Ambiguity is also seen in decision making, in which Colonel Powell, the leader of the mission, changed the “capture” into “kill” terrorists and faces many ambiguities of the officers in charge of making decision for launching the missiles.

Keywords: modern warfare; drone; ambiguity; Kenya; war on terror

1 Introduction

Film is a contemporary cultural product that is consumed by most modern people. The highly consumed movie is mostly because of some reasons such as its popularity, largely accepted by people, and its ability to reflect people’s anxiety and longing. Film as a contemporary cultural text is also able to express the problems that people encountered in history [1]. Miles claimed that film is one voice in a complex social conversation that occurs in a particular time [2]. Under this perspective, film becomes one of important studies in understanding it as a text under social political and cultural context [3].

Film as a social and cultural text also articulates and communicates values that reflect people’s belief and norms, as well as narrates the conflict that the characters encounter [4]. Film as a text under a particular social cultural context in its production and consumption can be used as a medium to understand people’s communicating the Islamic values. Popular movies according to cultural studies expert, Stuart Hall, become the site for negotiating power relation and conflict [5]. In more specific, film can also be used to analyze how people represent muslim people and
Muslim’s identity in contemporary social political constellation. These ideas build the connection between film studies and Islamic studies.

The issue of drone warfare is an important problem especially in modern warfare. Human Rights Clinic at Columbia Law School (2012) reported the thousands of civilian casualties as the impact of the US drone especially in Pakistan, Somalia and Yemen [6]. Under the banner of “war on terror,” a military campaign launched by the United States’ President, George W. Bush after the 9/11 bombing, targeted to the terrorist groups or countries supporting the terrorist, which is mostly Muslim countries [7].

The movie “Eye in the Sky” which was directed by Gavin Hood and script written by Guy Hibbert, was launched in 2016, in the same week with the US drone which reportedly killed 150 Somalian [8]. As Crane stated, film can be understood in articulating socio-political context of international relation or foreign policy of United States [3]. The title “Eye in the sky” refers to the function of the drone, an aircraft that can be remotely controlled, that is completed with high resolution camera and missiles. With its camera the drone functions as “the eye” that poses in the sky high above the target. It can send the real time picture to the Creech Air Force Base in Nevada. The drone is controlled by USAF pilot, 2d Lt Steve Watt with the USAF sensor specialist A1C Carrie Gershon. The operation is also supported by the image identifier specialists at Joint Intelligence Center Pacific at Pearl Harbor in Hawaii, while the decision is made at the office of Cabinet of British Room “A” led by General Benson, Colonell Powell’s superior.

Discussing about the war on terror that is represented in popular movies, especially Hollywood cinema, Thomas Riegler stated that the portrayal of terrorism in American films have developed in line with the social political context. The terrorism themed movies show people’s fear, fantasy and projection on terrorism [9]. In other words, Hollywood movies have built and sometimes distorted the perception on terrorism since 1960s. For example, in Hollywood 1970s movies, terrorists were represented by hijackers with the political background of Palestine or Vietnam, countries constructed as US enemy [10][11].

For that reason, this paper is aimed at discussing the film “Eye in the Sky”, which is a British thriller film, focusing on how it represents the issue of modern drone warfare by highlighting the discourse of ambiguity which is dominant in the plot of the film. Roger Ebert, an American site of film critics which has high credibility, gave a praise to this movie, “Eye in the Sky”, as a priceless because of its ability to narrate in detail, the roles and personels of military and government, especially in making decision whether or not to launch a drone strike in the hunt of terrorist [12].

The film sets in Nairobi Kenya, in which the Al-Shabaab, a radical terrorist group made their home. The mission for capturing the Al-Shabaab leaders in Nairobi commanded by Colonel Katherine Powell (British Army) is triggered by the murder of a British/Kenyan agent by this radical group and some bombings done by the group. The film begins with the situation in a village in Nairobi, Kenya, where the safehouse of the terrorist group locates. This is not an isolated area, instead, a densed suburb in which a young girl Alia Mo’Allim lives with her family. The family’s simple home is closed to the safehouse of the Al Shabaab. It is shown in the beginning, the girl Alia plays a hula hoop made by her father.

From the other side of the world, at Northwood Headquarters, London, Colonel Katherine Powell takes command a multinational team, heading the mission of capturing the Al Shabaab. The team work is equipped with video and voice systems, and aerial surveillance. In Kenya, the field agents named Jama Farah use short-range ornithopter and insectopter cameras. His
cameras link in ground intelligence. The Kenyan special forces are also involved in the operation, by positioning nearby the place, ready to make the arrest. The mission of capturing the three Al Shabaab target has been started, and the facial recognition is done at Joint Intelligence Center Pacific at Pearl Harbor, Hawaii. The method of facial recognition is to identify the target person precisely.

The Kenyan agent, Farah reports that the targets, three high-level Al Shabaab leaders are preparing two suicide bombers. It is assumed that they are going to be an attack to a civilian target. Knowing this, Colonel Powell decides to change the mission from “capture” to “kill” the targets. Therefore, the Colonel who lead the mission instruct the drone pilot Lieutenant Watts to do procedure for preparing Hellfire missile attack on the safehouse. However the decision is not easy to get approval from the superior both from the UK and US sides.

Meanwhile, Alia the little girl selling bread near the building becomes important collateral damage that has to be considered. The question of bombing or not is much more complicated. So, this paper intends to scrutinize the discourse of ambiguity in drone warfare represented in the film “Eye in the Sky.”

2 Methods

In discussing the discourse of ambiguity in modern drone warfare in film “Eye in the Sky”, the writer use Fairclough’s critical discourse analysis [13]. The Critical Discourse Analysis analyze the discourse of a text by comparing, interpreting, and synthesising textual data. The Critical Discourse Analysis is based on three levels of analysis, the first is called micro level analysis, in which the analysis is related to language devices used in the text, such as wording and rewording, diction, metaphor, and specific terms used in the text.

Second, mezzo level analysis which is related to the text producer’s production and consumption, mainly the references consumed by those producing the text. In this analysis, there emerges interrelationship between one text to the others, or the more commonly called intertextuality. The macro level analysis examines the text’s socio-political context that needs to be explored to get the whole comprehension of the discourse [14]. The macro analysis will support the idea of social political context of the “drone warfare” in international relation [15].

In discussing the movie “Eye in the Sky,” the focus will be upon the discourse of ambiguity on the drone warfare and the way it is represented in this film. The term ambiguity refers a word, a phrase or a sentence with a multiple meanings. There are two types of ambiguity syntactic and semantic ambiguities. Syntactic ambiguity is the phenomenon in which the same sequence of words has two or more meanings due to different phrase structure analysis. Semantic ambiguity is a word that has more than one meaning. Ambiguity is one of linguistic expressions so, in many occasion, people use it intentionally because it functions such as for humor and advertising.

In this analysis, the ambiguity can be seen from the term used at the conflict, “to kill mission.” The ambiguity is the actors involved in the making decision of launching hellfire missile, including the officers and the minister of UK Foreign Affairs and the US Department of State. The ambiguity also can be seen from the pilot, Lieutenant Watt and his partner, Carrie
Gerson who feel ambiguous in executing the job, the launching the hellfire missile, by considering the victims of the operation.

3 The Discourse Of Ambiguity In Modern Drone Warfare

This film begins with a Kenyan little girl named Alia, who lives near the target building that will be bombed by the drone controlled by the western joint military team led by Colonel Katherine Powell, playing hula-hoop. Alia and hula-hoop represents simplicity and innocence of the little girl, Alia. The simple housing compound also shows simple life of people in Kenya. Alia with the best hula-hoop she has ever had, which is made by her father’s hand gives a paradoxical situation compared with British General Benson who lead the Cobra (British Cabinet team) meeting. Before having the very important meeting to make decision of launching the missile, Benson is busy and confused of buying an expensive doll in a store for his daughter, who asks for moving doll instead of sleeping doll.

The paradox presented at the beginning of the film, between Alia’s father-made hula-hop and sleeping-moving doll describes the situation of two encountering parties, the target and the actor of the missile bombing. Hula-hop is a simple tool made of bamboo or rattan, for playing happily with all of the body moving, while doll is a factory-made, much more expensive compared to hula-hop, and playing doll does not need the whole body of a child to move. The happiness presented from these two ‘games’ is different, playing hula-hop conveys cheerfulness while playing a doll does not seem as cheerful as hula hop. Mr Benson looks so stressed to choose which doll that the daughter wants to and it seems that he wrongly choose the doll.

![Fig. 1. The drone camera shows Alia playing hulla-hop happily in front of her home.](image)

The drone camera presents Alia playing hulla-hop in the backyard of her home. The camera also gives in details the situation of people in their daily life. Alia’s father job is repairing bicycle, Alia’s mother makes bread which Alia sell everyday. Alia and the hulla hop made by her own father’s hand, and the situation of the home, and the larger landscape of Alia’s home which is close to the safe house – where the terrorist Al-Shabaab takes home, which becomes the target of the multi-nation mission. A paradoxical picture of sophisticated modern warfare, drone. The drone camera with Alia and her family functions to introduce the problems and ambiguity that will be encountered by the multi-national team led by Colonel Powell.
The picture 1 shows that the drone camera takes the picture of Alia playing hula-hoop in front of her house. The camera shows in “real-time” the girl playing the hula-hoop, and this photovideo is seen by drone pilot, 2nd Lieutenant Watts and his enlisted sensor operator, A1C Carrie Gershon. Carrie Gerson smiles when she sees the little girl. Those two people who is responsible to launch the Hellfire missile catch the figure of little Alia, and feel empathy to the girl.

Simplicity and innocent is symbolized by Alia and her hulla-hop. Alia, wearing white dress and pink head-dress, with her hulla-hop in the drone’s camera shows a unique combination compared with the drone that shows its sophisticatedness, its ability that can not be done directly by human being. It gives realtime picture which is important information that determine any action in war and the winner of the war. The drone technology is the latest progress in the warfare technology, in which it can do many important things, getting information, photos, from any places without any risk or harmful risk for the owner or controller of the drone.

Presenting Alia in the picture shows the potential of ambiguity, innocent little girl in the middle of complicated modern warfare. This also conveys meaning that a war is never a simple matter. It affects not only the life of the soldiers – as many described by films of World War I or II, or any other war, but it also affects the life of people at large, including innocent women and children. By presenting Alia at the beginning and the rest of the film, this articulate a discourse of the ambiguity of the war, who or what is the war against? The bombing of the safe house in which the target of the three terrorist leaders locate will also bring the collateral damage to the life of the innocent people surrounding the place. Presenting Alia through the drone camera successfully catches the pilot attention and empathy. The pilot, Lieutenant Watt can see the more direct risk of little Alia selling bread outside the targeted building, and they seek to delay firing the missile until she moves.

The use of drone in warfare is very efficient. The drone can do many things such as bombing, spying, giving the information on coordinate or reporting the exact position of the target, and any other information needed. It can also be used to launch missiles. In launching missiles, the modern warfare machine also gives small possibilities of risks or damage for the controller, because the drone does not need a pilot or person in it. It is controlled by pilot stationed at the office hundreds miles away from the target.

As described in the film, by using many cameras, any information about the safe house that becomes the target of Powell team’s operation, can be reported in exact manner, including the two people that Colonnell Powell has hunted for long time and they are suspected as the main actor of some suicide bombings. Powell feels enthusiastic when she gets confirmation that the people coming to the safe house are the people she has looked for for six years.

The two people that make Powell excited are a husband-wife British couple, Susan Helen Danford or Ayesha Al-Hady and her husband Muhammad Al Hady – a Somali-born. It is seen from the camera that the three people in the safe house are preparing two suicide bombers, one of which is an American citizen named Muhammad Abdisalam. Finding this important and urgent information, Colonel Powell changes her mind.

At the beginning of the mission she instructs the capture of the three terrorists, not to kill. But then she changes the mission into “to kill” the suspects. There is ambiguity in the changing of mission. When Colonnell Powell gives the instruction to the team of drone pilots, she said, “This is an operation to capture, not to kill. Your job is to be their eye in the sky.” Then the comander, Lieutenant Ed Walsh replied, “Thank you mam. Kill it.” It is clear that Powell instructs to capture
not to kill the terrorist. This instruction is well understood by Steve Watts and other team. When Walsh says, “Kill it” it is ambiguous, in one side it might mean synonym as “do it” (do the mission), but this also can mean ‘kill it’ (kill the target). In this case, kill the target means launching the bomb or missile to the target they have discussed. This ambiguity then turns out to be problematic.

The change mission that Colonel Powell strongly proposes, from “capture” to “kill” is caused by her finding that the three terrorists that she has tracked for six years are now found out together in the safe house. So, she does not want to waste the time, or let the three suspects flee. However, it is not easy to get approval from many parties, the UK team (Cobra) who are in the situation room and watch and supervise the mission, and the US team.

At first, Powell has to get approval from the Cobra team consists of two ministers and parliamentary member for Africa affairs, Angela Northman MP, the Parliamentary Under-Secretary of State for Africa. The situation room is led by Lieutenant General Frank Benson, deputy of Defense staff. The ministers do not agree to change the mission into “kill” the targets. Colonel Powell force them to agree on the “kill mission” when she found out that the terrorist group is preparing two suicide bombers by putting on the vest of bomb at the body of two young male perpetrators. While the preparation of the suicide bombers make the Colonel depressed because it is about 10 minutes left to prevent them blow the bomb. Every second counts. She knows that it is a preparation for suicide bomber that will explode somewhere, which will take many lifes of civilian as victims. On the other office, the Cobra, especially Angela Northman strongly opposes the “killing” mission, the launching of hellfire missiles. It is understood by the five officers in situation room that killing mission means launching the missiles to the target, that will cost a lot of lifes too.

Fig. 2. The Cobra (Cabinet of British) at the situation room, watching the screen displaying the situation at many places seriously.

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The ambiguity of the decision makers in the situation room makes highly tensed situation. One of the factors complicating the decision is that the suspects are British citizen, and the suicide bomber is US citizen. They do not want to kill their own citizens abroad because it is very risky of being accused by mass-media of not protecting their citizen. Then, the Cobra has to refer up to get the approval of the UK foreign minister, and the US minister of state for foreign affairs. The UK foreign minister is in Malaysia, and US minister of state in Beijing. Finally when the US minister of state said that the US will not protect their citizen when s/he is involved in terrorism,

The ambiguity in making decision in the operation because of the collateral damage that involves civilians especially children is marked at beginning of the film. There is a scene in which Musa (Alia’s father) teaches Alia reading and counting. Then there are some local terrorists who want their bike repaired. Musa hurriedly hides Alia’s books, because he does not want the people knows the books and Alia learning. Then Alia goes with playing hula hoop. But this is also respond negatively by the men so that the father asks the daughter to stop playing. This constructs the idea that the radical group or fanatic people are dominating the local civilians, and the group determines the right thing to do for anybody.

The collateral damage related with the action that Colonel Katherine Powell wants to execute needs to be legally and politically approved. That is why she seeks approval of the decision to launch the missiles. She asked for the approval from the COBRA team, but then she has to get the legal opinion from British Army legal counsel, which then asked her to seek approval from superiors because of the complexity of the case. The complexity is due to the conflicting legal and political views of the killing, especially when exposed with negative news of killing civilians and one of the targets is American citizen. The ambiguity is shown again when the General who asks approval to UK foreign secretary who does not give a definite answer. Instead, he refers to the US secretary of State who is in Beijing for a cultural exchange. After long way to track, the Secretary of State finally states that he denies protect the American suicide bomber.

The calculation of the damage, which is a legal procedural problem is also encountered by Colonel Powell that she needs to justify the action to launch the bomb, by the calculation of less than 50% collateral damage estimation. She asks her risk-assessment officer who does the calculation to lower the estimation, of which the CDE is 65% at the beginning. She did not care who and how many people will be died or harmed by the bombing, she only focuses on the less than 50% collateral damage estimation. At the end, after the missiles are launched twice, she emphasizes her instruction to the assessment staff in making report that the collateral damage estimation has to be 45%, which legally justifies her action.
The ambiguity experienced by Colonel Katherine Powell also shows the ambiguity of the high rank of government officers. This shows the other field of the war itself. The decision of the war is made by the officers in the situation room or the military office in London or in US, not in the field of war, and not even any of the people of decision makers are at the field of war. They are at military headquarters, office, or US Secretary of State at the ping-pong (table tennis) table somewhere in Beijing, and the other UK foreign minister is at the hotel toilet and room wearing pajama at the other side of the planet. They are all making decision in which the lifes of people in other part of the planet at stake. The ambiguity is also seen from the victims, not only the terrorists but also the innocent children and civilian people who have nothing to do with the war.

On the other side, the agent at field, Jama Farah is the person who has a high risk in his job. He operates a camera in the form of a bird that can be remotedly controlled. Through the camera bird, the situation in the rooms of the safehouse can be seen and reported to the commander of the mission in London and Nevada, US. Then, Farah gets instruction to save Alia by approaching her and buying the bread so that she can avoid the missiles. Unfortunately, before he finished his business he is discovered by militant people who guard surrounding the area, so that he is forced to flee saving himself. When all the procedure and the legal and political issue is overcome by Cobra and Colonel Powell, the drone pilot in Nevada, Steve Watts, has to execute the launching of hellfire missiles although he feels so sorry to Alia who can not be saved from the spot where she sells the bread. Right after the missile is dropped, the devastating damage of safe house of the radical group and surrounding, can not be avoided. Colonel Powell instructs the launching of missiles once again when she sees the terrorist is moving her body under the debris of the ruined building. Alia is badly injured, and rushed to hospital by her father, but her life is not secured. She dies.

The death of Alia shows that humanist people at the drone-controller room or situation room can not influence the decision when it has been authorized by the officer in charge. The commander in chief instructed the staff to do the calculation of collateral damage estimation to be less than 50%. This is also supported by the General Frank Benson’s statement toward the politician who criticize him as “disgraceful.” Benson says, "I have attended the immediate
aftermath of five suicide bombings on the ground with the bodies... Never tell a soldier that he does not know the cost of a war.” What Benson says shows the military power over civilian politician in making decision.

3 CONCLUSION

“Eye in the Sky” was launched in 2016, in the same week with the US drone killed 150 Somalian. The fact is that Somalia is not in the status of war against US, of which means that it is against the authority of US congress, stating that there must not any military action there [16]. This film is a form of critics for American foreign policy, dealing with the casualties resulted from the drone, in which Human Rights Clinic at Columbia Law School (2012) stated thousands of civilian death tolls as the impact of the US drone especially in Pakistan, Somalia and Yemen [6].

Compared with the other films under the theme “war against terrorism” like Zero Dark Thirty, which clearly portrays the war in one perspective so that it can be called as a propaganda, Eye in the Sky takes ambiguous position [17]. There are many aspects and layers of ambiguity, from the way decision is made by the government officers; US Secretary of State, UK Foreign minister, and Cobra members got difficulties in deciding to do or not to do the bombing. The ambiguity of war against terrorism is more obvious when we find out that it is not only the terrorists but mostly civilians who always become collateral damage. In this film, it is stated through the appearance of Alia in the very close spot of the target and becomes the real victim [18].

The discourse of ambiguity in this film shows that the contemporary war field is not only at real war field, instead the war field is located more at the office, hotel, sport area, as the battling place for the officers to discuss, argue and make decision on the war, in front of screens displaying photos and “real-time” information from drone camera and other devices. The ambiguity in making decision, in which they have to get approval from one to the other officers, from one rank officer to get the higher rank officer, who are far away at the other part of the planet, also implies that the officers do not necessarily know what or who is at stake. Like Colonel Powell, she is only focused on the target of killing terrorists whatever the cost.

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References

The Effectiveness of Audiovisual Aids in Teaching Qur’anic Based-History

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Abstract. This paper explains the effectiveness of audiovisual aids in teaching Qur’anic based-history of Islam. My object is the teaching of History of Islamic Civilization subject using DVD video for my students at Faculty of Ushuluddin, Islamic State University (UIN) Sunan Gunung Djati Bandung, using learning media approach. This research shows that the audiovisual aids is a very effective technique for improving the achievement of student learning. The effectiveness of audiovisual aids can be see from highly response rate of the students who agree to the use of audiovisual aids in teaching history of Islam (92.5%); highly agree to the use of interactive DVD video (87.5%); more easier to understand (82.5%); in line with student expectations (77.5%); and agree to recommend the use of audiovisual aids in teaching history of Islam (72.5%). This study has implications for the research on technology of audiovisual in helping lecturer to develop their teachings for students of higher Islamic education in Indonesia

Keywords: audiovisual, DVD, technology, effectiveness, teaching

1 Introduction

The information and communication technology rapidly developed in human activities. It is an increasingly creativity of human in their lives. One of their creativities is use of audiovisual aids in teaching activity [1]. There are many educational practitioners who used audiovisual for their teachings at school or university [2]. The use of audiovisual aids then raises their awarenesses to change the learning method, i.e. from teacher or lecturer centered to student centered, from conventional learning to internet-based learning (e-learning) and social media (e-mail, facebook, youtube, instagram, WhatsApp etc.) [3].

This study focuses on the effectiveness of audiovisual aids in teaching history of Islam in Islamic Higher Education. I used the audiovisual in the form of interactive DVD video entitled Potret Pribadi dan Kehidupan Rasulullah Saw., The personal portrait and life of the prophet Muhammad PBUH. It is a DVD video on history of Islam in Indonesia language which created by Ahmad Lutfi Fathullah. He is an expert of ḥadīth and sīra or biography of Muhammad who works at Hadith Studies Center of Al-Mughni at The Jakarta Islamic Center. [4] I will use the DVD video on history of Islam to help my students in learning History of Islamic Civilization subject at Faculty of Ushuluddin, Islamic State University (UIN) Sunan Gunung Djati Bandung.
There are many scholars who have studied the audiovisual aids in teaching. Rasul, Bukhsh and Batool has proved the effectiveness of audiovisual aids in teaching learning process at university level [5]. Meanwhile, Haryoko already discussed the effectiveness of learning using audiovisual aids in teaching students at Electronic Engineering Department in Indonesia. He stated that the audiovisual aids can increase the student performance than ever before. According to Haryoko, the students who used audio-visual aids in his learning (16,25) had higher performance than those used conventional learning (9,25) [1]. I also found another case in Joni Purwono’s research on the student performance after using audiovisual aids in their learnings at secondary school SMP Negeri 1 Pacitan. Their learnings run very interactive and enthusiastic. The students become more motivated to continue their learnings. [6] Similar results were also found in Hasan’s research on the use of audiovisual aids to achieve the student completeness of social sciences subjects (IPS) at the fourth grade elementary school SD Negeri 20 Banda Aceh [7]. Therefore, it is very significant to study the use of audiovisual aids in teaching Qur’anic based-history of Islam for students. This study not only highlights the effectiveness of audiovisual aids in the teaching and learning, but also shows that audiovisual aids have influence on the student performance in their learnings. In addition, this study is also important to improve the creativity of lecturers and students in learning Islamic history in Indonesia.

2 Methodology

This study uses the media of learning approach. I choose the method of Science, Technology, and Society (STS) [8]. It is a combination of conceptual approach, process skills, inquiry and discovery, and environmental approach. The philosophy of STS approach is the assumption that students constructed their own concepts within their cognitive structures based on what they already knew. The STS approach is considered appropriate not only to increase students performance, but also to study the use of audiovisual aids in teaching history of Islam.

I used the audiovisual aids in the form of interactive DVD video in Indonesia language which created by Ahmad Lutfi Fathullah. The DVD video contains twenty four major historical life themes of Muhammad, i.e. the history of Muhammad’s birth, his name and alias, Muhammad’s family, his friends, his physical form, cloths, foods, historic places of Muhammad, and the response of scholars to the prophet. This DVD video is in the form of a disk circle with 12 cm diameter. It is covered by paper and plastic material (19 X 13.5 cm). The title of cover is written in Indonesian and Arabic. The DVD video was first launched in 2010 and then reproduced in 2013.

I used audiovisual aids in teaching history of Islam for my students as population. They are students who studied currently at semester II, IV and VI, Qur’anic Studies and Tafsir Department (IAT) and Islamic Mysticism and Psychotherapy Department (TP). I also used the technique of simple random sampling. It is a technique which stated that each individual in the population has the same opportunity to be elected as a sample. The sample is determined randomly. I take forty students from three different classes as a sample. They are proposed to answer some questions using Whatsapp. I used rating satisfaction scale of five answers that must be choosed by respondents (excellent, very good, good, fair, poor). Following table shows the profile of respondents:

| Table 1 |
| Profile Of Respondents |
No | Profile of respondents
---|---
1. **Sex**<br>M 12/30 % | F 28/70 % - -
2. **Age**<br>< 20 4/10 % | > 20 36/90 % - -
3. **Department**<br>IAT 36/90 % | TP 4/10 % - -
4. **Semester**<br>II 4/10 % | IV 29/72,5 % | VI 7/17,5 %

I used interactive DVD video in classroom for every session using slide of projectors. There are two or three sessions of DVD video show for every semester. It is not all contents of history of Islam in DVD video can be showed. Every student are expected study the history of Islam.

### 3 Result and Discussion

**A. The steps of audiovisual aids in teaching**

Audiovisual is one of product of technologies that often used in education [9]. It means possessing both a sound and a visual component [2]. There are two kinds of audiovisual: silent and motion audiovisual. Silent audiovisual or impure audiovisual is an audiovisual which sound and visual component derived from another source, such as a sound frame film which its visual component is derived from the slide of the projector and the sound component is derived from a tape recorder. Meanwhile, motion or pure audiovisual is both sound and visual components derived from a single source, such as a video cassette film [1]. The interactive DVD video which created by Ahmad Lutfi Fathullah can be regarded as a silent or impure audiovisual.

The audiovisual aids in teaching has many steps as in other media of learning. I used three steps in the use of audiovisual aids in teaching: preparation, implementation, and follow-up stage. First, the preparation stage will include the plan of learning activity, studying manual instruction on audiovisual aids, and preparing audiovisual component that will be used. Second, the implementation stage of learning activities have to consider that the audiovisual aids and all equipment in teaching are complete and ready to use; to explain the objectives of learning that must to be achieved; to explain the subject to the students during the learning process; and to avoid the situations that can disturb the concentration of students. Third, the follow-up stage have to be done to strengthen students’ understanding of the subject that has been learned. This last activity aims to measure the effectiveness of learning that has been implemented [9].

**B. The response of the students to audiovisual aids in teaching**

This section will highlights the answers of respondents in the form of questionnaires that have been collected. I used rating satisfaction scale of five answers that must be choosed by respondents (excellent, very good, good, fair, poor).
(1) Do you agree that audiovisual aids in teaching can help your understanding?

![Fig. 1. Result of questions 1](image1)

(2) Do you agree to audiovisual aids in teaching of Qur'anic based-history of Islamic civilization?

![Fig. 2. Result of questions 2](image2)
(3) Do you agree with the use of Fathullah’s DVD video in the teaching Qur’anic based-history of Islamic civilization?

Fig. 3. Result of questions 3

(4) Is the subject of Fathullah’s DVD video wishes fulfilled?

Fig. 4. Result of questions 4
(5) Will you suggest to your lecturer to use Fathullah’s DVD video in the teaching of Qur’anic based-history of Islamic civilization?

Based on the above answers, the audiovisual aids has influenced the effectiveness of teaching Qur’anic based-history of Islam. The students agree to use audiovisual aids. There are excellent rating satisfaction scale from 72.5% to 92.5%. Meanwhile, both fair and poor rating satisfaction scale are 0%. It can be said that the students strongly agree to use audiovisual aids in teaching Qur’anic based-history of Islam. They mostly agree to suggest interactive DVD video which created by Fathullah.

CONCLUSION

The effectiveness of audiovisual aids in teaching Qur’anic based-history of Islamic civilization indicated very good response from the students. They mostly do not deny the use of audiovisual aids in teaching. The effectiveness of audiovisual aids can be see from highly response rate of the students who agree to the use of audiovisual aids in teaching Qur’anic based-history of Islam (92.5%); highly agree to the use of interactive DVD video (87.5%); more easier to understand (82.5%); in line with student expectations (77.5%); and agree to recommend the use of audiovisual aids in teaching Qur’anic based-history of Islam (72.5%).

References


Test of Heterotrigona Propolis Production Around Mahagony Threes and Marketing through Information System

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Abstract. Cultivation in trees area of Heterotrigna bees influences the number of propolis production. The Heterotrigona bees will visit the trees that contain partial large number of resin as the raw material to produce of propolis. This research aimed to study of the number of Heterotrigona propolis production in Rumah Kompos UIN Jakarta, influence of trees type. As research result was the number of propolis production ranging indicated increasing harvest time to time. Model of marketing through information system and analysis method used in this research was multiple linear regression to get the result that significantly base on variables who influenced propolis production in Rumah Kompos UIN Jakarta.

Keywords: Propolis, Heterotrigona, Marketing, Information System;

1 Introduction

Heterotrigna bees produce excellent property, i.e. propolis, a natural product from resin-producing plants. Propolis contains various chemical compounds [1] depends on the location, environment, and the type of plants [1]. Since long time ago, propolis has been one of biological compounds contained in traditional medicines [2]. Propolis produced by stingless bees contains 55% resin and essential oil, 30% beeswax, 10% ester oil, and 5% pollen [3]. Heterotrigona bees are more potential in producing propolis as the main resistance, compared to other bees [4]. The research of propolis utilization in health world has been often conducted to study antimicrobial, antiviris, and anticancer activities that can be potentially used as natural antibiotic for ruminant animals [5]. According to Artdiyasa et al. (2010), market demand of propolis is increasing and reaching 2% per year for its good benefit for human health. In Trubus magazine no. 482 edition January 2010/XLI, the selling price of a 6 ml propolis package was IDR 550,000, determined by some propolis producers and product distributors, i.e PT. Ratu Nusantara, CV Cahya Sejahtera, PT Melia Nature Indonesia, and PT High Dessert Indonesia [6].
Information technology has a major role to improve business practices and support marketing, such as B2B firms [13].

Student that have investigasi different facet of e-Marketing and e-Business penetration [12] described that ICT can be defined as the convergence from computer technologies telecommunication. Information System (IS) is a term for convergence in this technology which is generally used in describing several technologies and applications that are not the same by Bouwmann, Hoof, Wijngaert, & Dijk (2005).

In order to achieve the purpose of research and study questions below, the research questions has been set the direction as follows:

RQ1 Is the system that has been run in the distribution process?
RQ2 Is the production volume can optimal with this system?
RQ3 Is the management system optimal accordance with the marketing through Information System?

This research aimed to study: 1) the number of Heterotrigona propolis production in Rumah Kompos UIN Jakarta, 2) the influence of the type of trees, log size, temperature, and pests on propolis production, 3) the variables that mostly influence the propolis production, 4) the percentage of influence of the tree-type variables on propolis production, 5) the marketing model of propolis through system information.

2 Theoretical Framework

In the agricultural sector, recently, businesses developed related to their products and physical place. While marketing transactions are carried out by customers and adjusted based on special needs. Marketing is the process of managerial that includes individual and groups to achieve their needs, offering, and exchanging valuable products with other parties [11].

Urbach and Müller (2012) concluded that most information system (IS) studies are only focused on the measurement and assessment of the selected parts of the model, only few scholars who use the entire model. It is reasonable why the studies did not present a holistic approach to measuring IS success.

Companies are making large investments in e-commerce applications but are hard-pressed to evaluate the success of their e-commerce systems. IS researchers have turned their attention to developing, testing, and applying e-commerce success measures [9].

![Fig. 1. McLean IS success model](image_url)
IS model is a multidimensional and interdependent construct and that it is necessary to study the interrelationships among control for those dimensions.

3 Research Method

Data used in this research were primary and secondary data, obtained through the observation in Rumah Kompos UIN Syarif Hidayatullah Jakarta. Secondary data obtained from the Agriculture Service (Dinas Pertanian), the Indonesian Meteorological, Climatological and Geophysical Agency (BMKG), various literatures from books, papers, journals, and online articles.

Research was located at Rumah Kompos (House Compost), State Islamic University (UIN) Hidayatullah Jakarta [hereinafter mentioned as Rumah Kompos UIN Syarif Hidayatullah Jakarta, Cempaka Putih, Ciputat Timur, Tangerang Selatan, Banten. This location was selected to observe the production of Heterotrigona bees in the city because this species is originally the forest commodity.

Data used in this research were primary and secondary data, obtained through the observation in Rumah Kompos UIN Syarif Hidayatullah Jakarta. Secondary data obtained from the Agriculture Service (Dinas Pertanian), the Indonesian Meteorological, Climatological and Geophysical Agency (BMKG), various literatures from books, papers, journals, and online articles.

The author collected data and information through:

1. Observation by conducting direct observation of the objects studied in this research. In this case, direct observation at Rumah Kompos UIN Syarif Hidayatullah Jakarta.
2. Literature Study by collecting data and information through various relevant literatures related to the subject in this research, obtained from books, Dinas Pertanian, BMKG, Central Statistic Agency (BPS), related departments, online sources, and others.

3 Research Findings And Discussions

Regression analysis is one of statistical analyses that often used to analyze the influence of variables on the other variables. [7] stated that regression analysis is the analysis method that can be used to analyze data and significantly conclude the influence or dependent relationship of variables on the other variables. The relationship is commonly illustrated by math equation, which determines the relationship of independent variables and dependent variables in general formula of multiple linear regression, described statistically as follows:

\[ Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + e \]

Where:
- \( Y \) = Propolis Production (gram)
- \( X_1 \) = Type of Trees (trunk)
- \( X_2 \) = LOG size (cm)
- \( X_3 \) = Temperature (°C)
$$X_4 = \text{Pest (number)}$$
$$E = \text{error}$$

The results of the calculation using SPSS version 23, were obtained to calculate linear regression of the factors that influence propolis production in Rumah Kompos UIN Syarif Hidayatullah Jakarta, illustrated in the following table:

**Table. I**

<table>
<thead>
<tr>
<th>No</th>
<th>Influencing Variables</th>
<th>Coefficient Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intercept</td>
<td>146,406</td>
</tr>
<tr>
<td>2</td>
<td>The Type of Trees</td>
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</tr>
<tr>
<td>3</td>
<td>Log Size</td>
<td>0,021</td>
</tr>
<tr>
<td>4</td>
<td>Temperature</td>
<td>0,254</td>
</tr>
<tr>
<td>5</td>
<td>Pest</td>
<td>0,060</td>
</tr>
</tbody>
</table>

Research yielded multiple linear regression, i.e $Y = 146,406 + 0,041 X_1 + 0,021 X_2 + 0,254 X_3 - 0,060 X_4$, which can be explained as follows:

1. The intercept value (a) is 146,406, which describes that all dependent variables (the type of trees, log size, temperature, and pest) is nil. Hence, the independent variable (propolis production) value is 146,406 gr.
2. Coefficient value of the type of trees (X1) is positive, i.e 0,041, explains if the type of trees is increasing by 1 trunk, the production of *Heterotrigona* propolis of Rumah Kompos UIN Syarif Hidayatullah Jakarta will increase by 0,041 gr.
3. Coefficient value of the log size (X2) is positive, i.e 0,021, explains if the log size is increasing by 1 m, the production of *Heterotrigona* propolis of Rumah Kompos UIN Syarif Hidayatullah Jakarta will increase by 0,021 gr.
4. Coefficient value of temperature (X3) is positive, i.e 0,254, explains if temperature is increasing by 1° C, the production of *Heterotrigona* propolis of Rumah Kompos UIN Syarif Hidayatullah Jakarta will increase by 0,254 gr.
5. Coefficient value of pest (X4) is negative, i.e -0,060, explains if pest number is increasing by 1, the production of *Heterotrigona* bee of Rumah Kompos UIN Syarif Hidayatullah Jakarta will decrease by 0,060 gr.
Based on result indicates that the traditional relationship marketing practice characterized by Interaction Marketing still plays an important role for a large proportion of firms and challenges the view that e-Marketing is replacing Interaction Marketing as a relationship management tool.
This study hypothesizes that:

H1: Information Quality positively affects the Usage Intention toward Marketing System Implementation.
H2: System Quality positively affects the Usage Intention toward Marketing System Implementation.
H3: Service Quality positively affects the Usage Intention toward Marketing System Implementation.
H4: Relative Benefits positively affects the Usage Intention toward Marketing System Implementation.
H5: Relative Benefits positively affects the Marketing System Implementation.

4 Conclusions

Based on the factors that influence propolis production in Rumah Kompos UIN Syarif Hidayatullah Jakarta, it can be concluded that:

1. Multiple linear regression reveals the variables of: i) the type of the trees, ii) log size, and iii) pest significantly influence the propolis production. Meanwhile, the variable of temperature insignificantly influences the production due to the moderate temperature (non-extreme) in Rumah Kompos UIN Syarif Hidayatullah Jakarta. Thus, the average temperature is the same all year round.

2. Research reveals that the variable percentage of the type of trees (25.5%), log size (22.4%), and pest (31.2%) significantly influences the production of *Heterotrigona* propolis of Rumah Kompos UIN Syarif Hidayatullah Jakarta.

3. Marketing pattern needed in term of developing business and Information system model as method to measure in reaching success model.
Acknowledgment. This paper in conjunction with The 1st International Conference on Islam, Science and Technology (ICONIST 2018) in Malang, East Java.

References


Digitizing Qur’anic Manuscripts Using Office Lens for Educational and Research Purposes

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Abstract. Many scholars have not experimented with the effective use of smartphone camera for digitizing manuscript. Many of them confirmed that the digitization process uses standard manuscript digitization equipment. Whereas, some others assured the impact of ancient manuscript digitization. This article presents experimental results of manuscript archive master image comparison captured by smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 and DSLR camera Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens and analyzes the quality based on the performance level released by FADGI standard, UMass Armherst Libraries standard and US NARA standard. The results showed that manuscripts images captured by Smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 potentially obtaining “3 star” performance level of FADGI if other conditions are fulfilled. They also meet UMass Armherst Libraries Full-Size High Resolution and meet NARA alternative minimum criteria if projected on 13 and 14 inches LCD projector or LCD monitor screen. In turn, they are also compatible to be used by researchers, teachers as well as lecturers in need of manuscripts for learning materials and course practicum.

Keywords: digitizing manuscript; digitalizing manuscript; office lens; education; research;

1 Introduction

Many papers have suggested the results and impact of ancient manuscript digitization process using high-resolution digital camera or automated equipment, i.e. [1]–[3] Yet, none has specifically examined the use of smartphone cameras and android application to digitizing ancient Quranic manuscript, especially for educational and research purposes. In fact, ancient manuscripts in some pesantren (Islamic boarding schools) and surau(s) (traditional worship places) are often found poor and unpreserved,[4] not to mention that they are kept and taken care by individuals. Well-preserved manuscripts can only be found in the National Library[5] and Keraton (royal palaces).

Cirebonese Corner, which was initiated by MahruseL-Mawa conducted many data collections and digitization of ancient manuscripts, especially those of the Cirebon Palace and the community.[6] In the other place, The Centre of Islamic Studies, Culture and Community (PPIM) of UIN Jakarta in cooperation with the Centre for the Study of Manuscripts and Culture (CSMC) University of Hamburg supported by Arcadia, the funding institution of...
England, also carried out manuscript digitization in Southeast Asia through Digital Repository of Endangered and Affected Manuscripts in Southeast Asia (DREAMSEA) program [7].

Manuscript preservation efforts was carried out by the Department of Culture, Riau Province [8]. In addition, Yoserizal confirmed that the community lovers of classic manuscripts and museums often end in deadlock when the manuscripts owner exhibit uncooperative initiative with scholars while collecting[8] and digitizing the manuscripts. The uncooperativeness appears due to lack of awareness of data collection and digitization of the manuscripts.

The process of metadata collection, detailed information collection on manuscript condition and manuscript digitization process are extremely urgent as no guarantee for the manuscript's owners will likely take a good care of the manuscripts and neither will the next generation to come.

Inadequate skills of maintaining manuscripts as well as insufficient facilities and infrastructure become the main cause of many manuscripts extinction. In other words, manuscript owners are often not informed that manuscripts must be put in a storage with a specific temperature such as light, humidity, and insects and animal free, air pollutants, special treatment and under supervision.[9], [10].

Moreover, as Indonesia is located in the tropical area, manuscript damage can be caused by mechanical-physical (high tropical temperatures, sunlight, dust), chemical (humidity and pollutants) and biological factors (insects, fungi, bacteria,[11], [12]and oil sticking from human hands).

Furthermore, in the tropical area, unused and untouched manuscripts especially in the range of 100 to 200 years can be decayed. Prior to a complete decay, the data in the manuscript was lost along with the waning of ink as the quality of the ink or paper faded out and then decayed. Moreover, manuscripts in the hands of owners or researchers can also be damaged due to environmental condition as well less hygienic preservation and repository. Complicated conditions dealing with the quality of manuscript material, environment and climate will likely contribute to the manuscript damage. In tropical areas, manuscripts can survive even twice the age of humans, but in medium-climated areas, manuscripts can survive 5 to 20 times of the human age [13].

Lack of awareness and knowledge of manuscript owners especially for providing access to the government and scholars to digitizing manuscripts violates the Law No. 43. 2007 on libraries stating that government is responsible for preserving the manuscripts as the national-cultural heritage owned by the community and organizations [14].

According to field research conducted among Madurese communities during 2016 to 2018, the author found several manuscripts which have never been opened for decades. Some parts of the manuscripts have even been taken care by second generation and already in fragments.

This is an empirical study based on some realities. **First**, manuscript owners lack knowledge, awareness as well as skills to preserve the manuscripts. Thus, they tend to not welcome the scholars in efforts to digitize their manuscripts. **Second**, owners sacred the manuscripts. **Third**, anxiety experienced by the author that manuscripts will likely be damaged due to late digitization. **Fourth**, Islamic State Institute of Jember is willing to digitize many manuscripts owned by local ulemas as materials for lectures and as research objects.

As a lecturer of Faculty of Tarbiyah (Education) and Teacher Training (FTIK) often dealing with several courses in Quranic (The Koran) and Tafsir (Interpretation) Study Program, the author is committed to motivating students and colleagues to increase their
manuscript image collections through manuscript digitization using smartphone camera with Office Lens installed.

This paper aims to: first, compare the resolution of manuscript archive master image captured by smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 with DSLR Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens. Second, to analyze the feasibility of manuscript archive master image resolution based on minimum resolution standard (performance level) of digital manuscript released by FADGI, Guidelines for Digitization released by UMass Amherst Libraries, and Technical Guidelines for Digitizing Archival Materials for Electronic Access: Creation of Production Master Files - Raster Images released by US National Archives and Record Administration (NARA).

2 Manuscript Digitization

2.1 Methods of Manuscript Digitization

Microfilm has been the solution for manuscript photography since the 1930s as back then scientist had no many options at the time of manuscript discovery. The option was that they brought the manuscripts home or made some copies using microfilm system. On accessing textual documents, scholars use the manuscript’s microfilm as an alternative and remote way to access the manuscripts.[15]

In Indonesia, the Sonobudoyo museum has collaborated with the Ford Foundation to digitize its manuscript collection, though the system of the microfilm making and displaying are extremely costly. Nevertheless, the results of the manuscript digitization in Indonesia can be accessed through a catalog by Henri Chambert-Loir and Oman Fathurahman.[16], [17].

Over the past few decades, scanners have been used by many scholars to digitize manuscripts. The process of scanning a manuscript with a scanner[5] requires extra effort as in scanning the manuscript must often be lifted and turned over. Scholars must take a good care when digitizing to maintain the originality and readability of the contents of the manuscript. The efforts to digitize manuscripts by the Sonobudoyo Museum using microfilm have been carried out and supported by a media-transferring project of the Ford Foundation. However, this project was a failure due to complicated processing and expensive tools. Sonobudoyo Museum has also run media-transferring with a scanner sponsored by Leipzieg University in cooperation with UIN SunanKalijaga as the local committee [17].

Nowadays, digitizing manuscript using Dual Camera Book Capture System as digitization equipment including DSLR or high-resolution CCD camera, including tripod or cradle (shooting bound and loose materials), flash lamp, laptop, and image editing software [18].

Image processing software is used to crop and process RAW images as archives master (often RAW, TIFF, CR2 extension) and convert them to JPEG or JPG extension as distribution master to uploaded to repository.

DSLR camera used by scholars varies. Thus, not only Canon and Nikon DSLR cameras as commonly used by manuscript preservators in Indonesia.

To digitize poor manuscripts, Stanford Libraries, Stanford University's library uses a set of PhaseOne P65+ Reproduction System cameras with digital back specifications in the form of a PhaseOne P65+ full frame CCD camera which is capable to produce 8984 x 6732 pixel images, with 300 PPI to 600 PPI resolution; at 8-bit color with a working speed of 120 captures/hour. To produce sharp and detailed images in the field of manuscripts, the PhaseOne
P65+ frame CCD camera is supported by several devices. First, Digital Transitions R-Cam Reprographic. Second, Macro 72mm Macro Schneider lens. Third, motorized repro stands to facilitate scholars to move the PhaseOne P65 + CCD position up and down and accelerate the lens focus in the manuscript field placed horizontally. Stanford Libraries chooses the TIFF or LZW file format in the digitized manuscript image master archive with this device [19].

Although using the PhaseOne P65 + CCD camera main device with repro stand motorized, for digitization, manuscripts are still in good condition, Stanford Libraries used the Canon DR-7090C scanner with a resolution of up to 600 PPI, on 8-bit color. This scanner is capable of producing 88 images/minute in a 12-inch x 17-inch scan field stored in the TIFF or LZW format [20].

In Indonesia, digitizing manuscripts in Yogyakarta's Sonobudoyo museum uses a manual book scanner owned by the University of Leipzig.[17] This device’s characteristic like AtizBookDrive Pro used by Stanford Libraries to digitize non-manuscript books with fairly vulnerable physical conditions [21].

2.2 The Needs of Manuscript Image Resolution

Scientists of humanity are desperately in need of High-resolution manuscripts as occurred in the National Library of France and the National Library of the Netherlands. In general, they need to access various manuscript sources and complete information through the library website and library repository. The needs includes physical paper and the manuscript archive master image.[22]

According to Koning, in a study conducted by the National Library of France, two groups of library users appear with contradictory text preference needs: first, groups which prefer to work with high quality original manuscript (both manuscript archive master image and original manuscripts). This group focuses on the quality of the manuscript archive master image. In their research, they were in need of high-resolution manuscript archive master image (one or some pages) with complete metadata. As manuscript researchers, they need detailed research on specific elements of a manuscript, rather than examining the contents of the manuscript. Therefore, they avoid blurry manuscripts as the research performance can be hampered. This first group is often referred to as researchers who conduct qualitative research on manuscripts.[22]

Second, qualitative researchers; this group needs manuscripts images with medium readable resolution to analyze the words patterns and quantity. Quantitative researchers require repositories which provide manuscript images with complete pages, not high-resolutioned manuscript images. A large number of manuscript images are needed with similar themes from open access repositories to download, process, and analyze the software. This group also includes full-text manuscript (scholarly edition) hunters. This particular group of scientists are not fond of the original version of the digitized manuscript, yet preferred the full-text version of the manuscript previously typed by other scientists. The group consists of scientists conducting quantitative research on a manuscript, especially those of computational methods. Open access manuscript image repository also needed by qualitative researchers.[23]

Medium resolution manuscript archive master image is also needed by: First, field researchers who obtained research data via manuscripts. To rescue the information, manuscripts should be digitized. Second, lecturers or teachers; this particular group uses manuscripts for teaching materials. The manuscripts owners are not allowed to borrow them. Thus, the digitization uses simple equipments as the result of a good deal for the class.

2.3 Office Lens
Office Lens is an application developed by Microsoft Research. This application was introduced in early 2014 and is available for Windows Phone 8 at the beginning of March 17, 2014. This application was designed to help users to capture information on the board, documents, business cards and save them in PDF, Word, OCR, or PowerPoint file format, in One Drive storage, phone memory, Microsoft's cloud service, or store it in the OneNote application.

Office Lens was made to help users to quickly capture information, with less than 90 degrees angle from the object and automatic cropping. It can also minimize shadows on objects, get rid of odd angles, and auto-correct capturing angle to 90 degrees. Office Lens has four capturing modes, business card mode designed to maximize business card image, document mode optimized for photographing document images to get clearly visible and readable document text, whiteboard mode can produce whiteboard photos with optimally readable letters, and photo mode can help users maximize in taking people and natural objects.

### Manuscript Image Quality Standardization

Federal Agencies Digital Guidelines Initiative (FADGI) released manuscript digitization performance levels that contain 4 levels of digital manuscript quality, “1 star” to “4 stars”. Manuscript archive master image with 300 PPI resolution can be categorized to “3 star” FADGI performance level when fulfilling measurement parameters, including tone response (OECF) (luminance) ≤ 5, white balance error (luminance) ≤ 4, illuminate non-uniformity < 3%, color accuracy (mean ΔE 2000) < 5, color channel misregistration < 0.50 pixel, and several other parameters. Whereas, the manuscript archive master image with 400 PPI resolution can be categorized to “4 star” FADGI performance level when measurement parameters are fulfilled, including tone response (OECF) (luminance) ≤ 2, white balance error (luminance) ≤ 2, illuminate non-uniformity < 1%, color accuracy (mean ΔE 2000) < 3, color channel misregistration < 0.33 pixel, and several other parameters.

UMass Amherst Libraries also released different parameters for categorize manuscript archive master image. In Guidelines for Digitization, UMass Amherst Libraries divides digital manuscript into 6 types. First, Preservation/Service: TIFF image format with 300-600 PPI resolution, 3000-6000 pixels, 24-bit color or 8 bit grayscale, and uncompressed file. Second, Full Size-High resolution: JPEG/PNG image format, 300-600 PPI resolution, 3000-6000 pixels, and 24-bit color or 8 bit grayscale. Third, Full Size-Low Resolution: JPEG/PNG image format, 150 PPI resolution, 3000-6000 pixels, and 24-bit color or 8 bit grayscale. Fourth, Medium: JPEG/PNG, 150 PPI resolution, 600 pixels, and 24-bit color or 8 bit grayscale, and fifth, Thumbnail: JPEG image format, 150 PPI resolution, 150-200 pixels, and 24-bit color or 8 bit grayscale.

US National Archives and Record Administration (NARA) also released Technical Guidelines for Digitizing Archival Materials for Electronic Access: Creation of Production Master Files – Raster Images. To digitize grayscale documents, accurate color information is needed. It recommended image parameter and alternative minimum.

NARA recommended that each document was captured in 24-bit RGB mode and 400 PPI resolution for document with 1,0 mm character or above. Yet, it also provides alternative minimum criteria that document can capture in 24-bit RGB mode and 300 PPI resolution for document with 1,5 mm character or above.

### Methodology
This paper explores experimental research. The data were collected through manuscript capture using smartphone and DSLR on July 11 2018 at Lumajang District. The manuscripts were captured in the evening using two cameras (flash light on). First, smartphone Xiaomi Redmi 5a camera with Office Lens version 16.0.10228.20093 which was installed to captures JPG image format. Second, using DSLR camera Canon EOS M10 mirrorless camera with Canon EF-M 15-45mm f/3.5-6.3 IS STM lens captures JPG and CR2 image format.

This paper proposed methods as follows: First, by analyzing the feasibility of manuscript archive master image captured by smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 and DSLR Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens and are decoding and analyzing metadata using JPEGsnoop v 1.8.0, android application Exif Tool version 1.54 and Matlab Image Information, then all metadata manually compared by the author.

Second, calculating projection resolution (PPI) using 13 and 14 inches LCD projector and LCD monitor. Third, analyzing manuscript’s image performance level using performance level released by Federal Agencies Digital Guidelines Initiative (FADGI), Guidelines for Digitization released by UMass Amherst Libraries and Technical Guidelines for Digitizing Archival Materials for Electronic Access: Creation of Production Master Files – Raster Images released by US National Archives and Record Administration (NARA). In this experiment, author did not measure image quality using FADGI measurement parameters.

In this experiment, PPI was calculated using formula as follows:

\[
PPI = \frac{\sqrt{w^2 - h^2}}{d_l}
\]

In which \( w \) is width (in pixel), \( h \) is height (in pixel) and \( d_l \) is LCD projector or LCD monitor screen diagonal size (inches).

4 Experiment Result

4.1 Metadata Comparison

In this paper, manuscript archive master images were captured by smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 (JPG) and DSLR camera Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens (JPG and CR2 format), then decoded and analyzed using JPEGsnoop v 1.8.0, Exif Tool version 1.54 (android application) and Matlab Image Information to get metadata. The author applied manual comparison for all metadata provided.
Figure 1. Image Captured By smartphone Xiaomi Redmi 5a Camera Using Office Lens Version 16.0.10228.20093, Decoded With Jpegsnoop V 1.8.0.

Figure 2. Image Captured By DSLR Camera Canon Eos M10 Mirrorless Camera using Canon EF-M 15-45mm F/3.5-6.3 Is Stm Lense, Decoded With Jpegsnoop V 1.8.0.

Metadata Comparison:
1. Smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093

Table 1. Smartphone xiaomi redmi 5a camera using office lens version 16.0.10228.20093 image metadata(jpg) (filename 2018_07_11 18.41 office lens.jpg)

<table>
<thead>
<tr>
<th>Image Forensic Application</th>
<th>JPEGsnoopv 1.8.0</th>
<th>Exif Tool Android v 1.54</th>
<th>Matlab Image Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Type</td>
<td>JPEG</td>
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<td></td>
</tr>
<tr>
<td>File Type Extension</td>
<td>jpg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Format</td>
<td></td>
<td>jpg</td>
<td></td>
</tr>
<tr>
<td>Compressio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISO</td>
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<td>100</td>
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</tr>
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<td>f/2.2</td>
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<td></td>
</tr>
<tr>
<td>Exposure</td>
<td>232/10000 s</td>
<td>1/43</td>
<td></td>
</tr>
<tr>
<td>Camera pixel setting</td>
<td>13 MP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>3244 x 4000 px</td>
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<tr>
<td>ColorType</td>
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<tr>
<td>Light Value</td>
<td>7.7</td>
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<td>Brightest pixel search</td>
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<td>Flash</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>Class 2 - Image has high probability of being processed/edited</td>
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<td></td>
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<tr>
<td>File size</td>
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<td>1152 kB</td>
<td>1180042 bytes</td>
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<td>Compression ratio</td>
<td>33.01:1</td>
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</tr>
<tr>
<td>Bits per pixel</td>
<td>0.73:1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. DSLR Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens

**Table 2.** DSLR canon eos m10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens metadata (jpg) (filename: img_2757.jpg)

<table>
<thead>
<tr>
<th><strong>Image Forensic Application</strong></th>
<th><strong>JPEGsnoop v 1.8.0</strong></th>
<th><strong>Exif Tool Android v 1.54</strong></th>
<th><strong>Matlab Image Information</strong></th>
</tr>
</thead>
<tbody>
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<td>File Type Extension</td>
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</tr>
<tr>
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<td>jpg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression</td>
<td>JPEG</td>
<td>JPEG (old-style)</td>
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</tr>
<tr>
<td>ISO</td>
<td>6400</td>
<td>6400</td>
<td></td>
</tr>
<tr>
<td>Lens Aperture</td>
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<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Exposure time</td>
<td>1/80 s</td>
<td>1/80</td>
<td></td>
</tr>
<tr>
<td>Camera pixel setting</td>
<td>17.9 MP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>5184x3456 px</td>
<td>5184 x 3456 px</td>
<td>5184x3456 px</td>
</tr>
</tbody>
</table>
3. DSLR Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens

Table 3. Dslr canon eos m10 mirrorless camera using canon ef-m 15-45mm f/3.5-6.3 is stm lens image metadata (cr2) (filename img_2757.cr2)

<table>
<thead>
<tr>
<th>Image Forensic Application</th>
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<th>Exif Tool Android v 1.54</th>
<th>Matlab Image Information</th>
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<td>Format</td>
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</tr>
<tr>
<td>Compression</td>
<td>JPEG (old-style)</td>
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<tr>
<td>Lens Aperture</td>
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<tr>
<td>Exposure time</td>
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<td></td>
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<tr>
<td>Camera pixel setting</td>
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<td>5184 x 3456 px</td>
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</tr>
<tr>
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<td>Light Value</td>
<td>6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brightest pixel search</td>
<td>173,173,169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment Class 4 - Uncertain if processed or original</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.2 The Calculation of PPI Resolution

Based on the metadata comparison using JPEG snoop v 1.8.0, Exif Tool Android v 1.54, and Matlab Image Information, smartphone Xiaomi Redmi 5a camera with Office Lens version 16.0.10228.20093 apparently produces manuscript archive master image (JPG) with 3244x4000 pixel image resolution and DSLR Canon EOS M10 mirrorless camera with Canon EF-M 15-45mm f/3.5-6.3 IS STM lens manuscript archive master image (JPG and CR2) with 5184x3456 pixel resolution.

Each image was computed through the PPI resolution with the formula as follows:

$$PPI = \frac{\sqrt{w^2 + h^2}}{d_i}$$

The results show that: First, smartphone Xiaomi Redmi 5a camera with Office Lens version 16.0.10228.20093 produced manuscript archive master image in JPG format with 3244x4000 pixel resolution of the manuscript image when displayed on 13 inches LCD projector or LCD monitor screen can project 396.16 PPI image resolution. Yet, when projected on 14 inches one it can project 367.86 PPI image resolution. Second, DSLR Canon EOS M10 mirrorless camera with Canon EF-M 15-45mm f/3.5-6.3 IS STM lens produced manuscript archive master image in JPG format with 5184x3456 pixel resolution. It will show the manuscript image when displayed on 13 inches LCD projector or LCD monitor screen can project 479.26 PPI resolution, but if it is projected on 14 inches LCD projector or LCD monitor screen can project 445.03 PPI resolution. Third, DSLR Canon EOS M10 mirrorless camera uses Canon EF-M 15-45mm f/3.5-6.3 IS STM lens with output CR2 image 5184x3456 pixel resolution. It shows manuscript image when displayed on 13 inches LCD projector or LCD monitor screen can project 479.26 PPI resolution, but if it is projected on 14 inches LCD projector or LCD monitor screen can project 445.03 PPI resolution. This data Look similar to JPEG image data captured by the same camera.

5 Discussion

In this paper, manuscript archive master image was analyzed with FADGI performance level, Guidelines for Digitization released by UMass Armherst Libraries and Technical Guidelines for Digitizing Archival Materials for Electronic Access released by U.S. National Archives and Records Administration (NARA), so the results are:

1. Manuscript archive master image captured by smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 with JPG format and 3244x4000 pixel resolution if displayed on 13 inches LCD projector or LCD monitor screen potentially meet “3 star” of FADGI performance level as projecting 396.16 PPI (over 300 PPI), if projected on 14
inches one can project 367.86 PPI (over 300 PPI) if other measurement parameters are fulfilled. This image meets UMass Amherst Libraries Full Size-High resolution criteria as it can project 300-600 PPI, 24-bit true color and dimension over 3000 pixels, it also meets NARA alternative minimum criteria because captured in 24-bit RGB mode and surpassed 300 PPI resolution.

2. Manuscript archive master image was captured by DSLR Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens (JPG and CR2) with 5184x3456 pixel resolution if displayed on 13 inches LCD projector or LCD monitor screen get 479.26 PPI resolution. If displayed on 14 inches LCD projector or LCD monitor screen. This result makes both images potentially meet “4 star” FADGI performance level if other measurement parameters are fulfilled. This image meets UMass Amherst Libraries full-size high-resolution criteria and NARA recommended image parameter criteria as it was captured in 24-bit RGB mode and surpassed 400 PPI resolutions.

6 Conclusion

Manuscript archive master image was captured by smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093. If projected on 13 inches LCD or LCD, monitor screen potentially meets “3 star” FADGI performance level when other measurement parameters are fulfilled. It also meets UMass Amherst Libraries full-size high-resolution and meets NARA alternative minimum criteria as captured in 24-bit RGB mode and surpassed 300 PPI resolutions.

Smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 can be used as an alternative equipment to make a full-size high-resolution manuscript archive master image for educational and research purposes. Whereas, lecturers or teachers in need of manuscript for learning materials and course practicum can use smartphone Xiaomi Redmi 5a camera using Office Lens version 16.0.10228.20093 which captured manuscript images as it can clearly be available on 13 inches LCD projector and LCD monitor screen. Many researchers focus on conducting research on manuscripts. It also comes true with qualitative researchers who use manuscripts as primary or subsidiary data source. They do not need high-resolutioned manuscript image, yet only readable manuscript images for their research purposes. Thus, the 396.16 PPI (projected on 13 inches LCD projector or LCD monitor screen) or 367.86 PPI (projected on 14 inches LCD projector or LCD monitor screen) manuscripts image with 24-bit color is perfectly acceptable their purposes.

Manuscript archive master image captured DSLR Canon EOS M10 mirrorless camera using Canon EF-M 15-45mm f/3.5-6.3 IS STM lens (JPG and CR2 image format) with 5184x3456 pixel resolution if projected on 13 inches LCD projector or LCD monitor screen (479, 26 PPI) and 14 inches (445, 03 PPI) potentially meet “4 star” FADGI performance level when other measurement parameters are fulfilled. This manuscript archive master image also meets UMass Amherst Libraries full-size high-resolution criteria and NARA recommended image parameter criteria as it was captured in 24-bit RGB mode and surpassed 400 PPI resolutions.

Office Lens can process image faster and easier than DSLR camera as Office Lens has fast auto-focus feature, automatic cropping system, can reduce image shadow, and get rid of odd angles, and auto correcting capturing angle to 90 degrees.
Acknowledgements. This paper in conjunction with The 2nd International Conference on Quran-Hadith, Information Technology and Media: Challenges and Opportunities (ICONQUHAS 2018).

References

[14] Chapter 7 Verse (1) Letter (i), The Indonesian Law No. 43 2007 about Library.


Green Computer Science Millennial Students Examination

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Abstract. Smartphones as one of information technology products have been affected higher education in various aspects. This article explains the usefulness of smartphones in facilitating online examination in information systems and computer science students. The research objective to be achieved by the researchers through the research, are as follows: 1) Utilizing smartphone as a media test online exam for green computing environment, 2) How to use social information technologies in online test, and 3) Explore the facilities or features that could be used for the online exam implementation. The observation was conducted with 100 students as respondents. Researcher used google forms to disseminate questions for online examination. The findings of the research showed that most the college students used Android OS for their online examination. Social technology like google forms has rich features in supporting online examination for computer science students. The use of smartphones, google forms, and facebook can create an atmosphere of modern, green computer science exams, efficient, and environmentally friendly.

Keywords: IT-based education, millennial students, mobile examination, smartphones.

1 Introduction

Information technology (IT) offers many wonderful applications over internet. IT provides new space for digital world activities. Statistic shows that digital population worldwide as of July 2018 [1] has passed 4 billion users. Figure 1 informs us that: 1) Active internet users are 4.119 billion, 2) Unique mobile internet users are 3.802 billion people, 3) Active social media users are 3.35 billion, and 4) Active mobile social media users are 3.096 billion users.

Current information technology has been collaborated with many sectors, such as business, government, health care, entertainment, politics, including IT-based education. Group of social technology or social media has been attracted author's attention for a long time [2]. Several researchers have studied social media in politics [3]-[4], business [5]-[6], and personality [7]-[8]. This article extends the previous article that cover online examination by using smartphones [9] and social technology [10]. IT linkeded blended learning environment through social technology, pervasive mobile device and cloud technology [11].

Recent IT development have been merged with communication and education sectors. In communication field, IT becomes main backbone for serving the movement of data among gadgets. In education field, IT serves the learning process between lecturers and students. Since mobile communication device used in the middle of 1990s, many aspects in our daily life change including transportation [12]-[15], travelling [16]-[18] and residential locations...
Smartphones are being adopted at a phenomenal pace because smartphones have a diverse set of media capture capabilities. Smartphones have many advantages in sending voice, text, image, data, in rich format and extreme speed. As handheld personal computers, smartphones represent the most recent step in the evolution of portable information and communication technology. Smartphone devices can be used both as a mobile telephone and as a handheld computer, containing a wide range of sensors and communications interface.

This ubiquitous technology is viewed as a versatile device that dominantly used by young people or millennial generation, a cohort we define here as adults ages 18 to 29. The Millennials were born in or after the year 1982 until 2002. This generation also known by Baby Boomer and Gen X generations. The term of “Millennials” is the winner based on the online polling by Peter Jennings from ABC News Tonight. Nielson reported that people own smartphone per age group could be seen in table 1.

Social media users are led by surged by more than 20 percent in 2018, with Facebook in particular posting impressive increases, despite already being the world’s most popular social platform for the past decade. Now, close to 2.8 billion people around the world use social media at least once a month, with more than 91 percent of them doing so via mobile devices.

<table>
<thead>
<tr>
<th>No</th>
<th>Age</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18-24</td>
<td>98%</td>
</tr>
<tr>
<td>2</td>
<td>25-34</td>
<td>97%</td>
</tr>
<tr>
<td>3</td>
<td>35-44</td>
<td>96%</td>
</tr>
<tr>
<td>4</td>
<td>45-54</td>
<td>89%</td>
</tr>
<tr>
<td>5</td>
<td>55-64</td>
<td>80%</td>
</tr>
<tr>
<td>6</td>
<td>65+</td>
<td>68%</td>
</tr>
</tbody>
</table>

The prediction by January 2018: 1) Total number of active social media users are 2.789 billion or equal to 37% of total population, and 2) Total number of social users accessing via mobile are 2.549 billion or equal to 34% of total population (see Figure 2).
Among various of social media, market leader Facebook keep stayed on top of the rank [35] followed by YouTube, WhatsApp, Facebook Messenger, etc. Facebook was the first social network to surpass 1 (one) billion registered accounts and currently sits at 2.05 billion monthly active users (Figure 3).

Social media users are led by surged by more than 20 percent in 2018 [34], with Facebook in particular posting impressive increases, despite already being the world’s most popular social platform for the past decade. Last but not least, smartphones can act as green technologies and as integral parts of green information systems [23].

Such as a personal computer (PC) or laptop, smartphones also operated by an operating systems (OS). The OS is the heart of a smartphone software system [36]. Today Smartphones OS are dominated by five major players, namely: 1) Android OS - Google Inc., 2) iOS - Apple Inc., 3) S60 OS - Nokia Inc., 4) BlackBerry OS - BlackBerry Ltd., and 5) Windows OS - Microsoft Corporation. According to International Data Corporation (IDC) [37], in the 2016 Q2, Android lead the market shares until 87.6% followed by iOS, Windows, etc.

The rest of this article is organized into 3 (three) more sections. The next section, Section 2, will discuss research methods. After that, Section 3, covers results and discussions. This article is closed with a conclusion as Section 4.

2 Methods

2.1 Respondents
Total respondents involved in this research amounted to 100 freshmen (early year students) who are taking courses of Knowledge Management Systems. This course is the main course on one of his concentrations in information systems (computer science faculty) fields, Knowledge Management Systems.

2.2 Action Observation

Author implements the observation in the class to analyze the benefits of smartphones in mobile students examination. Student seating positions are arranged according to their serial number in the attendance list. During the exam did not use paper at all because the test is done by using facilities provided by google form. The exam media involves a smartphone.

2.3 Exam Questions

The examinations are given 3 (three) times during a semester: 1) Daily Examination, 2) Middle Examination, and 3) Final Examination. All of those examinations consist of 10 (ten) questions.

The questions posed is currently online exam consists of three types, namely: 1) Multiple choices questions (four choices form a to d), 2) Dichotomy questions (provide only two possible answers, True or False), and 3) short answer questions (type less than three words answers).

The examination need to be done in 1 (one) hour and 15 (fifteen) minutes. The first 10 (ten) minutes are used to fill students information. The next 1 (one) hour is allocated for answering all of the 10 (ten) questions. And the last 5 (five) mintes are used for final check and submitting the answers.

2.4 Online Google Form

This study involves several application of social information technology, such as: 1) Google Forms as the medium for online examination, 2) FaceBook, 3) WordPress, and 4) DropBox.

Google Form is used as a medium by lecturers to provide examination questions. Google forms could be used to record and display students’ responses [38]. This application normally for online surveys [39], but later on could be used for many purposes or “one size fits all” [40].

Lecturer creates a questions sheet by using google forms. After all questions with the possible answers’ space ready, then lecturer send virtual form via 1) email, 2) Uniform Resource Locator (URL) or shorten URL, 3) Embed HTML. Lecture also able to share the online questions forms to 1) Google+, 2) Facebook, or, 3) Twitter. Lecturer needs to do setting for collecting students responses via google forms. Lecturer needs to set or make the google forms as “quizzes”. In quiz options, lecturer able to release the mark immediately or later after manual review (turns on email collection). Respondent or students can see: 1) Missed questions, 2) Correct answers, and 3) Point values.
Students will answer the questions through the given link via social media Facebook. Facebook is used to create a social media-based learning environment, group students based on their class, disseminate serial lecture contents, announce a number of information, provided examination URL.

Students will answer all of the questions from their mobile phone, personal computer (PC), or laptop. They need to input their valid Google email into the Google forms. Fill all the required fields in Google forms. After students finished submitting their answers, a confirmation response will display a confirmation message. Each question in this study has equal mark, 10 points. Google forms able to save the correct answer for automatically marking (see Figure 4).

3 Results and Discussions

According to the observations in the class, researcher able to synthesize some point of views as results. In the first result author would like to display a post in Facebook. This post is used to inform about the exam to the students. The lecturer needs to provide the date of the test, especially the time limit. Lecturers also need to provide a URL that will take students to Google forms containing exam questions online. Current Facebook able to display the preview from the URL (Figure 5). After student clicks the given URL then browser will take it to Google forms containing examination virtual sheet.
3.1 Students’ Characteristics

The number of students as respondents in this study amounted to 87 early year computer science students. Students who were respondents in this research are dominated by male students (53.9%), while female students amounted to 46.1%.

**Table 2. Respondent Information**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Sub Criteria</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Men</td>
<td>53.9%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>46.1%</td>
</tr>
<tr>
<td>Status</td>
<td>Students</td>
<td>89.7%</td>
</tr>
<tr>
<td></td>
<td>Private company</td>
<td>4.6%</td>
</tr>
<tr>
<td></td>
<td>Civil servants</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td>Self-employed</td>
<td>1.1%</td>
</tr>
<tr>
<td>Gadgets</td>
<td>Smartphone Android</td>
<td>54.0%</td>
</tr>
<tr>
<td></td>
<td>PC</td>
<td>Laptop</td>
</tr>
<tr>
<td></td>
<td>Smartphone</td>
<td>4.6%</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smartphone iPhone</td>
<td>1.1%</td>
</tr>
<tr>
<td></td>
<td>Smartphone Android</td>
<td>54.0%</td>
</tr>
</tbody>
</table>

Although most of the respondents were students (83.9%), but some of them have worked. Approximately 4.7% worked in private companies, 2.3% work as civil servants (PNS) or state-owned enterprises (BUMN), 1.2% self-employed, while the other 2.3%.

3.2 Students Identification Sheet

In virtual google forms there are a number of fields that must be filled out by the students. For this study, all the fields are mandatory. When student arrive into google form for their examination, they will found notes that consist of class code, exam type, exam instruction, time limit, and the URL.
3.3 Online Questions Sheet

The first type of questions is questions that require short answers. Lecturer limits the answer will be given by the students as much as a maximum of two words. Place to answer short questions provided under the given problem. Information scale scores for each question appears on the upper right. In this research, each question is 10 points.

The second type of questions is dichotomy. This type of questions has only two possible answers (true or false), see Figure 7.b for the example of this questions. Students need to click one of the best answer for this type of question. Type of dichotomy questions is basically a type of multiple-choice questions that has only two possible choices of answers.

The third type of questions are multiple choice questions. In this type, there are four possible answers. Each possible answer is coded in the form of the character 'a', 'b', 'c' or 'd'. (Figure 7). At the end of the google virtual form there is "Submit" button which enables students to submit all of the answers.

3.4 Respondent Focus
Based on observations at the time of the mobile based exam, students focus on their own smartphone when answering the given questions. Because the space in smartphones are relative narrow than personal computer or laptop, students have less pedagogical movement to change active screen. They will focus on signing their google account, complete personal identification, then answering 16 questions, followed by some evaluation questionnaires.

3.5 Real Time Response

After students finished answering their answers and then click submit from their active google form, the information will be appeared in admin/lecturer screen. Lecturer able to see who is the latest student that submit is/her answers through google form. In this research, author uses google forms to record and display students’ responses. The following figure shows how google forms display recently submitted answers from a student in real time.

3.6 Colorful Bar Chart Representation

One of google form facility is statistic visualization in bar chart or pie diagram. The statistical view of bar chart is enriched with percentage and legend of each part of the chart. The section of correct section of the chart will also signed by different colours (darker).

Figure 8. Multiple choice questions example.

Figure 8 shows an example of visual representation by using tab chart enriched with percentage. Figure 8 informs 69.9% of students answers are correct. The correct choice will be displayed in a darker color.

3.7 Robust Tabulation

After all students finished submitting their answers, google forms provide the facilities to open the respons in spreadsheet (create a new spreadsheet or select existing spreadsheet). The spreadsheet is similar to microsoft excel spreadsheet. Once we have the data in Excel then we are able to do some tabulations.
3.8 Online Examination Evaluation

At the end of the exam, students must submit their responses to the exam scheme. The first 3 (three) questions are related to comfortable aspect for students. According to their responses, majority of students are “very comfortable” and “comfortable” with online exam, smartphone-based exams.

The author also collects opinions from students about the types of questions asked during the online exam. The percentage type of questions most liked by students are “Multiple choices” of 42.7%. Meanwhile, the questions type that students do not like is “None” for 24.3%.

The percentage for learning and examination venue could be seen in Table 5. The students who “Likes” and “Really like” to study in the class are 68.9% and 22.3%. Meanwhile for study in laboratory, 49.5% of students are “Likes” and 35.9% are “Really like” (please see Table 5).

**Table 3. Respondent Comfortability**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>VC</th>
<th>C</th>
<th>QC</th>
<th>QC</th>
<th>Uc</th>
</tr>
</thead>
<tbody>
<tr>
<td>comfortable with the online exam</td>
<td>45.3%</td>
<td>46.5%</td>
<td>8.1%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>comfortable with smartphone-based exams</td>
<td>33.7%</td>
<td>50.0%</td>
<td>12.8%</td>
<td>3.5</td>
<td>-</td>
</tr>
<tr>
<td>comfortable with the smartphone-based online exam</td>
<td>30.2%</td>
<td>53.5%</td>
<td>16.3%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 4. Famous Questions Type**

<table>
<thead>
<tr>
<th>Percentage type of questions most liked</th>
<th>The type of questions</th>
<th>Percentage type of questions least liked</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.2%</td>
<td>All</td>
<td>15.5%</td>
</tr>
<tr>
<td>20.4%</td>
<td>Short Questions</td>
<td>19.4%</td>
</tr>
<tr>
<td>6.9%</td>
<td>Dichotomy</td>
<td>19.4%</td>
</tr>
<tr>
<td><strong>42.7%</strong></td>
<td>Multiple choices</td>
<td>21.4%</td>
</tr>
<tr>
<td>3.9%</td>
<td>None</td>
<td><strong>24.3%</strong></td>
</tr>
</tbody>
</table>

**Table 5. Study in The Laboratory**

<table>
<thead>
<tr>
<th>The percentage of students enjoys studying in the classroom</th>
<th>The type of study venue</th>
<th>The percentage of students enjoys studying in the laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.3%</td>
<td>Really like</td>
<td>8.7%</td>
</tr>
<tr>
<td><strong>68.9%</strong></td>
<td>Likes</td>
<td><strong>49.5%</strong></td>
</tr>
<tr>
<td>6.8%</td>
<td>Quite like</td>
<td>35.9%</td>
</tr>
</tbody>
</table>
The percentage of students enjoys studying in the classroom is %.

<table>
<thead>
<tr>
<th>The percentage of students enjoys studying in the classroom</th>
<th>The type of study venue</th>
<th>The percentage of students enjoys studying in the laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>Do not like it much</td>
<td>1.9%</td>
</tr>
<tr>
<td>1.9%</td>
<td>Do not like</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

The percentage for examination location could be seen in table 6. The students who “Likes” and “Really like” to have exam in the class are 67.4% and 18.6%. Meanwhile for having exam in laboratorium, 59.3% of students are “Likes” and 24.4% are “Really like” (please see Table 6).

Table 6. Exam In The Laboratory

<table>
<thead>
<tr>
<th>The percentage of students love the exam in the classroom</th>
<th>The type of exam venue</th>
<th>The percentage of students love the exam in the laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.4%</td>
<td>Really like</td>
<td>7.8%</td>
</tr>
<tr>
<td>67%</td>
<td>Likes</td>
<td>52.4%</td>
</tr>
<tr>
<td>11.7%</td>
<td>Quite like</td>
<td>32%</td>
</tr>
<tr>
<td>1%</td>
<td>Do not like it much</td>
<td>4.9%</td>
</tr>
<tr>
<td>1.9%</td>
<td>Do not like</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

The last evaluation is related to students comfortability in online smartphone-based examination by using google form. The percentage of “Comfortable” equal to 55.3% followed by “Very comfortable” for 30.1%, and some 12.6% are “Quite Comfortable” to use smartphone in their examination (see Figure 10).

![Figure 10. Examination by using google form evaluation.](image)

3 Results and Discussions

Based on the observation reported above, author reach to several following conclusions, as follow: 1) Smartphone-based examination become new trend in IT-based education activities, 2) Mobile examination has personal impact in promoting green base education, 3) Mobile examination trigger students to concentrate more on their own question, 4) Mobile
examination robust correcting process, 5) Dominant students are comfortable with smartphone-based exams, 6) Most of the students love all types of the questions especially “Short Questions”, 7) Most of the students loves to study and having exams both in the class and/or in the laboratory, 8) Most of the students also enjoys to study by involving social media facebook, and last but not least 9) This evaluation still has some limitations.

Acknowledgements. This paper in conjunction with The 3rd International Conference on Islamic Education, Information Technology and Media: Challenges and Opportunities (ICIED) in Malang, East Java.

References


Blood Donor Location Search Using Floyd Warshall Algorithm Based on Android For Increasing Blood Donor in Muslim Civil Society In South Tangerang PMI (Indonesian Red Cross)

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Abstract. The Indonesian Red Cross (PMI) is an institution engaged in social humanity, according to WHO (World Health Organization) is ideally availability of blood is 2% of the total population, which means that for Indonesia currently requires 4.6 million bags of blood, but the PMI only get less the requirement of 0.5% in 2005. The availability of blood bags at the office of the Indonesian Red Cross (PMI) City of South Tangerang, continues to diminish. In fact, no additional stock of blood bags, thus able to meet demand from a number of blood bags Hospital. This fact is reinforced by Dr. Alwan as director of PMI South Tangerang who said that in the provision of blood stock PMI South Tangerang still rely on blood donation every agency has been scheduled, but the location of blood donors are difficult to find. It is a problem in determining the closed distance to reach the location of a blood donor. Therefore, it is background to research Blood Donor Location Search Using Floyd Warshall Algorithm Based on Android. It can help people to get to the closed location the blood donor. Finally, the result showed the display user interface menus of application software. It fulfills the needs of a blood donor in PMI South Tangerang.

Keywords: Floyd-Warshall algorithm; Android; Shortest Path; PMI (Indonesian Red Cross); Blood Donor; Muslim Civil Society

1 Introduction

In Indonesia, the blood needs a minimum of about 5.1 million blood bags per year, or according to WHO (World Health Organization) is ideally availability of blood is 2 percent of the population. But the production of blood and its components now only 4.6 million bags from 3.05 million blood donations, as much as 86.20 percent of which came from voluntary blood donors. That means blood production nationally is still less than 500,000 bags of blood [5].

The view availability of blood national can be seen in the image below:
From the picture above shows the need for high blood bags make the Indonesian Red Cross (PMI) has continued to organize blood donation so that the supply of blood bags in Indonesia can be met, particularly in the UDD every region in Indonesia.

The availability of blood bags in the office of the Indonesian Red Cross (PMI) Serpong, South Tangerang continue to diminish. In fact, no additional stock of blood bags, so overwhelmed meet demand for blood bags from a number Hospital[7], the lack of participation of the community to donate blood is still lacking, was very influential in the blood supply in the UDD PMI Tangsel. Because the population of South Tangerang as many as 1,443,403 people (BPS Tangsel, 2014), 2% of the population requires a blood bag as many as 28 868 people per year. Meanwhile, the stock of blood bags Tangsel PMI data last Thursday (23/7), a total of 554 bags of blood that has been issued to meet the needs of hospitals. While before fasting to 900 bags of blood ejected by the PMI. From these data, it is quite far away there is a difference of about 55% [7]. As a result, a lot of demand for blood bags are not all fulfilled.

Based on the interviews with the Chief Director of the PMI South Tangerang namely Dr. Alwan said that in the provision of blood stock PMI South Tangerang still rely on blood donation every institution that has been scheduled, but the information search site blood donation is still a problem in determining the path closest to reach the site of blood donors so we need a system that can show the direction of the location a blood donation takes place.

In addition, according to an interview to Mr. Guntur as the marketing division that says that people do not want to know about blood donation location information. This becomes a problem and need to be considered in view of the high demand for blood stock in the PMI South Tangerang.

in religious terms called ta'awun is an effort to help each other, synergize between one party and another. Then the possibility can be positive and also negative. It is positive if you help to do it in terms of goodness, and negative if you help, it is done in terms of disobedience. In the teachings of Islam, the command to help is directed in a positive context, namely in matters of kindness and piety.

History has proven how a civil society in Madinah was formed thanks to ukhuwah (sense of brotherhood) and helped each other in kindness and piety between the Muhajirin and Ansar groups. Like this, please help in line with the basic objectives of Islam, namely in order to foster positive values and laudable character in every Muslim person.

A. The collection of the Proposal of the Qur'anic Verses About Help in Goodness and Devotion

Mutual help in kindness and piety is a very noble thing. A number of verses in the Qur’an have also stated explicitly about this order. Here is a Qur’an verses about helping in goodness
and piety that are important to us to know, as an affirmation that the habit of helping in the context of goodness and piety is part of the noble Islamic teachings.

B. The Translate Qur’an Surah Al-Maidah (QS 5 : 2): (9)

O you who have believed, do not violate the rites of Allah or [the sanctity of] the sacred month or [neglect the marking of] the sacrificial animals and garlanding [them] or [violate the safety of] those coming to the Sacred House seeking bounty from their Lord and [His] approval. But when you come out of ihram, then [you may] hunt. And do not let the hatred of a people for having obstructed you from al-Masjid al-Haram lead you to transgress. And cooperate in righteousness and piety, but do not cooperate in sin and aggression. And fear Allah; indeed, Allah is severe in penalty.

Floyd Warshall algorithm is one variants of dynamic programming, which is a method that perform troubleshooting by viewing solution that will be obtained as a decision interrelated. [3]

The algorithm works by calculating the shortest path (i, j, k) for all pairs (i, j), then the results will be used to calculate the shortest path (i, j, k) for all pairs (i, j), and so on. This process will continue until k = n and we have found the shortest path for all pairs (i, j) using the vertices intermediaries. [3]

Using this method because Floyd Warshall algorithm looked at solutions that will be obtained as a decision of interrelated so that better ensure the success of the invention of the optimum solution for the case of determining the shortest path. [4]

Based on searching on Play Store Android, there is currently no system that can provide the shortest route to the location information of blood donors. And referring to the studies above are still using the web to do research and have developed into a mobile version.

So, we make the title the research is "Blood Donor Location Used Floyd Warshall Algorithm on Android (Case South Tangerang PMI)".

The study have limitation problem bellow:

Program used shortest distance search method Floyd Warshall. Development system used RAD (Rapid Application Development), which consists of three phases: planning requirements, workshop design and implementation. The modeling system Using UML (use case diagrams, activity diagrams, sequence diagrams, and class diagrams). Software testing
used Black Box Testing. The location of blood donors in South Tangerang region, with reference to the data of the UDD PMI (Indonesian Red Cross) South Tangerang. The location have been scheduled by PMI or already routinely perform blood donors in each certain institutions. The software used, among others, the Eclipse IDE for Java Developers Neon.1 Release (4.6.1), Sublime Txt 3, Microsoft Visio 2013. The application is built using the Java language, using SQLite database. The road map is used major roads, excluding the small streets or alleys.

This paper is organized as follows. Section 2 describes the related work of this research. Section 3 describes the method which used in this research. Section 4 describes the result and discussion. Finally, sections 5 resent our conclusion.

2 Related Works

The study the shortest path problem with cycles on a network; however the results can be simply applied to cases on a graph. They review the Floyd–Warshall algorithm that finds both the shortest costs and the shortest routes between every pair of nodes on this network, and develop a new efficient algorithm for this problem that reduces the required computational effort of the Floyd–Warshall algorithm substantially. [1]

Presented approach reduces the transitive closure calculation time for parameterized graphs representing all dependences in the loop in comparison with that yielded by means of techniques implemented in the Omega and ISL libraries. [2]

The Floyd-Warshall algorithm is a simple and widely used algorithm to compute shortest paths between all pairs of vertices in an edge weighted directed graph. It can also be used to detect the presence of negative cycles. We will show that for this task many existing implementations of the Floyd-Warshall algorithm will fail because exponentially large numbers can appear during its execution. [4]

3 Methods

The research used method of below:

3.1 Data Collection Methods

This research used: Observation, Interview; two persons of the PMI South Tangerang, namely Dr. M. Alwan A.T as Director of PMI South Tangerang and Mr. Guntur as marketing division. and literature review

Systems Development Method

In Designing Search System Blood Donor location with Floyd Warshall method, the authors use the method of system development Rapid Application Development (RAD).[8] There are three stages in the RAD, namely: 1. Requirements Planning Phase; 2. Stage Design Workshop; 3. Implementation phase

3.2 The Requirements Planning Phase

Consist of: 1. Problem Analysis; 2. Defining the problem; 3. Walking System Analysis; 4. Analysis of the Proposed is: the design system location search using Floyd – Warshall algorithm on Android-based as mobile device platform. We use the shortest distance search by
Floyd - Warshall Algorithm. It is one variant of the method of finding the closest distance to compare all the possible trajectories on the graph for each side of all the nodes that exist, so that the conclusions are very optimal.

3.3 Floyd Warshall Algorithm Analysis

3.3.1 Work Steps Floyd Warshall algorithm

These algorithms find the shortest route from the origin node to the destination node in a graph by comparing all the possible trajectories \((s)\) on a graph for each side of all nodes. The steps in determining the shortest route to the Floyd-Warshall algorithm namely:

a. The first issue is divided into several stages and creates a flowchart to facilitate the search for the shortest route.
b. When entering into a stage, the yield on the stage will be a new node to the next stage.
c. Define the first point as a starting point in order to do a search algorithm.
d. Find neighboring node directly to a node (the starting point).
e. Compare the weight of each stage are already summed with weights in the preceding stage, find the route with the weight of the smallest to the search process ends.
f. The weight held by a stage will be summed with weights exist at earlier stages as the number of stages.
g. The search stops when the destination node has been found.
h. After the process is complete, check out how these were acquired for a specific purpose and to select a route with the least amount of weight to be the shortest route from Floyd-Warshall algorithm.

3.3.2 Floyd algorithm flowchart Warshall

The algorithms design the flowchart to completed steps

3.3.3 Calculation Algorithm Floyd Warshall

The examples case that Floyd-Warshall algorithm calculation. It shows connectivity between route conditions in the region in this case, suppose someone will do a blood donor from point 3 to point 6. It seen in a graph following the map in

![Figure 3.1.](image1.png)

Figure 3.1. Undirected graph
The initial step is to group each stage of the search process and find nodes are connected directly to the node that is being reviewed, the process is as follows:

1. **Stage 1:** At this point node being reviewed is point 3. Then point 3 has two candidates solution that points 2 and 4.
2. **Stage 2:** Once phase 1 is completed to review, so now there are processes performed on stage 2, where the candidate point solutions exist at one stage, namely points 2 and 4 to be used next node on stage 2. Points 2 and 4 have candidate solutions i.e. 5 points, 1 and 9.
3. **Stage 3:** After phase 2 is completed to review, so now the process will be carried out there at stage 3, where the candidate point existing solutions in two stages ie 5 points, 1 and 9 for further used as a node in step 3. Points 5, 1 and 9 have candidate solutions that points 6,0,10 and 8.
4. **Stage 4:** In stage 4 until the latter stages will be explained through a flowchart, a process carried out in four stages similar to the process performed on the stages before. And if the points of interest is found, the calculation in Stop.

The following flowchart depiction is a description of the process flow of the search Floyd Warshall algorithm based cases.

![Flowchart](image)

**Figure 4.** Flowchart 5 cases of use Floyd Warshall algorithm

**Description of figure 4:**
- $X_i$ = Point Node
- $S_i$ = Candidates Solutions

**4 Result and Discussion**

Based on chapter 3 above we described follow:
- $f$: the value of the distance between a point-per-stage (in meters)
- $k$: phases of (1, 2, 3, 4, ..., n)
- $x$: node / point of origin by-step
- $s$: nodes under review to become candidates per-phase solution

**Stage 1:** $f_1 (s) = cx_1s$

<table>
<thead>
<tr>
<th>Table 1. Table Floyd Warshall Calculation Process Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>point of Interest</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Point of Interest</td>
</tr>
</tbody>
</table>
The first stage, the algorithm Floyd Warshall perform the calculation process from point of origin to the point 3-point interconnected to the point 6. In the first stage point 3 is connected with points 2 and 4, each point has a value of distance 2820 m and 4227 m. The following will be shown a map of the calculation of the shortest route phase 1 shown in Figure 5.

![Figure 5. Phase 1-searching shortest path Floyd-Warshall algorithm](image)

Phase 2: \( f_2(s) = \min \{cx_2 s x_2 + f_2-1(x_2)\} \)

<table>
<thead>
<tr>
<th>Point of Interest</th>
<th>Optimum Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>( x_2 )</td>
<td>( f_2(s) = \min x_2 {cx_2 s + f_2-1(x_2)} )</td>
</tr>
<tr>
<td>1</td>
<td>5072</td>
</tr>
<tr>
<td>9</td>
<td>4520</td>
</tr>
<tr>
<td>5</td>
<td>6313</td>
</tr>
</tbody>
</table>

The second stage, the Floyd Warshall Algorithm performs the process of calculation of the origin 2 and 4, which had previously been a candidate point solution in step 1. The candidates have a solution that is point 1, 9 and 5, each point has a value range as following:

1. The total distance obtained through the calculation of phase 1, namely: \(3 \rightarrow 2\) = 2820 m
2. The distance obtained in the calculation of phase 2, namely: \(2 \rightarrow 1\) = 2252 m
3. The total distance obtained through the calculation of phase 2, namely: (3 \rightarrow 2) + (2 \rightarrow 1) = 2820 m + 2252 m = 5072 m

Calculation of the distance to the point that others are:
1. The total distance obtained through the calculation of phase 1, namely: (3 \rightarrow 2) = 2820 m
2. The distance obtained in the calculation of phase 2, namely: 2 \rightarrow 9 = 1700 m
3. The total distance obtained through the calculation of phase 2, namely: (3 \rightarrow 2) + (2 \rightarrow 9) = 2820 m + 1700 m = 4520 m

While the calculation for the distance to the point is:
1. The total distance obtained through the calculation of phase 1, namely: (3 \rightarrow 4) = 4227 m
2. The distance obtained in the calculation of three stages, namely: 4 \rightarrow 5 = 2086 m
3. The total distance obtained through the calculation of phase 2, namely: (3 \rightarrow 4) + (4 \rightarrow 5) = 4227 m + 2086 m = 6313 m

Stage 3: \( f_3(s) = \min \{ CX_3 s x_3 + f_{3-1}(x_3) \} \)

<table>
<thead>
<tr>
<th>Point of Interest</th>
<th>Point of Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_3(s) = \min x_3 { CX_3 s x_3 + f_{3-1}(x_3) } )</td>
<td>Optimum Solutions</td>
</tr>
<tr>
<td>( x_3 )</td>
<td>( x_3 )</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>0</td>
<td>5356</td>
</tr>
<tr>
<td>10</td>
<td>6486</td>
</tr>
</tbody>
</table>

Table 3. Calculation Process Floyd Warshall Stage 3

The third stage, the Floyd-Warshall algorithm process of calculating from the origin 1, 9 and 5, which had previously been a candidate point solution in step 2. And the candidates have a solution that is point 6, 0 and 10, which each point has a value distance as follows:

1. The total distance obtained through the calculation of phase 2, namely: (3 \rightarrow 1) = 5072 m
2. The distance obtained in the calculation of three stages, namely: 1 \rightarrow 6 = 1280 m
3. The total distance obtained through the calculation of 3 stages, namely: (3 \rightarrow 1) + (1 \rightarrow 6) = 5072 m + 1280 m = 6352 m

Calculation distance from one point to others is:

1. The total distance obtained through the calculation of phase 2, namely: (3 \rightarrow 5) = 6313 m
2. The distance obtained in the calculation of three stages, namely: 5 \rightarrow 6 = 622 m
3. The total distance obtained through the calculation of 3 stages, namely: (3 \rightarrow 5) + (5 \rightarrow 6) = 6313 m + 622 m = 6935 m

Calculation of the distance to another point is the total distance obtained through the calculation of phase 2, namely: (3 \rightarrow 1) = 5072 m

1. The obtained distance in the calculation of phase 3, which is 1 \rightarrow 0 = 284 m
2. The total distance obtained through the calculation of 3 stages, namely: (3 \rightarrow 1) + (1 \rightarrow 0) = 5072 m + 284 m = 5356 m
While the calculation for the distances to the point are:

1. The total distance obtained through the calculation of phase 1, namely: $(3 \rightarrow 9) = 5420m$
2. The distance obtained in the calculation of phase 2, namely: $9 \rightarrow 10 = 1066 m$
3. The total distance obtained through the calculation of phase 2, namely: $(3 \rightarrow 9) + (9 \rightarrow 10) = 5420 m + 1066 m = 6486 m$

The following will be displayed map the shortest route calculation in accordance with step 3 in Figure 6.

From the analysis that has been sought, the importance of the two routes on blood donors who were in item 6. The following will be reordered 2 service obtained from the process of manual calculations using Floyd Warshall algorithm along with the distance of each route that has been traced for later compared data to where the shortest route to use search distance with Floyd Warshall algorithms.

Route 1: $3, 4, 5, 6 = 8935 m$
Route 2: $3, 2, 1, 6 = 6352 m$

![Figure 6. Phase 3-search shortest path Floyd-Warshall algorithm](image)

From both these, the results of each route are then compared and obtained the shortest route on the route to two with a total distance of 6352 m, so to get to the location of blood donors who are in point 6, these were obtained using the algorithm of Floyd Warshall is 3.2, 1.6. The following route map will be displayed from the calculation of the shortest route is obtained using Warshall Floyd algorithm, can be seen in Figure 7.

![Figure 7. The results of shortest path Floyd-Warshall algorithm](image)

Results Display User Interface:

1. Pageviews splashscreen
Image is an application splashscreen display. This page is the start page appears when you first run the application.

2. Home Page Views
   Image is the home display applications. This page is the home page that appears after splashcreen run.

3. Pageviews Stock Blood
   Image is the blood stock display applications. This page is the page that contains the features of blood stock selection blood stock information blood type A, B, AB and O.

4. Route Info Page Views
   Image is the info view these applications. This page is the page that contains the information feature maps the path closest to the location of a blood donor.

5. Location Info Page Views
   Image is an application location. This page is a page that displays feature location info map locations of donor blood that has been scheduled by UDD PMI South Tangerang.

6. Information Page Views
   Image is an information display applications. This page is a page that displays information feature selection user information required.

7. Calls Page Views
   Image is an application call display. This page is a page calling features that serve to make calls to the UDD Red Cross for the benefit of emergency first aid as well as information about the info blood.

8. Setting Page Views
   Figure is a display page calls an application that serves to make a call directly from our smartphone to UDD PMI.

5 Conclusion

The conclusions are:

1. Applications built already running on Android devices and can access content residing on the database on the server machine interface, and successfully demonstrated the shortest route directions to the location of the desired blood donor.

2. Various software (different versions of the Android OS) that is different, it can run all the application's features well.

3. Applications Search locations UDD PMI South Tangerang was able to show some of the features such as, blood stock location info, call and others, as well as finding the shortest route algorithm by applying Floyd-Warshall.

The suggestion are:

1. The development of further applications are expected to be able to show the data path that includes the types of roads (main roads and minor roads) and capable of adapting to road traffic conditions in the city of South Tangerang.

2. In the search application development next blood donor locations expected to have more other features in the app menu.

3. In the search application development locations next blood drive is expected to be operated not only on android smartphone, but also can be operated on any other platform.
4. The system is made to update the database is static (not dynamic).
5. The test results of blackbox testing there are still some features that are less attractive, such as its location so that there is no marker for further research can show the location marker to make it more attractive.

References

Root Cause Analysis using Cause and Effect Diagram to Identify Application Requirement

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Abstract. One of the ways to solve a problem is to identify the problem and its causes using root cause analysis method. The main problem discussed in this research is the ineffective business process used to handle service order from a customer. The method used in identifying the problem and finding the solution is Cause and Effect Diagram. This diagram is used because it may help to illustrate the causal factors of a problem and to determine which factors have the most significant contribution towards the main problem. The result of the problem analysis in the business process is used to determine the best solution that will be implemented into the mobile application that will be built. Thus, the built application may adjust the needs of the company and address its problems. This research concludes that the root causes of the problem are the process and human factors. Therefore, the solution implemented into the application focus on the business process improvement that can facilitate and prevent the users from making mistakes during the process.

Keywords: Root Cause Analysis, Cause and Effect Diagram

1 Introduction

Developers will use specific method while developing an information system or application. It is done so that the developer may have a guide or reference; then the development process can be more systematic. Furthermore, each method has its advantages and disadvantages. Therefore the developer may choose which method fits best the system. A case study that is discussed in this research is about the mobile application used to order a house-cleaning service provided by CV Kaalitas Hidup Sejahtera. This application is built using Rapid Application Development method. This method is chosen because the application has small-scale and time required to develop is limited. Thus this method fits the best.

Rapid Application Development (RAD) method has four core steps; they are system requirement planning, system design, system development and implementation (Pressman, 2010; Sommerville, 2011; Kosasi and Yulianti, 2015). On the first step, the developer will meet the client or end-user to discuss and identify the goals, project scope, and requirements of the application. The goal in this step is to solve the problems happen in the company.

To solve the problem, then both developer and end-user need to know what problem is happening inside the business process. When the problem is identified, then the best solution may be generated. This will also support the purpose of the RAD process which is to accelerate the development process. It is because the application is developed based on the scope without adding unnecessary components. Furthermore, Rad process helps the developer...
to limit the user’s expectation specifically towards the application. By designing the solution that fits best the problem, then the developer may do that easily because the user has already understood what they need based on the problem they are facing.

One of the ways to analyze a problem is by using the Cause and Effect Diagram or more commonly known as the Fishbone Diagram. Called as Fishbone Diagram, because it consists of a box representing the fish head containing the main problem, and lines representing the fish bones containing the causes of the problem. The Fishbone diagram is an analysis tool that provides a systematic way of looking at effects and the causes that create or contribute to those effects (Chang and Lin, 2006; Ilie and Ciocoiu, 2010; Wong, 2011). Fishbone Diagram usually used in system analyzing in the operation management to express the relationship of causes and effects between various factors and the problem qualitatively (Luo et al., 2007). The purpose of this diagram is to do reparation and improvements (Doshi et al., 2012). By knowing the causes then the best solution may be generated because it focuses on its causes.

The Purposes of this research are to analyze the causes of the problem happening inside the business process study case small enterprise and to determine the application requirement based on the problem. Therefore the application can provide the best solution to the problem.

This research is limited only to discuss the process of cause analysis of the problem in the business process, and the result of the analysis is implemented to determine the solution in the form of application requirements.

2 Research Method

Our research framework described as shown in Figure 1. According to Figure 1, our framework consists of four stages. There are root cause analysis, cause and effect diagram, application requirement, and business process stage.
2.1 Root Cause Analysis

Root Cause Analysis is a process meant to identify the root causes of a specific problem which leads to disadvantages and to develop team countermeasures (Center for Medicare & Medicaid Services). Another definition said root cause analysis is the task of identifying root causes as well as the components they affect (Julisch, 2003; Carroll et al., 2002; Wilson, 1993). More details, Root cause analysis is the process or methodology of identifying causal factors using a structured approach with techniques designed to provide a focus for identifying and resolving problems (Doggett, 2004; Rosenfeld, 2013). By using RCA, the team will be able to identify the breakdowns happen in a process or system which cause a problem and how to address them. RCA’s purpose is to define what is happening, why is it happening, and what changes to do.

RCA has four processes, such as the following (Tomic and Brkic, 2011).

a. Data Collection
The first step of the analysis process is to collect the data about the problem.

b. Causal Factor Charting
Causal factor charting provides a structure for the investigating team to analyze the gathered information. This step starts by creating a fishbone diagram contained by relevant data. When all the cases have been charted, the analysts can determine which case contributes the most towards the problem, later called as a causal factor. These factors are the contributors which when addressed may solve the main problem.

c. Root Cause Identification
After all the causal factors have been identified, the analysts will start to define the root causes. At this step, the analysts will identify the reason why those factors appear or happen. This identification will help them to know why those factors happen so they can formulate the best solution.

d. Recommendation Generation and Implementation
The next step is the formulation of recommendation or solution for the problem. This recommendation is based on the root cause identification step.

2.2 Cause and Effect Diagram

Cause and Effect Diagram or commonly known as Ishikawa or Fishbone Diagram (as shown in Figure 2) is the cause and effect analysis developed by Dr. Kaoru Ishikawa which illustrates a problem and its causes in the form of fish bones (Asmoko, 2013). The design of this diagram is the following.

a. The main problem is placed on the head of the fish on the right of the diagram.

b. The possible causes of the problem are placed on each fish bones on the left of its head.

This diagram can also be used in the system or process changing or improvement (Asmoko, 2013). This diagram can also be used in the system or process changing or improvement (Asmoko, 2013). This diagram has advantages and disadvantages. Based on WBI Evaluation Group (2007), the benefits are: (1) this diagram enables the analysis towards any possible causes to the problem; (2) This technique is easy to implement and produce the visual representation of the causes, cause categories, and the easy-to-understand needs which have to be fulfilled in order to solve the problem; (3) By using this diagram, the team can focus on the cause of the problem. While the disadvantages are its simple design can make it difficult to represent the connection between a problem and its causes on the complex situation.

The steps to create a fishbone diagram are as follows (Kusnadi, 2011; Asmoko, 2013).
a. Make a diagram structure

Fishbone diagram structure consists of a fish head which placed on the right of the diagram. This fish head will have a role to show the main problem. The second part is the fins which have a role to show the categories of the main causal factors. The last part is the fish bones which has a role to show the causes. The following image is the illustration of a fishbone diagram structure.

![Fishbone Diagram](image)

**Figure 2. Fishbone Diagram**

b. Define the main problem
c. Formulate the main causal factors
   This step can be done by brainstorming. On this step, the team will define the categories of the causes. These categories are placed in the fin. The common categories usually are people, process, methods, etc.
d. Define the possible causes of each factor
   At this step, the team will define the causes on each category and place them as fish bones on each fin.
e. Illustrate the problem and its causes in the fishbone diagram.

2.3 Application Requirement

Application requirement is the requirement of the application system domain and reflects the domain characteristic. There are two kinds of requirement, such as:
a. Functional requirement
   Functional requirements are the definition of the services the system has to perform and how the system should react towards the input and what the system should do in certain situations.
b. Non-functional requirement
   The non-functional requirement covers the condition that determines the quality of the application such as speed, security, user-friendliness, etc.

2.4 Business Process

Business process run in handling orders from customer consists of four steps including service initiation and introduction, service purchase, service schedule execution, and payment.
a. Service initiation and introduction
   In this step, the company’s customer service team will explain the services provided by the company. If the customer agrees to purchase then the process is continued to the next step.
b. Service purchase
Before purchasing the service, the customer will have to give information about their house or place to be cleaned. Afterward, the customer may choose service type, assign service schedule, and define the tasks that will be given to the team in Surat Perintah Kerja (work order).

c. Service schedule execution
   The team will come to customer’s location on the scheduled date to give the service. If the customer wishes to reschedule or cancel it, they have to inform the company about it no later than seven days before the schedule. Otherwise, the company will assume that the schedule is done and the customer will still have to make the payment.

d. Payment
   After all the schedule has done, the customer has to make the payment by transfer or cash.

3 Results and Discussion

Based on the business process explained in the previous section and the result of discussion with the company, there is the main problem that is the ineffective procedure to handle service purchase orders. In order to find a solution, it is best to know the causes first. Afterward, then the problem can be solved by eliminating the causes. The causes identified are as follow:

a. Service scheduling is done manually where before assigning it, the management has to check each cleaning team’s schedule to find their free time. It makes the customer has to wait for the confirmation from management about the schedule.

b. After assigning the schedule and team, there are possibilities the customer will wish to reschedule or cancel the service. Based on the company’s policy, if the customer wishes to do it, then they have to inform the company no later than seven days before the assigned date. However, sometimes customer forgets to do it which will give a disadvantage to them because they still have to make the payment.

c. Before giving services to the customer, the management team needs to get the information about the condition of customer’s house or mansion, its location, prioritized rooms, etc. in order to get that information; the team will ask the customer whether or not they are willing to take the survey. However, not every customer wants to do it because it needs more time allocation.

d. Cleaning team works under contract and Surat Perintah Kerja (work order). This letter is printed and given to the customer on every schedule.

e. The customer can order the service through telephone, SMS, Whatsapp, Facebook, and website. Unfortunately, the customer can only fill the service request form, but for the confirmation, scheduling, and SPK assigning are still done through telephone or e-mails.

f. The company still has a limited human resource (20 people) which causes limited capability to handle more orders.

The points of causes mentioned in the previous table then are grouped into several main causes. They are process, documentation, stakeholders (people involved in running the business process), and the technology used during the business process. The grouping details are in Table 1. The table also consists the level of influence of each cause towards the problem. By determining the level of influence, we may know which causes are the root causes of the problem. The cause which has the highest level of influence is the root cause. In this case, we have several root causes.
Table 1. Root Cause Determination

<table>
<thead>
<tr>
<th>No</th>
<th>Cause</th>
<th>Sub Cause</th>
<th>Level of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Process</td>
<td>Manual Scheduling Method</td>
<td>High</td>
</tr>
<tr>
<td>1.1</td>
<td></td>
<td>The customer has to wait for schedule confirmation</td>
<td>Low</td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td>Confirmation is given to customer one by one</td>
<td>Low</td>
</tr>
<tr>
<td>1.3</td>
<td></td>
<td>Ineffective survey method</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Documentation</td>
<td>SPK (work order) which must be printed</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Stakeholder</td>
<td>Limited human resource</td>
<td>High</td>
</tr>
<tr>
<td>3.1</td>
<td></td>
<td>Not all of the customer is willing to be surveyed</td>
<td>Low</td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td>Customer forgets to confirm schedule cancellation or rearrangement</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>Technology</td>
<td>The company website is not fully functioned</td>
<td>Low</td>
</tr>
</tbody>
</table>

After grouping the causes, then each point can be drawn into the Fishbone Diagram in Figure 3.

Figure 3. Fishbone diagram for the problem happening in the business process of Sapulidi professional and its causes

3.1 Problem Solving
Based on previous analysis, there are four root causes which contribute the most towards the problem. The root causes are the manual scheduling method, customer’s survey, schedule cancellation or rearrangement confirmation, and the lack of human resource. In order to eliminate those causes, the proposed solutions are as follows. These solutions (except the forth) will be implemented on the application.

a. Scheduling Method

On the current business process, the services are scheduled manually where the management team has to check whether there is any available employee on the expected date or not. The solution for this cause is by making the scheduling runs automatically by the system. Therefore, before customer gives their expected date for the service, they can choose any available date displayed on the application. The available dates are the dates when there are at least two employees available or are not assigned to any schedule. After that, the management team will be able to determine whether to accept the request or not and assign employees to the selected dates. By using this method, it will guarantee the availability of the dates displayed as available. It is beneficial for the management team so they can schedule the service effectively.

b. Customer’s Survey

Customer’s survey is meant for getting the information also needed for making work orders (Surat Perintah Kerja). The solution for this cause is by making a form that has to be filled by the customer before submitting a service request on the application. The form will collect information such as the customer’s location, prioritized areas to be cleaned, its condition, forbidden areas to enter, and tasks that will be given to the cleaning team. By surveying the form, it will eliminate the time and team needed to hold the survey.

c. Confirmation of Schedule Cancellation or Rearrangement

Sometimes the customer forgets to confirm the company that they want to cancel the schedule or rearrange it. The solution of this cause is by giving a reminder notification to the customer on seven and one days before the assigned date.

d. Lack of Human Resource

The solution of this cause is by increasing the number of employees which meet the qualification. By having more employees then the number of requests that can be handled will be increased too.

3.2 Application Requirements Identification

In formulating the requirements for the application, we need to identify the application scope, functional requirements, and non-functional requirements. The scope of this app covers service request and its handling, service scheduling, schedule execution, and post-service activities. Each main business function is broken down into several sub-functions explained in Table 2. The table also assigns which actor doing which function.
<table>
<thead>
<tr>
<th>No</th>
<th>Sub-function</th>
<th>Actor</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Registration functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Account registration</td>
<td>Customer</td>
<td>Register in order to get a new account</td>
</tr>
<tr>
<td>b.</td>
<td>Login</td>
<td>Customer, Admin, Cleaning Team</td>
<td>Access the system by doing login</td>
</tr>
<tr>
<td>2</td>
<td>Service Request functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Choose the type of service</td>
<td>Customer</td>
<td>Choose service type</td>
</tr>
<tr>
<td>b.</td>
<td>Choose available date</td>
<td>Customer</td>
<td>Choose the available date displayed on the app</td>
</tr>
<tr>
<td>c.</td>
<td>Create Work Orders (SPK)</td>
<td>Customer</td>
<td>Explain what tasks to be given to the cleaning team</td>
</tr>
<tr>
<td>d.</td>
<td>Submit request</td>
<td>Customer</td>
<td>Submit the request after completing all of the previous steps</td>
</tr>
<tr>
<td>e.</td>
<td>Cancel the request</td>
<td>Customer</td>
<td>Customer may cancel the submitted request as long as it has not been validated by the administrator</td>
</tr>
<tr>
<td>f.</td>
<td>Service request validation</td>
<td>Admin</td>
<td>Validate the information about the incoming request</td>
</tr>
<tr>
<td>g.</td>
<td>Request acceptance confirmation</td>
<td>Admin</td>
<td>Confirm whether the request is accepted or not to the customer</td>
</tr>
<tr>
<td>3</td>
<td>Scheduling functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Schedule allocation</td>
<td>Admin</td>
<td>Accept the submitted date or allocate a new date for the</td>
</tr>
</tbody>
</table>
b. Cleaning team allocation
   Admin
   Allocate the employees that will be assigned to the schedule

c. Get reminder notification
   Customer
   Get the notification about the allocated schedule

d. Review the schedule
   Customer
   Review the unfinished schedules

e. Change the schedule
   Customer
   Change the unfinished allocated schedule if needed

<table>
<thead>
<tr>
<th>Schedule Execution functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Access customer’s location Cleaning team Preview customer’s location by using Global Positioning System (GPS)</td>
</tr>
<tr>
<td>b. Work orders checklist Customer Check which task is finished by the cleaning team</td>
</tr>
</tbody>
</table>

5 Post-service functions
a. Complaint claim Customer Report any kinds of complaint about the given service

4 Conclusion

Based on the root cause analysis, we found out that the causes which contribute the most towards the problem are the ineffective process and human errors. Therefore, the solution which is implemented is focused on the quality improvement of the business process so the new business process can facilitate the service request handling in the company and avoid any kinds of error caused by users. However, the effectiveness of this solution is still normatively determined. It is because the application has only been internally tested during its development and not yet implemented on the real business process.

Acknowledgements. This paper in conjunction with the The 1st International Conference Recent Innovation (ICRI) 2018.
References

Design of Motorcycle Parking Management for Optimizing Queuing System at Exit Gate (Case Study: Esa Unggul University)

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Abstract. Tight competition among University made the University not selected by reputation only but also by the facilities. The parking area is one of the essential facilities to satisfy the demand for parking. Esa Unggul University is the one of University who has their parking area, for car and motorcycle. The long waiting line at servers of parking fee payment can make academicians feel dissatisfaction, especially students as the customers. The long waiting line can be caused by several factors, like the population’s size, the queue discipline, the number of servers, and design of the parking area. Even the method of work can be affected by the length of process time and causing the long line. Based on the analyze, the customer arrival rate (λ) is 3,493 motorcycle per minute, and the service rate (μ) is 3,440 motorcycle per minute. The standard time for servicing one customer is 18,885 seconds. Using queuing method and measuring of standard time method, there are three alternative models solutions. Alternative model 1 by adding the operator for checking Vehicle Registration Certificate. Alternative model 2 by building the notice boards and indicator light for showing the cause of queuing. Alternative model 3 by increasing the number of servers. The chosen model is model 2 and reducing the length of process time 40.909%. So the service rate (μ) up to 5,815 motorcycles per minute.

Keywords: Queuing Method, Average Arrival Rate, Average Service Rate, Standard Time

1 Introduction

Parking management refers to various policies and programs that result in the more efficient use of parking resources (Giuffrè et al., 2012; Mackowski et al., 2015; Litman, 2016). The development of new technologies in the parking management domain has provided additional alternatives to improve the operation of change-mode parking at facilities such as airports, railroad stations, bus, and rail transit stops (Maccubbin and Hoel, 2000; Kim et al., 2013; Kuran et al., 2015). These technologies aim to minimize the time required to park by simplifying the parking task would benefit the driver and the lot operator (Vianna et al., 2004; Bessghaier et al., 2012; Barone et al., 2013; Zargayouna et al., 2016). Esa Unggul University is the one of University who has their parking area, for car and motorcycle. To manage their parking area, Esa Unggul University has collaborated with Secure Parking Company. Esa
Unggul University has many academicians, and academicians are allowed to bring a vehicle. It is causing the long waiting line at servers of parking fee payment on exit gate periodically, especially servers of parking fee payment for a motorcycle. So people can feel dissatisfaction, especially students as the customers. This dissatisfaction feeling can make customers giving the poor ratings to service provider, Secure Parking and the University of Esa Unggul as the owner.

The long waiting line can be caused by several factors, like the population's size, the queue discipline, the number of servers, and design of the parking area. Even the method of work can be affected by the length of process time and causing the long line.

The problem is the long waiting line at servers of parking fee payment for a motorcycle on the exit gate in the University of Esa Unggul periodically. Therefore this research is analyzing the queuing system at servers of parking fee payment for motorcycle and the method of work by the operator while servicing customers for reducing the time of customer spends.

This research aims to find out the existing queuing system, to give alternative model solutions, and to choose the best model solution based on alternative models.

2 Research Method

The scope of this research is the observations are only on the servers of parking fee payment (exit gate). We collected data from May 9, 2016, to May 15, 2016. Data collecting performed through the observations on the peak time which is at 10.00-13.00 and 15.00-19.00. The method used in this research can be seen in Figure 1.
3 Results and Discussion

3.1 The Observation

The observations were on the servers of parking fee payment. Based on the observations, customers need to pay a parking fee to leave Esa Unggul University. Data collections divided into two categories, data of customer arrival frequency and data of service frequency. Moreover, it divided into seven subgroups for each category, based on the observations of class schedule and verified by the operator. Data of customer arrival frequency can be seen in Table 1 and data of service frequency can be seen in Table 2.

Table 1. Data Of Customer Arrival Frequency (Motorcycle)

<table>
<thead>
<tr>
<th>Time</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00-11.00</td>
<td>161</td>
<td>163</td>
<td>157</td>
<td>174</td>
<td>172</td>
<td>143</td>
<td>151</td>
</tr>
<tr>
<td>11.00-12.00</td>
<td>179</td>
<td>160</td>
<td>193</td>
<td>168</td>
<td>169</td>
<td>171</td>
<td>155</td>
</tr>
<tr>
<td>12.00-13.00</td>
<td>216</td>
<td>189</td>
<td>202</td>
<td>204</td>
<td>186</td>
<td>193</td>
<td>165</td>
</tr>
</tbody>
</table>
3.2 Testing The Adequacy of Data of Customer Arrival Frequency

To test the adequacy of data of customer arrival frequency using equation (1).

\[
N' = \left( \frac{k^2 s}{\sqrt{N \times \sum X_i^2 - (\sum X_i)^2}} \right)^2
\]  

(1)

with,

- \( k \) = confidence level
- 99% = 3
- 95% = 2
- \( s \) = margin of error
- \( N \) = the number of data collections
- \( N' \) = theoretically data size
- \( X_i \) = the value of observation i

The \( N' = 43,324 \approx 43 \) data. So data collections can be analyzed because \( N' > N(49 > 49) \).

3.3 Testing The Uniformity of Data of Customer Arrival Frequency

The result of testing the uniformity of data of customer arrival frequency can be seen in Figure 2. Based on the graph, data of customer arrival frequency is uniform.
3.4 Testing The Adequacy of Data of Service Frequency

To testing the adequacy of data of service frequency using equation (1), and the $N' = 44,869 \approx 45$ data. So data collections can be analyzed because $N' < N(45 < 49)$.

3.5 Testing The Uniformity of Data of Service Frequency

The result of testing the uniformity of data of service frequency can be seen in Figure 3. Based on the graph, data of service frequency is uniform.
3.6 Measuring Goodness of Fit of Customer Arrival Frequency Data

The measurement of goodness of fit of customer arrival frequency data using chi-square method. Based on the measurement, customer arrival frequency data is Poisson.

3.7 Measuring Goodness of Fit of Service Frequency Data

The measurement of goodness of fit of service frequency data using the chi-square method. Based on the measurement, service frequency data is exponential.

3.8 Calculation of Arrival Rate

The measurement of goodness of fit of service frequency data using the chi-square method. Based on the measurement, service frequency data is exponential.

\[
\lambda = \frac{\sum K}{n}
\]

with,

- \( K \) = average of subgroup rate
- \( \sum K \) = average of data collections
- \( n \) = the number of subgroups

The arrival rate (\( \lambda \)) is 209,551 motorcycle per hour or 3,493 motorcycles per minute.

3.9 Calculation of Service Rate
The calculation of service rate also using equation (2). The service rate ($\mu$) is 206,388 motorcycle per hour or 3,440 motorcycles per minute. So the average time for servicing customers is 0,291 minutes per motorcycle or 17.46 seconds per motorcycle.

**Identification of Existing Queuing System**

Design of existing queuing system is (M/M/2):(GD/~/~) or also known as Model B:(M/M/S).

1) **The Arrival Source**
There are two parking locations in system, front-side parking area and back-side parking area. The distance of front-side parking area to servers is 10.4 meters, and the distance of back-side parking area to servers is 172.58 meters.

2) **The Servicing System**
Design of servicing system is single phase-multi servers. There are two servers of parking fee payment. Moreover, the queue discipline is First Come First Serve (FCFS).

3) **The Service Method**
The service has started by taking ticket by customers. Then the customers are allowed to get in the parking area. The parking ticket is the evidence that customers hired the parking area. When the customers come, they can see an information board that gives information about the parking fee. The parking fee is Rp 1500 for one entrance.

When customers want to leave Esa Unggul University, they need to pay the parking fee. The service of parking fee payment has started from customer leave the parking area and go to the server. At the server, customers give the ticket, Vehicle Registration Certificate (VRC), and pay the parking fee to the operator. After the operator scanning the barcode of the ticket and checking the VRC, the customers are allowed to leave.

4) **Operator Activity**
Operator activity is the actual activity by the operator while servicing customers. The operator can be affected by the length of process time. Based on the observations, the work elements in one work cycle for 22 seconds can be seen in Table 3.

<table>
<thead>
<tr>
<th>Table 3. The Work Elements in One Work Cycle For 22 Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operator</strong></td>
</tr>
<tr>
<td>Typing the number of the license plate on the computer</td>
</tr>
<tr>
<td>Receiving a ticket and the cash, then checking the cash.</td>
</tr>
<tr>
<td>Scanning barcode ticket</td>
</tr>
<tr>
<td>Checking license plate, the type, and color of motorcycle based on the photo in the computer</td>
</tr>
<tr>
<td>Taking money for the change</td>
</tr>
<tr>
<td>Asking for VRC</td>
</tr>
<tr>
<td>Operator</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Waiting</td>
</tr>
<tr>
<td>Checking the VRC</td>
</tr>
<tr>
<td>Giving the change and VRC</td>
</tr>
<tr>
<td>Open the portal by pressing enter</td>
</tr>
<tr>
<td>Waiting</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Observations

For those reasons, then need to know the standard time for servicing customers. The data of cycle time measured by a stopwatch. It divided into seven subgroups, and ten times observations for each subgroup.

a) Testing the adequacy of data of cycle time
To test the adequacy of data of cycle time using equation (1), and the \( N' = 37,722 \approx 38 \) data. So data collections can be analyzed because \( N' < N(38 < 70) \).

b) Testing the uniformity of data of cycle time
The result of testing the uniformity of data of cycle time can be seen in Figure 4. Based on the graph, data of cycle time is uniform.

c) Determining Adjustment Factor
The adjustment factor had determined using an objective method. Assumed the operator's service speed is normal, then adjustment factor 1 (AF1) value is 1. Moreover, the adjustment factor by difficulty (AF2) is 1.07. So a total of adjustment factor is the multiplication of AF1 and AF2 = 1 \times 1.07 = 1.07.
d) Determining Allowance Factor
The allowance factor had been determined based on affecting factors. So the allowance is 5.5% = 0.055.

e) Calculation of Standard Time
The calculation of cycle time ($C_t$) using equation (3).

$$ C_t = \frac{\sum R_i}{n} $$

(3)

The cycle time is 16,729 seconds. Then calculating the normal time ($N_t$) using equation (4).

$$ N_t = C_t \times \text{adjustment factor} $$

(4)

So the normal time is 17,900 seconds. And then calculating the standard time ($S_t$) using equation (5).

$$ S_t = N_t \times (1 + \text{allowance}) $$

(5)

So the standard time is 18,885 seconds.

Alternative Model 1
This model is suggesting to comply with the procedure. Based on the procedure, there is VRC checker to checking the VRC since the waiting line started. So the operator at the server does not need to check the VRC.

Alternative Model 2
This model is suggesting to build the notice boards at the parking area and server (portal), an indicator light for showing the cause of queuing. The indicator light consists of 2 lamps, red and yellow. The red lamp means the queuing caused by system error or operator. Moreover, the yellow lamp means the queuing caused by the customer. The notice board used to notify the customer for preparing their ticket, VRC, and money since at parking area, keep riding in line and put the change and VRC back after passing the portal. Design of the notice board at the parking area can be seen in Figure 5.
Figure 5. Design of notice board at parking area

The notice board has two sides, and the truss is ±2 meters height. Design of the notice board at portal can be seen in Figure 6.

Alternative Model 3
This model is suggesting to increase the number of servers. So there are three servers. Servers 1 is at the front-side parking area. Server 2 and server 3 are at the back-side parking area. The location of server 1 can be seen in Figure 7.
The location of server 2 and server 3 can be seen in Figure 8.

**Comparison of Alternative Models**

The comparison of alternative models by theoretical calculation can be seen in Table 4.

**Table 4.** Comparing Models by the Calculation Results

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Alternative Model</th>
<th>Existing</th>
</tr>
</thead>
</table>

*Figure 7. Location of server 1*

*Figure 8. Location of server 2 and server 3*
### Results

<table>
<thead>
<tr>
<th>Model</th>
<th>The number of servers</th>
<th>Service rate ($\mu$)</th>
<th>Cycle time</th>
<th>The probability that there are no customer in the system ($P_0$)</th>
<th>Average number of customers in the queue ($L_q$)</th>
<th>Average time customer spends in the queue ($W_q$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 servers</td>
<td>5,040 ≈ 6 motor-cycle per minute</td>
<td>15 sec</td>
<td>48,50%</td>
<td>1,632 sec</td>
<td>0,78 sec</td>
</tr>
<tr>
<td></td>
<td>2 servers</td>
<td>5,815 ≈ 6 motor-cycle per minute</td>
<td>13 sec</td>
<td>53,81%</td>
<td>1,031 sec</td>
<td>0,78 sec</td>
</tr>
<tr>
<td></td>
<td>3 servers</td>
<td>3,440 ≈ 4 motor-cycle per minute</td>
<td>16,729 ≈ 17 sec</td>
<td>35,80%</td>
<td>0,047 sec</td>
<td>0,353 sec</td>
</tr>
<tr>
<td></td>
<td>2 servers</td>
<td>3,440 ≈ 4 motor-cycle per minute</td>
<td>16,729 ≈ 17 sec</td>
<td>32,70%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4 Conclusion

The conclusions of this research are:

1) The existing queuing system
   a) Customer arrival rate ($\lambda$) 3,493 motorcycle per minute and service rate ($\mu$) 3,440 motorcycle per minute.
   b) The standard time for servicing one customer is 18,885 sec.
   c) The probability that there are no customer in the system ($P_0$) = 32,7%, average number of customers in the system ($L_s$) = 1,368 ≈ 2 motorcycle, average time
customer spends in the system ($W_s$) = 23.52 sec, average number of customers in the queue ($L_q$) = 0.353 ≈ 1 motorcycle and average time customer spends in the queue ($W_q$) = 6.06 sec.

2) There are 3 alternative model solutions
   a) Alternative model 1, add the operator for checking VRC.
   b) Alternative model 2, build the notice boards and indicator light for showing the cause of queuing.
   c) Alternative model 3, increase the number of servers.

3) The chosen model as the solution is model 2, with:
   a) Reducing the length of process time.
   b) The service rate ($\mu$) up to 5,815 motorcycles per minute.
   c) The probability that there are no customer in the system ($P_0$) = 53.81%, average number of customers in the system ($L_s$) = 0.661 ≈ 1 motorcycle, average time customer spends in the system ($W_s$) = 11,354 sec, average number of customers in the queue ($L_q$) = 0.060 ≈ 1 motorcycle, and average time customer spends in the queue ($W_q$) = 1,031 sec.

Based on the results and discussion section, the recommendations for future research are:

1) May implementing/measuring alternative model solutions.
2) May analyzing the speed of operators.
3) May comparing model solution to another parking company.
4) May considering the cost.

Acknowledgements. This paper in conjunction with the ICRI 2018 in Jakarta, Indonesia.

References


The Role of Government in Preservation and Distribution of Muslim Scripture: From Written to Digital Quran

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Abstract. Indonesia is a country with the most populous Muslim in the world. However, this country is not based on Islam; rather it prefers to be a Pancasila state. This fact, no doubt, leads to a question of how the state manages the religious life of its majority citizen, especially in terms of their scripture, al-Quran. This research raises such question, with specific reference to government policies in terms of preservation and distribution of the Quranic text. This research concludes that although it is not from the very beginning, the state had indeed concern about the policies of preservation and distribution of Quranic text. Those policies took form in regulations and provisions that bind all interest-parties in order to preserve and venerate the Quran. To arrive at the conclusion above, this research used content analysis method accompanied with several approaches. As for the data, this research utilized primary and secondary sources gathered through different methods. The data collection was conducted through library research and interview with those competents in the field, especially the officials at Committee of Correction of Quranic Text (Lajnah Pentashihan Mushaf Al-Quran, LPMQ).

Keywords: Quran, government, LPMQ, digital Quran, tashih.

1 Introduction

Quran is a holy book which from its early revelation claims to be words of God that are authentic and free from any distortion (Quran, 6:115). In one of its verses, for example, this book argues that it is revealed by God and its perfection and authenticity is insured by Him. In another verse it is stated that this book will not suffer from any change and distortion as the other previous books (Quran, 15:9; 4:46; 5:13). Furthermore, it is reported in a prophetic tradition (hadith) that the Prophet Muhammad was ordered to recite the Quran under supervision Gabriel in the every month of Ramadan [1]. Attempts at preservation of the Quranic authenticity continued to be carried out in the period of Rashidun caliphs [2]–[4] and continued from the following periods to the present. The Kingdom of Saudi Arabia, for example, in its attempt to preserve and distribute the Quran, has established a specific institution called Mujamma’ Malik al-Fahd li-Tiba’at al-Mushaf al-Sharif [5]. This institution is responsible for printing and distribution of Quran into all over the world. In addition, it continues to develop translation of the book into diverse
languages of different peoples. It is not surprising that this institution is in avant-garde in preservation and distribution of the Quran in the world.

Although it is not an Islamic state, like Saudi Arabia, Indonesian government also insures, and is responsible for religious practices conducted by its citizen, including Muslim religious life. As majority, it is not strange if Muslims get a great attention from the state especially in religious affairs, especially in terms of their scripture, Quran.

To meet this, the state has established Lajnah Pentashihan Mushaf Al-Quran (LPMQ, Institute for Verification of Quranic text) under Ministry of Religious Affairs (MORA). Through this institute, the state expects the need of Muslims towards the Quran can be well and rightly fulfilled. Furthermore, Quranic text distributed to Muslim society is free from any mistake and defect that leads to disturb the authenticity of the book and bring about a doubt among them. Studies in this topic have been conducted by a number of scholars such as Enang Sudrajat [6], Abdul Hakim [7], Jayusman [8] and so on.

This paper discusses the role of LPMQ in preserving and distributing the Quran to Muslim society, as well as its role in developing their understanding of this scripture, including the provision of digital application of the Quran. It is intended to describe the policies issued by the government through LPMQ on this scripture.

2 Methodology

This paper uses content analysis as method followed with political and theological approaches. As Earl Babbie [9] argues, content analysis is applicable to newspaper, magazine, speeches, documents, laws and constitutions, and even platform of organizations. Furthermore, political approaches are necessary because government policies on the Quran are parts of the state practices towards this scripture, whereas theological approaches are used since the Quran is the core of Islam which cannot be separated from doctrines of this religion. As for the data, this paper draws on the regulations issued by Ministry of Religious Affairs as well as related works on the issues under discussion. The data are obtained through documentary study and in-depth interviews with the stakeholders of LPMQ.

3 Result and Discussion

3.1 Government Policies

The concern of Indonesian government with the Quran did not commence since its independence in 1945. Rather, its concern started with Regulation of Minister of Religious Affairs Number 1 issued in 1957 [10]. One of considerations underlying this regulation is that it is a kind of implementation of the first principle of Pancasila, “Belief in One God” (Ketuahan Yang Maha Esa). In effect, this principle implies that the state does not merely recognize the faiths of Indonesian peoples, it is also responsible to facilitate them in practicing their faiths. Therefore, the Quran—Muslim scripture—should be placed in its due and preserved from any mistake.

However, there is no institution that is authoritative and responsible for this task in Indonesian Muslim society. This is very different from Christianity which has a specific institution for this task known as Lembaga Alkitab Indonesia (Indonesian Bible Society). This
institution played an important role in translating and distributing bibles in Bahasa Indonesia and other local languages. For this reason, such institution is necessary to insure the authenticity and validity of the Muslim scripture [10].

According to this regulation, this institution was named Majelis Musahhihin (Council of Verification). Since the Quran will be printed and distributed to Muslims, this text should be free from any mistake, and it is this task that this council should insure. Initially, this institution was not informal in that it was not included into a formal structure in ministry. Moreover, its members were the ulama known for their knowledge and memory of the Quran (Quranic scholars) from different backgrounds.

In general, the content of this regulation can be classified into two categories: administrative and substantive. By administrative we mean prerequisites necessary for publication of the Quranic text, including permission, materials used to print, and so on. On the other hand, we mean by substantive prerequisites are verification of the huffazh (scholars who memorized the Quran), using the Arabic letters for the arts of reciting the Quran and so on.

From the above discussion it can be stated that the Regulation of Ministry of Religious Affairs Number 1 of 1957 is a milestone of government concern with the Muslim scripture. Besides, it is this regulation that served a basis for progressive concern of the government toward the Quran as will be seen in the next regulations.

In 1959, Ministry of Religious Affairs issued another Regulation which dealt specifically with this institution. Based on this regulation, this institution was transformed from Majelis Musahhihin into Panitia Pentashih Mushaf Al-Quran (Committee of Verification of Quranic Text). Moreover, this regulation explicitly mentions that this institution should consist of nine experts in Quranic studies. However, the task they hold is responsibly to preserve the authenticity of Quran and to ensure that there is no mistake in the printed text of Quran. No less important is that this institution should oversee the distribution of Quranic text in Indonesia [11].

However, the need of Muslims towards their scripture is not limited to the availability of its text. Rather, they need to develop their understanding of the Quran so that they can implement its tenets in their life. In response to this need, MORA issued decrees number 91 of 1962 and number 63 of 1963 on Institute of Translation and Interpretation of Holy Quran. Under direction of Prof. Mr. Soenarjo, this institute published Al-Quran dan Terjemahnya (The Quran and Its Translation) in 1972 and its complete edition in 1980 [12].

In 1982, MORA expanded the task of this institute through Regulation number 1 of 1982 on Lajnah Pentashih Mushaf al-Quran [13]. According to this regulation, LPMQ had higher status than before due to the fact that it was an auxiliary board of Minister of Religious Affairs in terms of verification of Quranic text, its translation and interpretation, recording and publication in different forms, including in an electronic manner. This is because the need of Muslims towards their scripture also developed in line with the development of technology. Therefore, this institute developed a number of divisions necessary to meet the above task.

Those divisions include: (1) Division of Tashih; (2) Division of Quranic text in Braille form; (3) Division of Quranic Translation and Interpretation; and (4) Division of Quranic Recording and Electronic forms. From these divisions, it seems that LPMQ meets specially the need of blind Muslims on the one hand and those Muslims familiar with electronic media on the other towards the Quran. Moreover, this development shows that the government—via MORA—is really aware of the need of Muslims in reference to their scripture [13].

As mentioned previously, LPMQ has translated the Quran into Bahasa Indonesia in order that Indonesian Muslims understand their scripture. However, this translation is supposed to
be outdated that it needs a revision. To respond this, MORA through Regulation number 230 of 2003 formed a new team for refinement of Quranic translation and interpretation. The main objective of this team is to revise and make additional notes necessary for and relevant to the completion of this translation and interpretation [14].

There is a significant change in LPMQ when MORA issued Regulation number 3 of 2007 [15]. What is significant in this regulation is that LPMQ is not responsible only for verification (\textit{tashih}) of Quranic text, it is also responsible for the translation of Quranic text that will be distributed to Muslim society. In addition, the Regulation stipulates that LPMQ should facilitate Muslims for understanding the teachings of their scripture through its translation and interpretations from diverse dimensions. Above all, this institute has an additional and new task, i.e. to maintain and preserve Islamic culture in Indonesia. It seems that this last task is irrelevant to LPMQ, but it will be clear that Islamic culture here can be interpreted to include anything related to the Quran, such as calligraphy, manuscripts, and so on [16].

Based on this regulation, LPMQ at the present has three different divisions with their own different responsibilities. \textit{First}, division of tashih, which is responsible for correction of Quranic text, its translation as well as its interpretation in variety of forms. \textit{Second}, division of Quranic studies, which is responsible to develop, study and publish Quranic text, its translation and interpretation. \textit{Third}, division of Bayt al-Quran and Documentation whose main task is to preserve and manage museum called Bayt al-Quran [15].

From the above discussion it is clear that the government—through LPMQ—is highly concerned with the Quran for Muslims. This concern developed gradually from its attention to Quranic text to Muslim understanding of this scripture through its translation, interpretation and study of its main teachings.

3.2 Mechanism for Verification of Quranic Text

As previously alluded to, the main task of LPMQ is to verify the Quranic text, its translation and interpretation that will be distributed to Muslim society. In this section, this paper discusses in brief the mechanism used by LPMQ to meet its task, especially in terms of substantive requirements [17].

\textit{First}, the manuscript will be verified by the scholars or experts of Quranic text. \textit{Second}, the manuscript that had been verified by one scholar or expert, it will be verified by another scholar. This cross-verification is not conducted only once, but many times to insure that the manuscript will not suffer from any mistake. Another way to verify the manuscript is through reading and listening where one is reading the manuscript while the others are listening and verifying it. In addition, verification can be carried out through listening to recording of Quranic recitation in which the scholars listen to this recording and at the same time verify the manuscript.

\textit{Third}, after cross-verification was conducted many times, there is list of mistakes and their correction in two pieces, one for the publisher that proposed the manuscript and another for LPMQ. \textit{Fourth}, the publisher should make correction as recommended by LPMQ. \textit{Fifth}, the publisher should come to LPMQ with the corrected manuscript to be cross-verified once again. \textit{Sixth}, if the manuscript is in line with the listed correction, LPMQ will hand over the manuscript to the publisher to publish an example. \textit{Seventh}, the sample of printed manuscript will be verified again by LPMQ, and if there is no mistake, then LPMQ will issue a certificate for the publisher to print the manuscript. \textit{Eight}, it is based on this certificate that the publisher can publish the manuscript legally for public purpose in accordance with number proposed to LPMQ.
Although there are some other steps to follow for the publisher, but they are not so substantial that we are needless to explore here. This mechanism is also applicable to cassette recording, CD-Rom, and to other forms of electronic version. According to Ahsin Sakho, process of certification of manuscript takes long enough time, about two months, if every step mentioned above runs well. This is conducted to preserve the authenticity of the Quran on the one hand and to prevent any doubt on this scripture among Muslims. It is for this reason that he suggests the publisher to have its manuscript verified by its own scholar or expert before proposed to LPMQ, so that the process at this institute does not take too long time [18].

What this section has discussed shows that LPMQ has been seriously concerned with authenticity of the Quran and insured that this scripture has been verified well before its publication and distribution to Muslim society. This also shows that the government—through LPMQ—paid serious attention to Muslim religious life, especially in terms of their scripture.

3.3 Digital Quran

As alluded to previously, the task of LPMQ is not limited to verification of the Quran. It is also responsible to meet the need of Muslims towards their scripture. With the development of technology, LPMQ provides the Quran in digital form. This Quran has been launched in August 28, 2016, by Minister of Religious Affairs, Lukman Hakim Saifuddin [19].

In that occasion he stated, “I hope that this first step of launching this application can be developed in much better manner in both technical terms and contents so that it can facilitate Muslim society in widest sense for reading and studying the Quran.”[19] Moreover, he adds that an attempt at preservation of the authenticity of the Quran should not limited to its written form or text, it is also important to preserve its contents. In the digital era which is full of openness, any information will be easily accepted by society, including religious understanding.

According to him, information is not always of positive content. It can contain hate expression and violence as can be found in social media, and this is difficult to prevent. Therefore, the government attempts to provide literatures on understanding and interpretation of the Quran in moderate and tolerant way, and respectful to diversity of religion through a number of media, both in printed and electronic ones. On the basis of this situation, “Today, I am very happy that along with the international seminar on the Quran to commemorate its first revelation 1.450 years before, Ministry of Religious Affairs presents to society digital application of the Quran companied with its translation and interpretation.”[19]

On the other hand, the head LPMQ, Muchlis Hanafi, explains that the users of smartphones can download the digital application of the Quran at Google Play Store, as well as at App-Store and Windows Phone Store.

Hanafi said that the first generation of this application provides the Quranic text completely accompanied with its translation. Moreover, it also contains interpretation in two different versions: tahliili (detailed interpretation) and short ones. He adds that this application has another feature, that is, murattal recitation of the Quran by Syekh Mahmud Khalil al-Hushary [20].

Hanafi explains further that this application utilizes Indonesian standard of Quranic text (Mushaf Al-Quran Standar Indonesia) in terms of method of writing, symbols and so on. As for the translation, this application uses Al-Quran dan Terjemahnya (Quran and Its Translation) composed by Ministry of Religious Affairs, while the interpretation, especially in tahliili version, is based on Al-Quran dan Tafsirnya (Quran and Its Interpretation) which is also composed by MORA. On the other hand, short interpretation available in this application is based on Tafsir Ringkas Al-Quran Al-Karim as a product of study of Quranic interpretation
conducted by MORA and Center for the Study of Quran (Pusat Studi Al-Quran), Jakarta. He promised that this application will be developed and added with new features, such as thematic and scientific interpretation of the Quran, the conditions of Quranic revelation (*asbab al-nuzul*) and so on [20].

4 Conclusion

Some conclusions can be drawn from the above discussion. Although it is not an Islamic state, Indonesia is seriously concerned with Muslim scripture through LPMQ. This institute has played an important role in provision and distribution of the Quran in Muslim society. Moreover, it is responsible for preserving the authenticity of Quranic verses and at the same time for the development of Muslim understanding of their scripture by providing the translation and interpretation of this scripture. In a nutshell, it can be argued that the state, although it is not Islamic, cannot put aside the faith of its citizen, especially in terms of their scripture.

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References

Biodiesel Production from Kapok Seed Oil Using Bimetallic Oxide MgO/CaO as Catalyst in Continuous Fixed Bed Reactor

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Abstract. The study of renewable energy has become increasingly important as scientific research to overcome the increasing consumption for fossil fuel. Biodiesel production in continuous reactor system with heterogeneous catalyst has been pointed out as the solution instead of the conventional method using batch reactor. This study uses non-edible oil kapok seed oil (Ceiba pentandra) as the feedstock and MgO/CaO as catalyst. Bimetallic oxide MgO/CaO catalyst with the composition of 10 wt.% of MgO were calcined at 950°C for 5 h. Degumming process was conducted to separate impurities from kapok seed oil. It was shown that after degumming process the oil has yellow color, brighter than before the pretreatment. It was shown that the FFA value of the feedstock was reached of 22.75%. The esterification process considerably reduced the FFA to 0.7%. The transesterification was maintained in various temperature (60-80°C) in fixed bed reactor. This work was extended in various reactant flow rate of 20, 30, 40, and 50 mL/min. The highest biodiesel yield of 20.33% was achieved at 70°C reaction temperature with feed flow rate of 20 mL/min.

Keywords: biodiesel, calcium oxide, fixed bed reactor, kapok seed oil, magnesium oxide, transesterification

1 Introduction

Nowadays, the energy supply from fossil fuel has become important for human activities, especially in transportation sector. Biodiesel has been receiving great attention as one such alternative energy to substitute diesel oil [1]. Its advantages are biodiesel such as biodegradable, non-toxic, and low carbon monoxide emissions [2]. Additionally, biodiesel can be used in the small amount of diesel oil without impairing the physical-chemical properties, thus, being possible to use in diesel engines without having a need of modification [3]. Biodiesel which can be derived from transesterification between vegetable oil, animal oil, or waste cooking oil and methanol as short-chain alcohol usually called as fatty acid methyl ester (FAME). In the past few decades, palm oil has been potentially used as the main feedstock biodiesel production in Indonesia due to its abundant in production. Palm oil has high demand especially in food industry due to its role as the edible oil. Utilization of palm oil for biodiesel feedstock leads the price of edible oil increased. In addition, high demand of palm oil leads forest clearance on large scale. Biodiesel production derived from non-edible oil have
great attention which leads many researchers to develop the green method of biodiesel production. The study is needed to overcome the competition in edible oil market [4,5].

Kapok seed oil (Ceiba pentandra) as non-edible oil has great potential to be utilized as the feedstock of biodiesel production instead of the edible oil consumption due to its oil containing of 18-40% oil, relatively inexpensive, and its abundant availability in Indonesia [6]. Kapok fiber is also possible to be utilized as the resource for ethanol production due to its contains 35-64% of cellulose content [7].

In typical, biodiesel can be synthesized towards catalyzed transesterification process between long-chain fatty acid and short-chain alcohol with the assistance of homogeneous base or acid catalyst [8]. The disadvantages of homogeneous catalyst utilization leads this type of catalyst is rarely chosen to assist transesterification reaction. Several disadvantages have been reported such as soap formation as the side product and complexity of separation between liquid product and catalyst leading to high energy requirement [2]. Previous studies have been reported the use of heterogeneous catalyst for transesterification which are easily separable in batch system. The use of metal oxide catalyst such as ZnO, SiO, and TiO2/ZrO2 are frequently used to provide the transesterification process, which have been shown to be very interesting [9]. It was reported that metal oxides shows impressive results as catalyst in the methanolysis of soybean oil in batch system, which achieves reactions yield around 90%. The catalyst from alkaline-earth oxides also exhibited good activity in transesterification reaction due to the high basicity. The alkaline-earth oxide has strong potential for application because it serves as less expensive material compared to most of other transition metal. However, magnesium oxide (MgO) exhibits high surface area with low catalytic activity. Introducing of CaO in the mixture of catalyst leads the higher basic strength. Ability of CaO to form the \( \text{M}^{2+}\text{O}^2\) pair has an important role in transesterification process.

Previous study reported the highest biodiesel yield of 55.22% was achieved at 70°C for 75 min with kapok seed oil and methanol as the reaction in molar ratio of 1:15. The transesterification was carried out in batch system in the presence of MgO/CaO as catalyst [2]. Few articles reported synthesized of biodiesel in fixed bed continuous system. Its advantages including in low cost of separating catalyst from product mixture, reduction of waste water during the purification of product, and reusability of catalyst. Previous study have been done to study biodiesel production using fixed bed Lewis-bed catalytic system, which results biodiesel yield of 75% using soybean oil and methanol as reactant at temperature of 100°C. The study reported that slightly higher operating condition is needed in continuous process compared to the batch system [3]. Buasri et. al. (2012) reported that there are several important parameter in obtaining optimum reaction condition for transesterification process such as methanol/oil molar ratio, feed flow rate, catalyst bed height and reaction temperature. Transesterification reaction was carried out in waste cooking palm oil using calcium oxide supported on activated carbon as catalyst in a fixed bed reactor. The highest conversion of 94% was obtained at 60°C reaction temperature, 8 h residence time, 295 mm packed bed height and 25:1 methanol/oil molar ratio [10].

Utilization of non-edible oil as the feedstock and heterogeneous catalyst may offer less production cost for biodiesel production in large scale. This study aims to develop biodiesel production from kapok seed oil, catalyzed by MgO/CaO bimetallic oxide catalyst in continuous fixed bed reactor. The effects of temperature reaction and feed flow rate were investigated.

2 Materials and Methods
2.1 Materials

The kapok seed oil used was purchased from Pasuruan, Easet Java, Indonesia. Methanol (Bratachem, 98%), MgO (Merck, 99%), CaO (Merck, 99.5%), H$_2$SO$_4$ (Merck, 98%), and H$_3$PO$_4$ (Merck, 85%) were used without further purification.

2.2 Characterization of kapok seed oil

The fatty acid composition in the kapok seed oil was determined by Gas Chromatography-Mass Spectrometry (GCMS) using GCMS-QP2010S SHIMADZU. Column was packed with SH Rxi 5Sil MS with the length of 30 m and helium as the carrier gas. The initial temperature of oven was adjusted at 50ºC for 5 min and increased by 15ºC min$^{-1}$ to a final oven temperature of 280ºC with the holding time of 19 min. The acid value were determined using titrimetric method [11].

2.3 Degumming Process

Degumming was prepared by heating the kapok seed oil until reaches the temperature of 70ºC. Further, H$_3$PO$_4$ solution was introduced into the oil with the amount of 0.1% of oil volume. The degumming process was maintained for 30 min under the temperature of 70ºC. The product and impurities was discarded from the feedstock using separation funnel after 24 h. The remnant solution was heated at 110ºC to remove the remaining water.

2.4 Esterification Process

Esterification was carried out by introducing the oil and methanol in molar ratio of 1:6 followed by adding the acid catalyst (H$_2$SO$_4$ solution) 0.5% of oil mass. The esterification was maintained at 60ºC for 1.5 hours. The product was washed using warm aquadest followed by heating to remove the remaining water. The free fatty acid (FFA) value of esterification product was determined using titrimetric method [10].

2.5 Preparation of MgO/CaO Catalyst

The catalysts were prepared by adding the distilled water into the mixture of MgO/CaO with the composition of 10 wt.%. The mixture was stirred at room temperature for 3 h. Afterward, the excess water in the mixture was evaporated by heating at 70ºC until turned into pasta. The remnant solid particle were dried using oven for 12 h at the temperature of 110ºC. Furthermore, the catalysts with the pellet form were calcined at 950ºC for 5 h.

2.6 Transesterification Process

Transesterification was performed by reacting the oil and methanol in molar ratio of 1:15 with MgO/CaO catalyst. Transesterification was carried out in continuous fixed bed consisting of feedstock tank, heater, pump, needle valve, flow meter, reactor (35 cm long and 1 cm inner diameter), jacket electric heater, control panel (temperature controller), condenser, and product tank, as shown in Fig. 1. The tubular reactor was partially filled with 1.4 g of pellets catalyst. The initial pre-heating of feed was placed in the initial stage of system before entering the tubular reactor. The flow of feed through the reactor was controlled by needle valve with the assistance of pump as the driving force. The reactor was heated by electric heater placed along the external of tubular reactor. The output flow was cooled and collected in tank.

The transesterification was maintained in various temperature 60, 70 and 80ºC to study the effect of temperature. The reaction extended by varying the feed flow rate of 20, 30, 40,
and 50 mL/min. Biodiesel products were analyzed by GC analysis to determine the FAME content. The GC analysis using GC HP 5890 with the carrier gas was nitrogen. The initial temperature of GC-FID was adjusted at 150°C for 3 min with rise of 7.5°C min⁻¹ up to 250°C. The yield % of biodiesel can be defined as follows:

\[
\frac{\text{Yield of biodiesel (\%)} = 100 \times \frac{W_{\text{of actual biodiesel}}}{W_{\text{of oil}}}}{1}
\]

Where W of the actual biodiesel amount is the actual weight of FAME (g) from the experiment and W of oil is the actual weight of kapok seed oil (g).

![Figure 1. Schematic diagram of a fixed bed reactor apparatus](image)

### 3 Results and Discussion

#### 3.1 Characterization of Kapok Seed Oil

The composition of kapok seed oil was determined using GCMS analysis. The result shows that kapok seed oil composition are dominated by 9,12-octadecadienoic acid as shown in Table I.

<table>
<thead>
<tr>
<th>Table 1. Kapok Seed Oil Composition</th>
</tr>
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<table>
<thead>
<tr>
<th>Component</th>
<th>Value (wt.%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentadecanoic acid</td>
<td>23.98</td>
</tr>
<tr>
<td>6-octadecanoic acid</td>
<td>0.59</td>
</tr>
<tr>
<td>8-octadecanoic acid</td>
<td>1.16</td>
</tr>
<tr>
<td>6-octadecanoic acid</td>
<td>4.01</td>
</tr>
<tr>
<td>9,12-octadecadienoic acid</td>
<td>40.18</td>
</tr>
<tr>
<td>9-octadecenoic acid</td>
<td>22.31</td>
</tr>
<tr>
<td>Octadecanoic acid</td>
<td>3.15</td>
</tr>
<tr>
<td>9-octadeconoic acid</td>
<td>1.78</td>
</tr>
<tr>
<td>10-octadecenoic acid</td>
<td>1.65</td>
</tr>
<tr>
<td>Decane</td>
<td>1.19</td>
</tr>
</tbody>
</table>

Free fatty acid value was determined using titrimetric method [11]. It was confirmed that the FFA value in the feedstock of kapok seed oil is 22.75%. This value is too high for the feedstock before entering the continuous fixed bed reactor. The large amount of FFA leads the saponification reaction [6].

### 3.2 Pre-treatment Process

Pre-treatment process in this study consisting of degumming process and esterification reaction to prepare the feedstock before entering the fixed bed reactor. The presence of impurities such as gum, latex or oil-slime leads the emulsion of oil and soap so the refining of oil will be hindered [12].

Degumming process was conducted to separate the impurities. Degumming process obtained the white gum layer in the bottom of the oil. The FFA value was also determined after this stage. The FFA value was reduced from 22.75% to 7.55% which can be related to the partially of FFA is settled along with the gum. This value was not suitable for the feedstock due to the previous study reported that the FFA value of kapok seed oil has to be less than 1% for transesterification process [6].

Esterification process aims to reduce the value of FFA in the oil. Esterification was carried out by reacting the oil with methanol in the presence of H$_2$SO$_4$ solution as the acid catalyst. Scheme 1 shows the formation of water as the byproduct of esterification process. The FFA of kapok seed oil are converted into fatty acid esters. Based on the result of titrimetric method, it was shown that this process considerably reduced the FFA value to 0.72% which is less than 1%.

\[
\text{H}^+ + \text{R}_1\text{COOH} + \text{ROH} \rightarrow \text{R}_1\text{O-}\text{CO-R}_j + \text{H}_2\text{O}
\]

*(Scheme 1. Esterification reaction equation)*

The presence of water as the side product of esterification reaction tends to promotes hydrolysis of triglycerides into FFA due to the saponification reaction [4]. This problem can be overcome by heating the kapok seed oil to remove the remaining water.

### 3.3 Effect of Temperature Reaction
Biodiesel production was carried out by adding oil and methanol in molar ratio of 1:15. Excess methanol is used to promote the reaction towards the product due to the reversible reaction. Diffusion of reactants on the surface of catalyst also can be facilitated by adding the methanol in larger amount. The larger amount of methanol is applied to overcome the major limitation of mass transfer due to immiscible liquid phases between methanol and oil, also the solid catalyst surface [13].

The pellet catalyst was placed along the inner tubular reactor with the amount of 1.4 g. The effect of reaction temperature was studied in range of 60, 70, and 80ºC. The feed flow rate was held at 30 mL/min.

![Figure 2. Effect of reaction temperature on biodiesel production at oil to methanol ratio 1:15, 1.4 g MgO/CaO catalyst, flow rate 30 mL/min](image)

Reaction temperature has an important role in kinetic of reaction, which affects the yield of biodiesel. Fig.2 shows that an increase in temperature reaction led to higher yield due to higher rate of reaction. At the temperature of 60ºC, the yield was achieve 9.75%. It can be related to insufficient energy to promote the collision among the reactant [2]. Then, the yield slightly increased due to the increasing of temperature led to collision between the reactant atoms. The higher collision activities will be frequently occurred and sufficient activation energy will be reached in tiny time [8].

The yield decreased to 8.45% by altering the reaction temperature to 80ºC. It can be related to the boiling point of methanol which is around 64.7ºC. When the reaction was maintained at the higher temperature than 70ºC, partially of methanol liquid phase will be turned into vapor phase [13]. The collision between oil and methanol will be less effective occurred in this stage. The methanol molecules have less time to contact on the surface catalyst. The highest yield 10.58% was achieved at 70ºC. Thus, the highest temperature was limited to 70ºC for transesterification of kapok seed oil in fixed bed reactor.

3.4 Effect of Feed Flow Rate

The reaction extended by varying the feed flow rate of 20, 30, 40, and 50 mL/min to determine the optimum operating condition. The feed flow rate has important role to control the residence time of reactant in tubular reactor.
Figure 3. Effect of feed flow rate on biodiesel production at oil to methanol ratio 1:15, 1.4 g MgO/CaO catalyst, temperature reaction 70ºC

As shown in Fig. 3, the biodiesel yields tend to decreased with the increasing of feed flow rate, as expected. At the low feed flow rate, the highest yield of 20.32% was achieved at 20 mL/min. The effect of feed flow rate is related to the residence time of the reactor. Decreasing of feed flow rate led to a longer reaction time which promote the more active sites contact with reactant. The longer reaction time promote the reaction between kapok seed oil and methanol. Previous study reported that increasing feed flow rate promotes the reduction of mass transfer resistance resulting in high rate reaction. However, too high flow rate of feed led to the reactants pass towards the tubular reactor in a shorter time resulting in a low conversion [13].

4 Conclusion

Biodiesel was synthesized in continuous fixed reactor system with MgO/CaO as heterogeneous catalyst. The effect of parameter including reaction temperature and feed flow rate were found. The highest biodiesel yield of 20.33% was achieved at 70ºC reaction temperature with feed flow rate of 20 mL/min.

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References


Developing Social Studies Teaching Materials Based on Multimedia EPUB for The Effectiveness on Learning Outcomes

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Abstract. The aims of this study 1) to develop of Social Studies teaching materials based on multimedia EPUB 2) To determine the effectiveness on learning outcomes of the development of social studies teaching materials based on multimedia EPUB. This study uses a development method based on the Dick and Carrey model. 1) The results of the development are informed from the validation of material experts who get 85% in the effective category. The results of the validation of linguists, media and design experts receive 89% percent in the effective category. Based on the percentage obtained, the Social Studies teaching materials based on multimedia EPUB meet the worthy standards of test. 2) The results of the trial on the learning of the Social Studies teaching materials based on multimedia EPUB obtain a score of 72% which states that the increase of post-test is influenced by the success of the use of teaching materials based on multimedia EPUB, so that the development of Social Studies teaching materials based on multimedia EPUB can be effectively used for the learning of Social Studies.

Keywords: social studies; teaching materials; development multimedia epub

1 Introduction

Electronic books (e-book) are digital version books that are compatible with various electronic devices by offering practicality and interaction in digital formats that are interesting rather than printed books [1] [2]. The term e-book becomes popular than digital objects that are designed to be accessible online and can be read via a PC, netbook or smartphone [3] [4]. The use of e-books today looks very massive and more popular and can be continued to develop as a the first choice, not just as an alternative than printed books [2] [5]. This is due to the rapid technological development, so that users can easily share literacy only through applications on an electronic device, like a smartphones [6].

With the increasing number of e-book readers and the availability of reading experience with various electronic devices such as smartphones, tablets, netbooks and other devices of affordable prices, reinforced by the use of e-ink technology adoption that helps reduce eye strain and helps users read below sunlight, large battery capacity (3000-4000mah), and enhanced e-reader options for highlighting, bookmarking, and adding notes make the e-book the top choice for consumers.[5]
There are various e-book formats. One of which is a familiar format, namely Portable Document Format (PDF) which can display various document formats [7]. However, PDF has weaknesses, including difficulties when editing text, displaying video, and the ability to adjust on a small device screen, like a smartphone [2] [8]. Electronic Publication (EPUB) is an e-book format that offers the ability to overcome deficiencies in the PDF format, including the ability to adjust the appearance of electronic devices, displaying image formats such as JPEG, PNG, and SVG [2], [8]. EPUB was developed by the International Digital Publishing Forum (IDPF), with an extension (.EPUB), with the latest version of EPUB 3 (latest version 3.1) based on HTML5, SVG, CCS3, and Javascript [9] [10] [11].

The advantages of EPUB 3 allow web components to be summarized in a book that can host and stream multimedia content (images, audio and video), and contain features that support the world of education, such as quiz and interesting interaction components [9]. With all these advantages, EPUB facilitates lecturers and teachers to facilitate active and interactive learning for students by presenting digital-based teaching materials [12], in order to assist them to learn independently and overcome learning difficulties [13]. Enriched with multimedia content, EPUB brings students to virtual classrooms that provide a variety of rich learning experiences in media and interactive content, exciting and intensifying their learning processes to improve learning outcomes [14]. The presence of EPUB 3 format will open the gate of pedagogical opportunities that are very various and challenging than printed books, especially at the tertiary level which is supported by the development of e-learning, blended and hybrid learning, as well as easier opportunities to own and get technology and information-based learning tools, including teaching materials [3] [9].

The courses of Social Studies that are presented at level 1 of 3 levels in the Department of Teacher Education for Islamic Elementary School. The basis of this research begins with the analysis of teaching material needs, in which 88% of students stated that they needed teaching materials of social studies, 74% of them chose to use electronic devices in learning. The new EPUB 3 format is the ideal format for accelerating the development of teaching materials for basic social science subjects for elementary schools that are loaded with picture and video content to achieve learning objectives. Research shows the effectiveness of digital-based teaching materials, especially multimedia EPUB format in the world of education can affect students' interest and learning outcomes [6] [15] [16] [17] [18] [19] [20]. The use of EPUB is also available to assist blind people in the learning process [21]. The presence of learning resources with EPUB extension due to several factors, which can be accessed easily whenever and wherever using a smartphone, especially Android-based, ease of use, the concept of material supported by the video and the looks, can adjust the device screen and can load many images with an attractive layout.

2 Methods

The type of research used is development. The development model refers to the adaptation of the Dick and Carey procedural model [22]. The number of college students who purposively became the subject of this study were 160 people who took the courses of Social Studies on the Department of Teacher Education for Islamic Elementary School. Software used to develop teaching materials convert to EPUB format is the Sigil application.

The research hypothesis uses the null hypothesis and alternative hypothesis [23]. The null hypothesis is the achievement of students before and after using the same EPUB. An
The alternative hypothesis is that the achievement of students before and after using EPUB is not the same.

The research carried out through 3 stages, 1) the stages of product design using the Dick & Carey model [22], 2) the stages of product design testing, 3) the stages of product testing using the one group pre-test-post-test design [24]. Experiments were conducted on 115 students from 160 students. Analysis of experimental results employed t-test with paired samples [23].

3 Result and Discussions

The results of material expert validation on the development of Social Studies teaching materials based on multimedia EPUB obtain 85% in the effective category. The results of the expert validation of linguists, media and design receive 89%. Based on the percentage obtained, the instruction to development of Social Studies teaching materials based on multimedia EPUB meets the worthy standards of user trial.

The results of product trials using the one group pre-test post-test design can be seen as follows.

<table>
<thead>
<tr>
<th>Table 1. Paired Samples Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>pre-test</td>
</tr>
<tr>
<td>post-test</td>
</tr>
</tbody>
</table>

The table above shows that the overall increase in the average score of participants 15.71 points. A score of 70 is the student's minimum achievement score in the course. Based on the comparison analysis of the average pre-test and post-test, the presentation Social Studies teaching materials based on multimedia EPUB can assist students to achieve minimum standards.

<table>
<thead>
<tr>
<th>Table 2. Paired Samples Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>115</td>
</tr>
</tbody>
</table>

The table above shows the correlation coefficient between pre-test and post-test values. The correlation coefficient is 0.852. If it continues to the analysis of determination, it is necessary to square the correlation coefficient so that the result becomes 0.72. If the determination number is multiplied by one hundred, it will find a value of 72%. This means that 72% of post-test's 15.71 points increase is influenced by the successful use of the Social Studies teaching materials based on multimedia EPUB. While 28% is influenced by other factors outside this research.
The t-test value obtained is -25.164. This number becomes 25.164 [25] with t count (25.164) is greater than the t table value (1.960). This result indicates that the difference between pre-test and post-test values is significant [26]. Significant value indicates 0.000 which indicates that this value is smaller than 0.05. Then the null hypothesis is rejected and an alternative hypothesis is accepted [23], [27]. The test results state that there are differences in results between before using EPUB and after using EPUB.

The results of student responses to the Social Studies teaching materials based on multimedia EPUB on their experience using EPUB form at digital books reveal that 92% students need teaching materials in digital format with practical reasons and provide easy access. Only 8% of students prefer the printed book format for ease of reading and as many as 74% of students choose the EPUB format compared to other digital book formats. Regardless of this finding, EPUB can be integrated directly with multimedia content.

### 4 Conclusion

The development of textbooks on the basic concepts of EPUB-based IPS can be acceptable and feasible to be functioned based on the results of expert validation in the effective category. The results of the field trial showed that there were differences in results between before and after using the EPUB-based IPS basic teaching materials. The high response of students to the use of the Social Studies teaching materials based on multimedia EPUB shows that books in digital format are more practical and easier to access and can be directly integrated with multimedia content. The high response of users of the Social Studies teaching materials based on multimedia EPUB can be a guide for the development of teaching materials in digital format, especially EPUB-based as a part of the Education 4.0 era.

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**References**


Color Laplacian and Color Signless Laplacian Energy of Complement of Subgroup Graph of Dihedral Group

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Abstract. Laplacian and signless laplacian energy of a finite graph is the most interesting topics on areas of energy of a graph. The new concept of energy of a graph is color energy and furthermore color laplacian and color signless laplacian energy. In this paper, the formulae of color laplacian and color signless laplacian energy of complement of subgroup graphs of dihedral group are determined. Color laplacian and color signless laplacian spectrum of these graphs are also computed.

Keywords: Color Laplacian Energy, Color Signless Laplacian energy, Subgroup Graph, Dihedral Group

1 Introduction

The energy of a finite graph $G$ is defined as the sum of absolute values of all eigenvalues of matrix of $G$ (Balakrishnan, 2004). Gutman (1978) introduced the concept of adjacency energy of a graph, and now it has evolved into other concept of energy. Researches related to the energy of a graph have been done, such as adjacency energy (Gutman, 2001), incidence energy (Gutman et al., 2009 and Jooyandeh et al., 2009), Harary energy (Güngör & Çevik, 2010), Randic energy (Das et al., 2014), maximum degree energy (Adiga & Smitha, 2009), detour energy (Ayyaswamy & Balachandran, 2010), matching energy (Gutman & Wagner, 2012), distance energy (Ramane et al., 2008), covering distance energy (Kanna et al., 2013), dominating distance energy (Kanna et al., 2014), Laplacian energy (Gutman & Zhou, 2006, Zhou & Gutman, 2007 and Zhou et al., 2008) and signless Laplacian energy (Liu, 2010). Subsequent developments introduced the concept of color energy of graph (Adiga et al., 2013) and finally color Laplacian (Bhat & D’Souza, 2015) and color signless Laplacian energy (Bhat & D’Souza, 2017a) of graph.

Graphs obtained from a group have also been introduced, such as Cayley graph (Heydemann, 1997), transitive Cayley graph (Kelarev & Praeger, 2003), conjugate graph (Erťian & Tolue, 2012), commuting graphs (Chelvam et al., 2011), non-commuting graphs (Raza & Faizi, 2013), inverse graphs (Alfuraidan & Zakariya, 2017), identity graphs (Kandasamy & Smarandache, 2009) and subgroup graphs (Anderson et al., 2012). Anderson et al. (2012) defining the subgroup graph of a group $G$ as a directed graph containing all elements of $G$ and two distinct vertices $x$ and $y$ will be joined by an arch if and only if $xy$ is belong to the related subgroup. When the given subgroup is a normal subgroup of $G$, then the
subgroup graph obtained is an undirected graph and thus its complement is also an undirected graph (Kakeri & Erfanian, 2015).

Abduussakir has determined detour energy of the complement of subgroup graphs of dihedral group. (2017). In this research, the formulae of color Laplacian and color signless Laplacian spectrum and energy of these graphs are determined.

## 2 Literature Review

Let $G$ be a finite graph with order $|V(G)| = p$ and size $|E(G)| = q$. Two distinct vertices $x$ and $y$ are called adjacent if they are joined by an edge in $G$ or $xy \in E(G)$. The adjacency matrix $A(G)$ of $G$ is a matrix $A(G) = [a_{ij}]$ of order $p$ where $a_{ij} = 1$ if $v_i v_j \in E(G)$ and $a_{ij} = 0$ if $v_i v_j \notin E(G)$ (Abduussakir et al., 2009). The degree $\deg(x)$ of a vertex $x$ in $G$ is the number of vertices that adjacent with $x$. The degree matrix $D(G)$ of $G$ is matrix $D(G) = [d_{ii}]$ of order $p$ where $d_{ii} = \deg(v_i)$ for $i = j$ and $d_{ij} = 0$ otherwise (Abduussakir et al., 2017).

Matrix $L(G) = D(G) - A(G)$ is called the Laplacian matrix of graph $G$ (Elvierayani & Abduussakir, 2013) and matrix $L'(G) = D(G) + A(G)$ is called the signless Laplacian matrix of $G$ (Ashraf et al., 2013). The characteristic polynomial of $L(G)$ and $L'(G)$ are det($L(G) - \lambda I$) and det($L'(G) - \lambda I$), respectively. The roots of the characteristic equation of a matrix are called eigenvalues of the matrix (Jog & Kotambari, 2016). The eigenvalues of $L(G)$ are called Laplacian eigenvalues of $G$ and the eigenvalues of $L'(G)$ are called signless Laplacian eigenvalues of $G$.

Let $\lambda_1, \lambda_2, \ldots, \lambda_p$ are Laplacian eigenvalues of graph $G$. The Laplacian energy of $G$ is defined by Zhou & Gutman (2007) as

$$LE(G) = \sum_{i=1}^{p} |\lambda_i - \frac{2}{n}|.$$  \hspace{1cm} (1)

In similar way, the signless Laplacian energy of graph $G$ is defined by Xi & Wang (2017) as

$$LE^s(G) = \sum_{i=1}^{p} |\lambda_i^s - \frac{2}{n}|$$  \hspace{1cm} (2)

where $\lambda_i^s$ are signless Laplacian eigenvalues of $G$.

Adiga et al (2013) introduced the concept of color energy of a graph motivated by the work of Sampathkumar and Sriraj (2013). Coloring of a graph $G$ is assigning color to all vertices of $G$ such that two adjacent vertices have the different color (Bondy & Murty 2008). Coloring of graph $G$ can be considered as a function $c: V(G) \rightarrow \mathbb{N}$ such that $c(x) \neq c(y)$ if $x$ and $y$ are adjacent in $G$ (Chartrand et al. 2016). The minimum positive integer $k$ is called chromatic number of $G$ and denoted by $\chi(G)$ if $c: V(G) \rightarrow \{1, 2, \ldots, k\}$ is a coloring of $G$ (Akbari et al., 2009).

Let $G$ be a colored graph and $c$ is a coloring of $G$. Color matrix $A_c(G)$ of $G$ is defined by

$$a_{ij} = \begin{cases} 
-1 & \text{if } v_i \text{ and } v_j \text{ are not adjacent and } c(v_i) = c(v_j) \\
1 & \text{otherwise}.
\end{cases}$$  \hspace{1cm} (3)

Eigenvalues of $A_c(G)$ are called color eigenvalues of $G$ and the sum of absolute values of color eigenvalues of $G$ is called color energy of $G$ and denoted by $E_c(G)$ (Adiga et al. 2013). Bhat and D’souza (2015) and also Shigeballi and Betageri (2015) introduced color Laplacian matrix of a colored graph $G$ as $L_c(G) = D(G) - A_c(G)$. Furthermore, Bhat and D’souza
(2017b) defined color signless Laplacian matrix of a colored graph $G$ as $L^+_{c}(G) = D(G) + A_{c}(G)$, where $D(G)$ is the degree matrix of $G$. The eigenvalues of $L^+_{c}(G)$ are called color Laplacian eigenvalues of $G$ and the eigenvalues of $L^+_{c}(G)$ are called color signless Laplacian eigenvalues of $G$.

In a similar way with the definition of Laplacian and signless Laplacian energy, the color Laplacian energy of colored graph $G$ of order $p$ and size $q$ is defined as

$$ LE_{c}(G) = \sum_{i=1}^{p} |\mu_{i} - q\| $$ (4)

and its color signless Laplacian energy is defined as

$$ LE^+_{c}(G) = \sum_{i=1}^{p} |\mu_{i}^+ - q\| $$ (5)

where $\mu_{i}$ are color Laplacian eigenvalues and $\mu_{i}^+$ are color signless Laplacian eigenvalues (Bhat & D’souza, 2015, Shigehalli & Betageri, 2015 and Bhat & D’Souza, 2017b).

If a graph $G$ is colored with $k(G)$, then color matrix, color Laplacian matrix and color signless Laplacian matrix of $G$ are called chromatic matrix, chromatic Laplacian matrix and chromatic signless Laplacian matrix of $G$ and denoted by $A_{c}(G)$, $L_{c}(G)$ and $L^+_{c}(G)$, respectively. Furthermore, chromatic Laplacian energy and chromatic signless Laplacian energy of $G$ are denoted by $LE_{c}(G)$ and $LE^+_{c}(G)$.

Let $\mu_{1} \gg \mu_{2} \gg \ldots \gg \mu_{s}$ ($s \leq p$) are distinct color Laplacian eigenvalues of $G$ and $m_{2}, m_{2}, \ldots, m_{2}$ are their multiplicities. The color Laplacian spectrum of $G$ is defined as

$$ \text{Lap}_{c}(G) = [\mu_{1}^{m_{1}}, \mu_{2}^{m_{2}}, \ldots, \mu_{s}^{m_{s}}]. $$ (6)

Let $\mu_{1}^{+} \gg \mu_{2}^{+} \gg \ldots \gg \mu_{t}^{+}$ ($t \leq p$) are distinct color Laplacian eigenvalues of $G$ and $m_{1}^{+}, m_{2}^{+}, \ldots, m_{t}^{+}$ are their multiplicities. The color signless Laplacian spectrum of $G$ is defined as

$$ \text{Lap}_{c}^{+}(G) = [\mu_{1}^{+}, \mu_{2}^{+}, \ldots, \mu_{t}^{+}]. $$ (7)

The following are previous results that will be used in further discussion.

**Theorem 2.1.** (Bhat & D’souza 2015) For $n \geq 2$, then

$$ \text{Lap}_{c}(K_{n}) = [n^{n-1}]. $$

and

$$ LE_{c}(K_{n}) = 2(n-1). $$

**Theorem 2.2.** (Bhat & D’souza 2015) For $n \geq 1$, then

$$ \text{Lap}_{c}^{+}(K_{n}) = [n^{n-1}]. $$

and
\[ \text{LE}_x (N_H) = 2(n - 1). \]

**Theorem 2.3.** (Bhat & D’Souza 2015) The chromatic Laplacian spectrum of \( K_{m,n} \) is
\[
\det \begin{bmatrix}
m + 1 - 1 + \sqrt{mn} & m + 1 - 1 - \sqrt{mn} & \cdots & m + 1 - 1 - \sqrt{mn} \\
1 + \sqrt{mn} & 2 - \sqrt{mn} & \cdots & 1 - \sqrt{mn} \\
\vdots & \vdots & \ddots & \vdots \\
m + 1 - 1 - \sqrt{mn} & 1 - \sqrt{mn} & \cdots & m + 1 - 1 - \sqrt{mn}
\end{bmatrix}
\]
and
\[ \text{LE}_x (K_{m,n}) = \frac{1}{mn} \left[ mn^2 + n^2 + (m + n)(\sqrt{mn} - 1) \right], \]
if \( m = n \) and \( n = m + 1 \) and
\[ \text{LE}_x (K_{m,n}) = \frac{1}{mn} \left[ (m - m\sqrt{mn} + (m + n) \right], \]
if \( n > m + 1. \)

**Theorem 2.4.** (Bhat & D’Souza 2017b) For \( n \geq 2, \)
\[ \text{Spec}_x^+ (K_n) = \left[ -1 - 1 - 1 - \cdots - 1 \right] \]
and
\[ \text{LE}_x^+ (K_n) = 2(n - 1). \]

**Theorem 2.5.** (Bhat & D’Souza 2017b) For \( n \geq 1, \) then
\[ \text{Spec}_x^+ (N_n) = \left[ \begin{array}{ccc}
\cdots & -1 & -1 \\
-1 & \cdots & -1 \\
-1 & -1 & \cdots 
\end{array} \right] \]
and
\[ \text{LE}_x^+ (N_n) = 2(n - 1). \]

**Theorem 2.6.** (Bhat & D’Souza 2017b) The chromatic signless Laplacian spectrum of \( K_{m,n} \) is
\[
\det \begin{bmatrix}
m + 1 & 1 + \sqrt{mn} & \cdots & 1 + \sqrt{mn} \\
1 + \sqrt{mn} & 2 - \sqrt{mn} & \cdots & 1 - \sqrt{mn} \\
\vdots & \vdots & \ddots & \vdots \\
m + 1 & 1 - \sqrt{mn} & \cdots & m + 1 - \sqrt{mn}
\end{bmatrix}
\]
and
\[ \text{LE}_x^+ (K_{m,n}) = 2\left( \sqrt{mn} + n^2 - mn - 1 \right) - \frac{\max_m}{n + 1}. \]

Recently, graph of group has also been a research topic discussed by many researchers. Anderson et al (2012) introduced the concept of subgroup graph of a group. Let \( H \) is any subgroup of a group \( G \). The subgroup graph of \( G \) is defined as a directed graph with vertex set \( G \) such that vertex \( x \) will be adjacent to vertex \( y \) if and only if \( x \equiv y \) and \( xy \in H \) and denoted by \( \Gamma_H (G) \). If \( H \) is a normal subgroup of \( G \), then \( \Gamma_H (G) \) is an undirected simple graph and so \( \Gamma_H (G) \) is an undirected simple graph too (Kakeri & Erfanian, 2015).

Research on color Laplacian and color signless Laplacian spectrum and energy of subgroup graphs have not reported yet until now, especially for the subgroup graphs of
dihedral group. Let $D_{2n} = \langle r, s \rangle$ is the dihedral group of order $2n$ ($n \geq 3$). All normal subgroup of $D_{2n}$ are the subgroups $\langle r \rangle$, $\langle r^d \rangle$ where $d$ is divisor of $n$, and $D_{2n}$, for odd $n$ and the subgroups $\langle r \rangle$, $\langle r^d \rangle$ where $d$ is divisor of $n$, $\langle r^{n^2}, s \rangle$, $\langle r^{n^2}, sr \rangle$ and $D_{2n}$, for even $n$ (Abdussakir, 2017). Motivated by this condition, the color Laplacian and color signless Laplacian spectrum and energy of subgroup graphs of dihedral group are studied. All subgroups discussed in this paper are normal subgroups of $D_{2n}$.

3 Results

Because this study focused on the coloring with minimum number of colors, the main results of this study are the chromatic Laplacian spectrum and energy and the chromatic signless Laplacian spectrum and energy.

\[ \text{Theorem 3.1. For } n \geq 3, \text{ then } \]
\[ \text{Lspec}_{x}(\Gamma_{D_{2n}}(D_{2n})) = \begin{array}{c|}
\end{array} \]
\[ \text{and} \]
\[ \text{LE}_{x}(\Gamma_{D_{2n}}(D_{2n})) = 2(2n - 1). \]

\[ \text{Proof.} \] By definition of subgroup graph, then the subgroup graph $\Gamma_{D_{2n}}(D_{2n})$ of dihedral group $D_{2n}$ is a complete graph of order $2n$. By Theorem 2.1, the proof is obtained. \hfill \blacksquare

\[ \text{Theorem 3.2. For } n \geq 3, \text{ then } \]
\[ \text{Lspec}_{x}(\Gamma_{D_{2n}}(D_{2n})) = \begin{array}{c|}
\end{array} \]
\[ \text{and} \]
\[ \text{LE}_{x}(\Gamma_{D_{2n}}(D_{2n})) = 2(2n - 1). \]

\[ \text{Proof.} \] Since $\Gamma_{D_{2n}}(D_{2n})$ is a complete graph of order $2n$, then $\Gamma_{D_{2n}}(D_{2n})$ is a null graph of order $2n$. Using Theorem 2.2 the proof is obtained. \hfill \blacksquare

\[ \text{Theorem 3.3. For } n \geq 3, \text{ then } \]
\[ \text{Lspec}_{x}(\Gamma_{D_{2n}}(D_{2n})) = \begin{array}{c|}
\end{array} \]
\[ \text{and} \]
\[ \text{LE}_{x}(\Gamma_{D_{2n}}(D_{2n})) = 2(2n - 1). \]

\[ \text{Proof.} \] The subgroup graph $\Gamma_{D_{2n}}(D_{2n})$ of dihedral group $D_{2n}$ is an unconnected graph with two components. The two components are complete graphs of order $n$ with vertex set $\{1, r, r^2, \ldots, r^{n-1}\}$ and $\{s, sr, sr^2, \ldots, sr^{n-1}\}$, respectively. Therefore, $\Gamma_{D_{2n}}(D_{2n})$ is a complete bipartite graph $K_{n,n}$. By Theorem 2.3 and some computation, the proof is obtained. \hfill \blacksquare

\[ \text{Theorem 3.4. For } n \geq 4 \text{ and is even, then } \]
\[ \text{Lspec}_{x}(\Gamma_{D_{2n}}(D_{2n})) = \begin{array}{c|}
\end{array} \]
\[ \text{and} \]
\[ \text{LE}_{x}(\Gamma_{D_{2n}}(D_{2n})) = 2(2n - 1). \]

\[ \text{Proof.} \] The normal subgroup $\langle r^i, 2 \rangle$ of $D_{2n}$ for $n \geq 4$ and $n$ is even is $\langle r^i, 2 \rangle = \{1, r^i, r^{2i}, \ldots, r^{(n-2)i}, 2, 2r^i, 2r^{2i}, \ldots, 2r^{(n-2)i}\}$ and $\langle 2, r^i \rangle \langle 2, r^{i+j} \rangle \subseteq \langle r^i, 2 \rangle$ if and only if $i$ and $j$ both even or both odd, for $1 \leq i, j \leq n - 2$ and $k = 0, 1$. Then, the subgroup graph $\Gamma_{D_{2n}}(D_{2n})$ has two components and each component is
complete graph $K_n$ of order $n$. Therefore, $\Gamma_{G_{2n}}(D_{2n})$ is a complete bipartite graph $K_{n,n}$. By using Theorem 2.3, the proof is complete.

**Theorem 3.5.** For $n \geq 4$ and $n$ is even, then
\[
\Lambda_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = \left\{\begin{array}{cc}
\sum_{i=1}^{n} a_i b_i u_i v_i & n \\
0 & n = 1
\end{array}\right.
\]
and
\[
\Delta_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = 2(n-1).
\]

**Proof.** The subgroup graph $\Gamma_{G_{2n}}(D_{2n})$ has two components and each component is complete graph $K_n$ of order $n$. Therefore, $\Gamma_{G_{2n}}(D_{2n})$ is a complete bipartite graph $K_{n,n}$. The proof is obvious by using Theorem 2.3.

**Theorem 3.6.** For $n \geq 3$, then
\[
\Lambda_{G_{2n}}(\Gamma_{D_{2n}}(D_{2n})) = \left\{\begin{array}{cc}
\sum_{i=1}^{n} a_i b_i u_i v_i & n \\
0 & n = 1
\end{array}\right.
\]
and
\[
\Delta_{G_{2n}}(\Gamma_{D_{2n}}(D_{2n})) = 2(n-1).
\]

**Proof.** Since the subgroup graph $\Gamma_{D_{2n}}(D_{2n})$ of dihedral group $D_{2n}$ is a complete graph of order $2n$, by using Theorem 2.4 the proof is obtained.

**Theorem 3.7.** For $n \geq 3$, then
\[
\Lambda_{G_{2n}}(\Gamma_{D_{2n}}(D_{2n})) = \left\{\begin{array}{cc}
\sum_{i=1}^{n} a_i b_i u_i v_i & n \\
0 & n = 1
\end{array}\right.
\]
and
\[
\Delta_{G_{2n}}(\Gamma_{D_{2n}}(D_{2n})) = 2(n-1).
\]

**Proof.** Since $\Gamma_{D_{2n}}(D_{2n})$ is a complete graph of order $2n$, we have $\Gamma_{D_{2n}}(D_{2n})$ is a null graph of order $2n$. Using Theorem 2.5 the proof is obtained.

**Theorem 3.8.** For $n \geq 3$, then
\[
\Lambda_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = \left\{\begin{array}{cc}
\sum_{i=1}^{n} a_i b_i u_i v_i & n \\
0 & n = 1
\end{array}\right.
\]
and
\[
\Delta_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = 2(n-1).
\]

**Proof.** Since $\Gamma_{G_{2n}}(D_{2n})$ is a complete bipartite graph $K_{n,n}$. By Theorem 2.6 and some computations, the desired proof is obtained.

**Theorem 3.9.** For $n \geq 4$ and $n$ is even, then
\[
\Lambda_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = \left\{\begin{array}{cc}
\sum_{i=1}^{n} a_i b_i u_i v_i & n \\
0 & n = 1
\end{array}\right.
\]
and
\[
\Delta_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = 2(n-1).
\]

**Proof.** By the proof of Theorem 3.4, then $\Gamma_{G_{2n}}(D_{2n})$ is a complete bipartite graph $K_{n,n}$. By using Theorem 2.5 the proof is obtained.

**Theorem 3.10.** For $n \geq 4$ and $n$ is even, then
\[
\Lambda_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = \left\{\begin{array}{cc}
\sum_{i=1}^{n} a_i b_i u_i v_i & n \\
0 & n = 1
\end{array}\right.
\]
and
\[
\Delta_{G_{2n}}(\Gamma_{G_{2n}}(D_{2n})) = 2(n-1).
\]

**Proof.** Since $\Gamma_{G_{2n}}(D_{2n})$ is a complete bipartite graph $K_{n,n}$ by the proof of Theorem 3.5, then it is obvious by using Theorem 2.6.

4 Conclusions
The formulae of chromatic Laplacian and chromatic signless Laplacian spectrum and energy of complement of subgroup graphs of dihedral group for several normal subgroups have been determined. Further research is needed to observe chromatic Laplacian and chromatic signless Laplacian spectrum and energy of complement of subgroup graphs of dihedral group for the rest normal subgroups.

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References

Blended Learning Approach in Arabic Teaching for Non-Native Speaker Students

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Abstract. The study attempted to measure the impact of the blended learning approach in Arabic teaching to the non-native speaker students of the Islamic state university in Indonesia. This research employed the quantitative method using the quasi-experimental design. There were 60 students participated in this study, which is divided into 30 students in each of the experimental, and control group. The data gained through the writing test have been analyzed by assisting the SPSS program. The results found that the students’ score in the content got the highest score, and then followed by the grammar. It means that there were students who did not have the good score in Arabic writing through blended learning because only their writing content improved while their grammar did not improve significantly. Overall, the students’ posttest score achievement in the experimental was higher than in the control group. Thus, it is crucial for further study to examine other skills of Arabic by using the blended learning approach.

Keywords: Arabic writing; blended learning; non-native speaker students

1 Introduction

In the digital era, the development of the information and communication technology (ICT) has become a necessity for all levels of society in all aspects of their life, as well as in education [1]–[5]. Therefore, it is possible to hold the distance learning by using the internet to connect between students and lecturers, checking the students’ score online, finances, the schedule of college, sending assignments given by lecturers and so on.

It does not mean that the conventional learning is no longer entirely a mainstay, but in the midst of technological advances today, it takes a variety of methods that provide more opportunities to learn by utilizing various sources, not just from the manpower as well as educators [6], [7]. The learning required is to utilize information technology, leaving no direct guidance from the educator and the broader use of learning resources. This concept is also termed by mixing e-learning with the conventional so-called blended learning. Blended learning is an approach that combines the traditional or face-to-face learning with the online learning resources via the internet as the communication and interaction option in teaching and learning process [8]–[12].

The blended learning learning takes place more meaningfully because it utilizes various media and technology [13]. Students also do not just learn Arabic easily and casually, but there are interactions and social activities that enable them to apply their knowledge. Hence,
the Arabic ability of the students is increasing, and the learning process motivates them to study diligently.

In the 21st Century, educators should design and develop the learning material that assists students in acquiring the knowledge and skill such as the critical thinking, problem-solving, good communication and collaboration, and the creation and innovation value [14]–[16]. The innovative teaching methodology of Arabic Language amongst Non-Arabic speakers is suggested by integrating the technology in every single of education activity. The technology has become the crucial requirement in education to assist the success of teaching and learning process in improving the students’ Arabic mastery and their communication skill [17][18]–[20].

In this study, the researchers applied a blended learning approach in teaching Arabic to measure the students’ learning achievement in Arabic writing using the blended learning approach. The results of this study can be used for educators to design and develop the blended learning approach in Arabic teaching.

2 Literature Review

Zhao explains that blended learning is a new term that is difficult to define [21]. Although it is quite difficult to define the notion of blended learning, some experts who examine the blended learning mentions the concept of blended learning as an approach that integrates the traditional and face-to-face learning using online learning resources [22]–[25].

Al-hunaiyyan et al. stated that the blended learning, on the other hand, is merging the aspects of the e-learning such as the web-based instruction, video/audio, synchronous and asynchronous tools, etc., with the traditional or face-to-face learning methods [26]. Another identical definition proposed by Bicen who states that the concept of the blended learning is the newest model so-called blended e-learning (BEL). The BEL model is designed primarily based on the combination of online learning, structured face-to-face learning, and real-world practices [27]. Based on those definitions, it can be concluded that the blended learning is a combination of e-learning aspects regarding the web-based instruction, video streaming, audio, synchronous and asynchronous tools with the traditional face-to-face learning as well as the teaching methods, learning theories, and pedagogical components.

In teaching the Arabic writing, the researchers conducted six stages of the blended learning approach to optimize the results. The six stages include (1) specifying the kinds and materials of the teaching materials, (2) establishing the blended learning design, (3) setting the online learning format, (4) testing the design, (5) organizing the blended learning well, and (6) preparing the evaluation criteria of blended learning implementation. First, establish the kinds and materials of teaching materials. Researchers should be well aware of what relevant teaching materials are applied to distance education that is partly done in face-to-face learning and the online or web-based learning. Second, set the design of blended learning used. The design of learning should be well designed and involve e-learning experts to help. It is intended that the design of learning that is made relevant and facilitate the system of learning face to face and long distance, not even complicate students or other educational personnel in the provision of education. The blended learning design should consider (1) how the teaching materials are presented, (2) which teaching materials are mandatory to learn and which ones are recommended to enrich the knowledge, (3) how students can access the two components,
(4) what support factors are needed, e.g., what software is used, whether it is necessary for group work or individuals only.

Third, set the format of online learning. Whether the teaching materials are available in PDF format, video, also need what the educator uses hosting notifications, whether Yahoo, Google, Facebook, or others. The recent study employed the combination of Facebook group wall discussion for the e-learning activities and face-to-face in the classroom interaction. Fourth, test the design made. This test is done to determine whether the learning system is running well or not. Starting from the effectiveness and efficient concerned, whether it makes it difficult for students and educators or even really facilitates learning. Fifth, organize blended learning well. Previously there has been socialization of teachers or lecturers about this system. They can start from the introduction of the task of each component of education and access teaching materials. Teachers or lecturers here served as promotional officers, because of the following the implementation of blended learning bias from parties themselves and even from other parties. Sixth, prepare criteria for evaluation. Examples of evaluations are: (1) easy to use, (2) the content, (3) layout and format, (4) interested, (5) applicable, and (6) cost consuming/value.

3 Methods

The study engaged the quasi-experimental design. This design employed two groups namely the experimental and control group. The experimental group has been treated using the blended learning approach and the control group by applying the conventional teaching and learning by presenting the Arabic writing material using drill technique [28].

The population of the research was the students of Arabic education department of Universitas Islam Negeri Maulana Malik Ibrahim Malang in academic year 2016/2017. The sample of this research was 60 students who divided into 30 students in the experimental group and 30 students in the control group. Both classes have been selected randomly. The class DK of the fourth semester was taken as an experimental group that implemented the blended learning approach, and the class AK was selected as a control group by considering that both students of the two groups have the same level and the same ability of Arabic writing.

The researchers employed the writing test to measure the students’ learning achievement in two components of writing (Kitabah) such as the content and grammar through the tests. It consisted of the pretest before conducting the treatment and the posttest after holding the treatment. The pretest and posttest focused on the students’ writing descriptive text.

Data on students’ writing achievement have been scored using the writing rubric proposed by Heaton & Coon [29] to be more focused on the content and grammar of writing scores and standard deviations using the SPSS version 17 program analysis. The data were presented descriptively and inferentially.

4 Results and Discussion

Based on the analysis, the researchers present the frequency and percentage of students’ Arabic writing achievement in term of the content of writing scores of both the experimental and control group that can be seen in Table I.
Table 1. The Frequency and Percentage of The Content Score Achievement in The Pretest

<table>
<thead>
<tr>
<th>Range of Score</th>
<th>Classification</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>86-100</td>
<td>Excellent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>71-85</td>
<td>Very good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>56-70</td>
<td>Good</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>41-55</td>
<td>Average</td>
<td>5</td>
<td>16.6</td>
</tr>
<tr>
<td>26-40</td>
<td>Poor</td>
<td>23</td>
<td>76.6</td>
</tr>
<tr>
<td>&lt; 25</td>
<td>Very Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1 presents that the students of both the experimental and control group pretest scores classified in the poor category. The percentage accumulation of the low achiever students in the pretest were 23 students (76.6%) in the experimental group and 26 students (86.6%) in the control group. The student’s score classified in the good category were 2 students (6.7%) in the experimental group and 1 student (3.3%) in the control group. Based on those accumulations of the pretest scores, it indicated that the low achiever student’s score was higher than the high achievers. It means that the students writing skill regarding the content of writing are still needed to be increased. After giving the treatment, the frequency and percentage of students’ writing scores in term of the writing content in both groups has improved. It can be seen in Table 2.

Table 2. The Frequency and Percentage of The Content Score Achievement in The Posttest

<table>
<thead>
<tr>
<th>Range of Score</th>
<th>Classification</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>86-100</td>
<td>Excellent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>71-85</td>
<td>Very good</td>
<td>5</td>
<td>16.6</td>
</tr>
<tr>
<td>56-70</td>
<td>Good</td>
<td>24</td>
<td>80.0</td>
</tr>
<tr>
<td>41-55</td>
<td>Average</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>26-40</td>
<td>Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&lt; 25</td>
<td>Very Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2 describes that the most students in the experimental group scores categorized in the high achievers in which 24 students (80.0%) were in good category and 5 students (16.6%) were in very good classification. The students’ score in the control group also has improved after the treatment but not significantly as happened in the experimental group; there were 17 students (56.6%) in good category and 1 student (3.3%) in the very good category and 11 students (36.6%) in the average classification.

The frequency and percentage scores of both the experimental and control group in term of grammar could be seen in Table 3.

Table 3. The Frequency and Percentage of Grammar Score Achievement in The Pretest
Table 3 describes that most of student’s writing scores in both of the experimental and control groups in term of the grammar were still in the poor or low classification. There were 20 students (66.6%) of the experimental group in the poor category and 2 students (6.7%) in the good classification. While in the control group, there were 22 students (73.3%) in the poor category and 1 student (3.3%) in the good category. It illustrates that the low achiever students were higher than the very good achiever. It also indicates that the students writing skill in term of grammar should be increased.

The frequency and percentage of students writing scores in term of grammar after conducting the treatment can be illustrated in Table 4.

Table 4. The Frequency and Percentage of Grammar Score Achievement in The Posttest

<table>
<thead>
<tr>
<th>Range of Score</th>
<th>Classification</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>86-100</td>
<td>Excellent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>71-85</td>
<td>Very good</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>56-70</td>
<td>Good</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>41-55</td>
<td>Average</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>26-40</td>
<td>Poor</td>
<td>20</td>
<td>66.7</td>
</tr>
<tr>
<td>&lt; 25</td>
<td>Very Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4 illustrates that most of the students’ writing score after giving the treatment to both of experimental and control group were classified in the average category in which 17 students (56.6%) of the experimental group were in the average classification and 11 students (36.6%) were in the good category. The student’s scores in the control group after the treatment were also in the average category. There were 27 students (90%) in the average category, and 1 student (3.3%) has a good classification. It means that there was no significant improvement in students writing skill regarding grammar. In the table below, the researchers presented the mean scores and standard deviation of both experimental and control group achievement in the pretest and posttest.

Table 5. The Mean Score And Standard Deviation Of Students’ Writing Achievement In The Experimental And Control Group
The mean score and standard deviation were shown the difference scores in the pretest and posttest. The data obtained based on the computation analysis using SPSS version 17.0. The data presented in Table 5 illustrates that the mean scores of the pretest and posttest were different after conducting the treatment. It means that there was an improvement of students’ writing skill in term of the content and grammar through the blended learning approach. It can be proved by the mean score gained in the posttest of the experimental group that is 70.20, and the standard deviation was 6.50. The mean score was high compared to the pretest score that is 39.80 with the standard deviation is 10.56. Meanwhile, the mean score of the pretest in the control group was 35.26 with the standard deviation was 7.38, and the mean score in the posttest was 51.10 with the standard deviation was 7.49. The mean scores in the pretest and posttest of both groups were different after giving the treatment (70.20>39.80) and (51.10>35.26).

The hypotheses were tested using the inferential analysis. In this measuring, the researchers employed the t-test (testing of the significance) for the independent sample test, that is, a test aimed to know the significances of the differences between the result of the students’ mean score in the pretest and posttest as can be presented in Table 6.

<table>
<thead>
<tr>
<th>Achievement</th>
<th>Experimental Group</th>
<th>T</th>
<th>2 Tailed Value</th>
<th>α</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest and Posttest</td>
<td>25.89</td>
<td>1</td>
<td>0.00</td>
<td>0.05</td>
<td>Significantly Different</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Group</th>
<th>T</th>
<th>2 Tailed Value</th>
<th>α</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest and Posttest</td>
<td>27.18</td>
<td>2</td>
<td>0.00</td>
<td>0.05</td>
</tr>
</tbody>
</table>

The probability value of the t-test analysis of the experimental and control group scores presented in table 6 shows that there was a significant difference between the pretest and posttest scores. The gain of the probability value (0.00) was smaller than the level of significance of the t-table used in this study (0.05). It means that the probability value was small than the α value (0.00<0.05). It indicated that the alternative hypotheses (H₁) was accepted and the null hypotheses (H₀) was rejected. Therefore, the researchers concluded that the data on posttest scores as the final results gave the significant difference and improvement. The use of the blended learning approach was able to give a greater contribution to the
teaching of Arabic writing, especially improving the students’ writing skill regarding the content and grammar.

The results showed that the use of the blended learning significantly improves the students writing skill. Specifically, the result of the mean score in the posttest. In the experimental group shows that the two aspects of writing such as content got the highest mean score followed by the grammar. The researchers assumed that the improvement of students’ writing skill relating to the material presented in Facebook and the approach itself. The researchers assumed that during treatments, most of the students paid attention to the content and use them to construct an interpretation. Teaching and learning the language is to trigger student interest and motivation in the class. Besides, the researchers assumed that students were familiar with the topics. Meanwhile, the result of data analysis shows that the mean score of students’ grammar is lower than content. The researchers assumed that grammar got the lowest mean score in posttest because students were not accustomed to focusing on the elements of grammar.

The effectiveness of the blended learning in teaching Arabic writing was supported by some previous findings [2], [19], [30]. Tamim [30] reported that the blended learning had positive impact to the students’ empowerment. Sadik [19] asserted that the utilization of meaningful technology could improve students’ achievement. Salikin & Tahir’s study reported that Yahoo Messenger and voice chat in language learning improved students’ language skills where the students can expose their ideas freely with friends in the online learning, and they can establish their learning interaction joyfully [2].

The several types of the research findings on the use of blended learning in line with the advantages of online learning by Brown who stated that the online learning provided students’ opportunity and their initiation in learning, face-to-face gave and taken, for practicing and negotiating the meanings, for extended conversational exchange, and for students rule adoption that otherwise be impossible [31]. Some advantages of blended learning could make students involve themselves directly in the process of teaching and learning [32]–[35]. It also can provide opportunities for all students to participate actively, particularly if the discussion is carried on in the blended learning approach. The researchers assumed that the advantages of blended learning had made students interested in learning and improved their Arabic writing skill.

5 Conclusion

The researcher comes to the following conclusions that the exploiting of the blended learning approach in teaching Arabic writing improved the students’ writing skill in term of the content and grammar. The analysis results showed some students could not improve their Arabic writing through blended learning, because only their score of writing content improved but their grammar did not improve significantly. The experimental students’ scores in the posttest are higher than the control group scores. Thus, the researchers recommend to the further research to investigate the use of the blended learning approach in Arabic teaching by considering the students’ activeness controlling in e-learning, enhance their grammar, and consider the internet connection.
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References


The Use of Android-Based Dictionary Game for Arabic Vocabulary Learning in Elementary School

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Abstract. In the field of teaching and learning of the Arabic language, the dictionary has a special role as the teaching media that are used by teachers to enrich the vocabulary of the students easily and fast. Vocabulary has a significant impact on the adequacy of language development. Therefore, a lot of educational strategies has developed in order to raise students’ motivation toward learning the Arabic language, especially in order to raise their interest and their orientation in keeping vocabulary, practicing it in speaking, reading and writing. The android-based dictionary game is the exciting strategy to train students to be master through the competition to define the meanings of difficult vocabulary quickly and accurately. This article presents android-based dictionary game in Arabic vocabulary learning, and also explains a strategy model for integrating android and media into students' vocabulary learning experience in the classroom.

Keywords: Arabic vocabulary learning; dictionary game; android; internet, elementary school.

1 Introduction

Vocabulary is one of the important elements of the Arabic language that must be mastered by learners to sustain their ability in listening, speaking, reading and writing. “Vocabulary is also an area where teachers are asking for guidance on instructional approaches, strategies, and materials” [1]. The minimum number of vocabularies that must be mastered by students for mastering Arabic language skills, are around 750-1000 words, provided that they have been given mastery of structures and of using dictionaries [2]. For that reason, “vocabulary should be considered in a balanced way compared to other language elements. Because, vocabulary has a large role in the development of students’ language skills mastery” [3]. Thus, with sufficient vocabulary knowledge, students are able to communicate with others well, and express their opinions and feelings with the language they learn. Therefore, the teacher must do various language exercises for learners to practice vocabulary skills and understand their meaning, memorize it, and use it properly and correctly.

Various learning strategies have been developed by Arabic teachers as the perfect solution for achieving vocabulary learning. Especially, to stimulate learners' motivation in learning Arabic, and stimulate their interest in memorizing vocabulary and using it in speaking, reading and writing. Some of them make use a dictionary that is packaged creatively into a game of language known as a dictionary game. And the android-based language game is a choice of contemporary strategies that attract learners to train them in vocabulary mastery through
competitive activities in recognizing the meaning of difficult vocabulary quickly and carefully.

Dictionary is not new. Now in the global era, an era that requires the use of foreign languages as a means of communication between individuals, between institutions, and between countries in the world, dictionaries become items that must be owned by each individual. In fact, in an era of information and communication technology (ICT) that is increasingly sophisticated and growing very fast, dictionaries are always hunted and accessed every time. Humans need a translator tool for each of their activities. In fact, in Arabic classes the existence of dictionaries is always needed. Teachers and students need dictionaries that are easy to get and are used to find vocabulary and find meaning in a practical and fast way.

The use of dictionaries as a tool in learning Arabic is common and ordinary. However, not all students are good at using dictionaries, some even find it difficult to find a vocabulary they are looking for. Then, the question arises: is the dictionary being used incomplete? Or the owner of the dictionary who does not know how to use it? Or do they not yet know how to search for a word in the dictionary? Or are they not used to using dictionaries because they don't have a dictionary? Or even, do they prefer to ask friends like “walking dictionary” rather than having to open a dictionary?

In addition, we are confronted with the reality, especially that which occurs in Islamic elementary schools, as stated by Fakhrurrozi, that “in the selection of vocabulary learning materials for children, teachers are usually fixated on available material which is usually in the form of textbooks. It is very lucky, if the teacher can use textbooks that are interesting, systematic and in accordance with the syllabus used in their school. However, from the point of view of children, it is very boring if the material presented by the teacher only comes from a textbook” [4].

In fact, in the era of communication and information technology, “the era that impossible to avoid it” [5]. Technology has changed the way of students in learning, and even the way of teachers in teaching in the classroom.

Therefore, nowadays, the subject matter needs to be presented creatively, including in the presentation of vocabulary learning materials, among them by utilizing a dictionary designed by teachers creatively with the help of android technology, so it becomes a popular language game application known as android based-dictionary game. With this application, learners are expected to use the dictionary to search for and discover the meaning of vocabulary; and can increase their interest and motivation in learning vocabulary, memorizing it and using it when listening, speaking, reading and writing; and the learners are also expected to learn Arabic happily, competitively, and learn together in order to obtain the best results in learning Arabic.

This paper will discuss the use of android technology in Arabic vocabulary learning in elementary school. The main issues discussed are: how is a dictionary game that uses android app? And how is the use of these android-based dictionary game in learning Arabic vocabulary in elementary school?

2 Literature Review

2.1 Technology and the Challenges of the Age in Education

The word technology is the most widely used word of our time. The current era is characterized by the explosion of knowledge and technology, the proliferation of communication systems, the increasing use of computers and the expansion of the use of the
internet, which has made the world an electronic global village. States have begun to feel the growing importance of computer literacy by providing an interactive learning and training environment that attracts the attention of individuals in an age characterized by rapid development and constant change. The employment of information technology and the internet in training and education is one of the most important indicators of the transformation of the society into an information society, as this will contribute to increasing the efficiency and effectiveness of education systems and in the dissemination of information awareness and thus contribute to building the information cadres sought by the societies in the current era. [6]

The main reason for using technology in teaching and learning is to gain multiple benefits as follows:

1) Increase the effectiveness of learning and degree of proficiency.
2) Reduce the time the teacher needs to reach the designed goals.
3) Increase the efficiency of teachers in view of the numbers they know without detracting from the quality of education.
4) Reduce cost without affecting the quality of learning.
5) Increase the productivity of the educational process, by freeing the teacher from the routine work, and give him the opportunity to devote to help his students to learn, and planning their activity, and the teaching of basic skills.
6) The establishment of the educational process and its establishment on scientific grounds, to rely on the results of research documented in human learning, and to benefit from the results.
7) Modifying behavior and highlighting new trends.
8) Develop linguistic wealth, help build new concepts sound, clear.

2.2 Android and Its Use in Education

Android is a free operating system developed by Google, an operating system for devices that contain touch screens such as smartphones and tablets. Now, “the android system in the electronics market is becoming more and more popular, especially in smartphone market. Because of the open source, some of the development tools are free, so they are plenty of applications generated. This greatly inspired the people use the android system” [7].

There are three types of android Apps: Native, Web-based and Hybrid. “Many users are interested in using native mobile apps as they can be used even when there is no internet connectivity” [8]. Various domains of Android Applications include Entertainment, educational purposes, retail, financial, social, travel, education, healthcare etc.

Some researches indicate that the use of android apps for learning makes it easy, effective and fun [9] [10] [11]. Drawing on these researches, many android applications have been developed for educational objectives, such as horizontal educational expansion, knowledge flow, multiple knowledge vessels, multiple human tools, solving learning problems, facilitating learning and solving problems of excessive pronunciation. Students have started using Apps for educational purposes. “Many Apps are available which provides course material and assignments for practice. Also, students can choose to display information according to their choice.” [12] For example, there are many android applications that can solve the problems of Arabic language teaching and learning and can facilitate for Arabic vocabulary learning. Different famous apps for Arabic vocabulary learning include Learn Arabic Vocabulary-6000 words or Learn Arabic Vocabulary Free.

2.3 Dictionary Game: Its Use in Vocabulary Learning
In the context of language teaching and learning, the use of the game has become a strategic, exciting and popular place for children. There are many educational benefits offered by games to children” [13].

Drawing on research-based principles of vocabulary learning and multimedia learning, there are many strategies that use game to engage their students in vocabulary learning. One of the popular games for vocabulary learning is dictionary game. It is “a collective activity by a team of students, where students build vocabulary, where students compete with each other to define the meanings of difficult words facing them quickly and accurately defined. This game will strengthen the skill of students in the use of the lexicon of the school efficiently, as the use of the lexicon in the detection of the meaning of the vocabulary contributes to the knowledge of the root of the word, as well as to identify the different meanings of the single language, and the contexts in which it usually and how to pronounce correctly” [14].

Al-Bari [15] said that there are six steps in learning vocabulary using the dictionary game, that are:

1) The students are divided into groups or teams of 4-5 students each. Then the teacher gives a diction to each team (or the teacher asks each team to prepare one diction on the previous day), with the diction that is distributed/ prepared is a dictionary that has the same specifications (thickness size and publisher) so that the game runs fairly.

2) The teacher mentions the rules of the game for all teams: each student has to search for a new word in the dictionary individually without the help of a friend of his team.

3) The teacher starts the game by asking the students to read certain sentences contained in the reading, then the teacher determines a word to look for in the dictionary. When the teacher points to a word and designates a student in each team, then each designated student starts competing to find its meaning through the dictionary.

4) Then, one of the team members conveys the definition of the word searched, in addition to specify the mode of pronunciation and the fragment of its pronunciation.

5) The team capable of delivering the definition of the vocabulary searched properly and completely will be the “winning” team and the team entitled to submit the final conclusion report of the discovery of the word.

6) Then the teacher appoints another team to be the first team challenger who has won in the first round, by raising new words that have not been found by the first team, and so on until the word to be searched has been “exhausted” or all definitions are known.

3 Discussion

3.1 How is a dictionary game that uses android app?

It is clear from the definition of dictionary game that the main elements of the game are goals, order, challenges and dealings. The game usually involves the excitement of the psychological brain or the physical excitement, or sharing them together. The whole game helps the development of practical competencies, and is considered as a means in the exercises, or play an educational role, and works as a demonstrator or psychologically active. Sugiarshi said, that “the game is a way for children to surf the world, from things not even known to things known, from things that are not even to things that can be done to them. It is correct to say that games and their practicality for children have important value and privacy in promoting the development of daily life” [16].
In the context of language teaching and learning, the use of the game has become a strategic, exciting and popular place for children. Because the language game is an effective way to abort the spirit of learning and prepare a place for recovery from the dryness of learning. The learning share is represented by learning to play within active learning strategies, in application of educational quality, and in the pursuit of quality educational services. The strategy of learning by playing is an effective educational tool that helps to achieve the goals associated with the curriculum to develop students' ability to communicate and interact with others. The strategy develops the mental, and raises the mind to think, and increase the positive classroom interaction significantly in the transmission of the impact of learning, and give meaning to what the student teaches within the framework of education, combining the benefit and fun.

Despite these benefits, the effectiveness of learning by using game can’t be achieved if it is not designed well [17]. Mahmud Ismail Shini proposes to choose the game taking into account the following things: (1) educational material, (2) educational objectives, (3) individual differences for students, (4) communication problems in the classroom, (5) psychological conditions among learners in the classroom, (6) design of education process, (7) facilities and devices available in the classroom [18].

Therefore, the android applications have been developed for educational objectives such as horizontal educational expansion, knowledge flow, multiple knowledge vessels, multiple human tools, solving learning problems, facilitating learning and solving problems of excessive pronunciation. There are many android applications can be integrated into Arabic vocabulary learning in the classroom. But, the choosing android apps has to fulfill these criteria: (1) the choose application has created depending on principles of vocabulary learning and multimedia learning, (2) the app has to be suitable for individual differences for students and for the psychological conditions among learners in the classroom, (3) the app has to adapted to vocabulary learning objectives, (4) the app has to be easy to use and can give solution for communication problems in the classroom.

Some android apps have fulfilled these criteria include the following:

1) Learn Arabic Vocabulary-6000 words. This app is created by FunEasyLearn. With this apps, students can learn Arabic for free, learn more than 6000 words trough image illustration, recorded pronunciation, and native translation into 59 languages.

2) Learn Arabic Vocabulary free. This app is designed for rapid Arabic learning of vocabulary and phrases. In this apps, available Flashcard language lessons:
   - Most frequent Words in Arabic (Beginner A1, 500 words; Elementary A2, 501-1250 words; Lower Intermediate B1, 1251-2250 words; Upper Intermediate B2, 2251-3500 words; Advanced C1, 3501-5000 words).
   - Add your own vocabulary list. If you are taking a course at a school, university or private academy, you can add the words from your textbook and learn them here instead of looking them up in a dictionary.

3.2 How is the use of the android-based dictionary game in learning Arabic vocabulary in elementary school?

Arabic vocabulary learning is an important and indispensable part of Arabic language learning process. The objectives of Arabic vocabulary learning are that "not only is the student proficient in pronouncing their voices, and understanding their meaning independently, and learning how to derive them, or just describing them in a correct language structure, but are that the student is able to all this, in addition to something else is to be able to use the appropriate word in the appropriate context. Therefore, the teacher must train students on the
following things: (1) understanding the meaning of the word, (2) pronunciation, (3) derivation, (4) using word and its meaning in the sentence [59].

In order to achieve these objectives, the teacher must provide his students with some strategies that help them to learn. And he must train them on some strategies and techniques that contribute to the increase of vocabulary. The teacher must apply the basic principles of vocabulary teaching as follows:

1. Provide adequate opportunities for students to learn the language.
2. The teacher's diagnosis of more than three thousand words used by the learner.
3. Direct and direct learning of vocabulary.
4. Provide adequate opportunities for the expansion of knowledge of words.
5. Provide the opportunity to increase vocabulary fluency of words known to the emerging.
7. Test different dictionaries and choose the easiest for students. [20]

Based on these principles, many educational strategies have been developed to teach vocabulary in order to stimulate students' motivation to learn Arabic, especially to stimulate their interest and tendency to memorize, to practice, and to use vocabulary in conversation, reading and writing. One of the strategies developed is implementing an android-based dictionary game. This game is an exciting strategy to train students for acquiring and controlling vocabulary through competition to define the meanings of difficult vocabulary quickly and accurately. Al-Bari said that there are six steps in learning vocabulary using the dictionary game, that are:

1. The students are divided into groups or teams of 4-5 students each. Then the teacher gives a diction to each team (or the teacher asks each team to prepare one diction on the previous day), with the diction that is distributed/ prepared is a dictionary that has the same specifications (thickness size and publisher) so that the game runs fairly.
2. The teacher mentions the rules of the game for all teams: each student has to search for a new word in the dictionary individually without the help of a friend of his team.
3. The teacher starts the game by asking the students to read certain sentences contained in the reading, then the teacher determines a word to look for in the dictionary. When the teacher points to a word and designates a student in each team, then each designated student starts competing to find its meaning through the dictionary.
4. Then, one of the team members conveys the definition of the word searched, in addition to specify the mode of pronunciation and the fragment of its pronunciation.
5. The team capable of delivering the definition of the vocabulary searched properly and completely will be the “winning” team and the team entitled to submit the final conclusion report of the discovery of the word.
6. Then the teacher appoints another team to be the first team challenger who has won in the first round, by raising new words that have not been found by the first team, and so on until the word to be searched has been “exhausted” or all definitions are known. [13]

Actually, the steps of dictionary game can be created and developed by the teachers according to the characteristics of learners, objectives and materials taught. That is, by creating new game rules. Here are some game rules (as an alternative) that can be applied in the dictionary game:

Alternative #1:

1. A dictionary game activity is performed in pairs;
2. Students first write one word (verb / noun) in Arabic, for example "دراسة", then he writes the first letter of a word that the second student must guess, for example "ح";
(3) The second student guesses by saying the word according to the first letter written by the first student, e.g. "حصة".
(4) Then, alternatively, the second student writes the first letter of a word to be guessed by the first student; And so on until it reaches the specified number of words.

Alternative #2:
(1) A dictionary game activity is performed in pairs;
(2) The first student writes one word in Arabic, for example "تعلم"; Then he asked the second student to guess the translation in Indonesian;
(3) The second student guesses by mentioning the translation of the "Arabic word written by the first student";
(4) Then, alternatively, the second student who gets the turn to write a single word in Arabic which should be mentioned in the Indonesian language by the first student; And so on until it reaches the agreed number of words.

Alternative #3:
(1) A dictionary game activity is performed in pairs;
(2) The first student writes one word in Arabic and the translation at once, for example "تعليم" means "teaching"; Then, he writes the first letter of a word to be guessed by a second student, such as the letter "م";
(3) The second student guesses the word meant by the first student as well as the translation: "المدرسة" means "teacher";
(4) Furthermore, the second student who gets the turn to write the first letter of a word to be guessed by the first student, and so on, until it reaches the agreed number of words.

The following is a vocabulary learning model using an android-based dictionary game in elementary school:
- Before use, the teacher must prepare a number of vocabulary cards of direction (e.g., four cards), and prepare a number of dictionaries, and choose an android-based dictionary game available in google play (like: Learn Arabic Vocabulary-6000 words or Learn Arabic Vocabulary Free).
- then, the teacher divides the students into four groups (in each group five members of students), and then the teacher asks each student to run the application;
- The teacher explains the rules of the game that each group should adhere to in this game: “Each student individually works in the search for new vocabulary in the application, and Each student does not assist to other student in his group until finish the individual search for this vocabulary”.
- Then, the teacher asks one of the students to be in front of the class to get the card. If the group has finished searching for the vocabulary that asked in the card, another member of that group can proceed to the chapter without waiting for the call to obtain the next card, so until the end of the other card.

Here is an example of the following:
Read this guide in the card, then search for any word in the box using the android apps (Learn Arabic Vocabulary Free)!

Table 1. Example

<table>
<thead>
<tr>
<th>CARD #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>This word is started by <em>harf</em> QAF, it’s a tool used by student for writing</td>
</tr>
</tbody>
</table>
Then, the student returns to his group, and shares with other members, to discuss the vocabulary that suits the guide. Each group must find the appropriate word in the given directory written in the Cards. Each group, which was the fastest in finding all the words correctly, become a winner in this game.

In the final process, the teacher asks each group to submit their findings to the class. In this process, the teacher performs the entire set and assigns one of them as the winner in this game.

4 Conclusion

In closing, the author invites the teachers of Arabic language to use android based-dictionary game that can support active learning. This game has many educational benefits, which increase the effectiveness of Arabic vocabulary learning and degree of proficiency. Many android based-dictionary games have been developed to learn Arabic vocabulary, the teacher must choose one of the appropriate android-based dictionary games that has to fulfill some criteria, and use it for integrating android into his students' vocabulary learning experience. And, for implementing an android-based dictionary game, there is a vocabulary learning model using an android-based dictionary game in elementary school, but the teachers can create the steps of dictionary game according to the characteristics of learners, objectives and materials taught.

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References


Language Used in Social Media and Its Impact Toward Teens Language Acquisition

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Abstract. The development of technology in the modern era today is so fast and easy to use for the general public, including the information spread through gadgets. Such internet-connected technology makes it easy for users to access information around the world through the most common application for teenagers namely social media. This application is easy to obtain and use, as well as expand the network of teenagers to access information that is educative, recreational and social. This paper discusses the use of social media and its impact on language acquisition in adolescents. The method of data collection uses observation and interviews with students of MTs Negeri Batu, Indonesia. The study results show that the use of social media does not fully have a positive impact on the acquisition of language in adolescents. This research is expected to be a consideration for educators and parents to monitor the use of social media applications for children to contribute more positively.

Keywords: language acquisition; social media; teens language

1 Introduction

Human need for information and news is one of the things that cannot be left behind, from state news, crimes, gossip, and other news that is considered entertaining, can fill the void of time or fulfill curiosity. Along with the development of media technology that contains news not only displayed in print versions such as newspapers and magazines, but many online media that facilitate access to information to get interesting news. Online access is more practical, instant and inexpensive.

One online media that offers practical and instant interesting news is social media where users can participate in creating content such as blogs and other social networks. This media is easy to use and portable so users can always access the latest information while participating through a network of messages and comments. This is what maximizes the use of social media to express or express various things, including ideas, moods and the likeness of its users.

It cannot be denied that the benefits of social media can dominate various communication and interaction activities that require quick and new access. Access to this fast communication on the one hand helps users from both adults and adolescents. But on the other hand it also raises the phenomenon of language summarization used in communicating through social media. Not infrequently social media users especially teenagers abbreviate words or sentences written, such as writing the word "makan" to "mkn", "gede rasa" to "GR". These abbreviations are not listed in the Indonesian Language Dictionary, which can be categorized in language
creativity but does not always facilitate the reader. In addition to communicating on social media, teenagers often use slang language which they think is the language of young people.

Teenagers are young people who have different characters from the previous generation, namely childhood and adulthood. In the group of adolescents there are individuals who have similarities in age range, and experience important historical events in the same time period [1]. The criteria for language diversity in individuals adolescents used in social media are the focus of this study. This is because adolescents, especially the Z generation, have the following characteristics: (1) fluent technology, thirst for technological renewal and highly adaptable to technological applications, (2) social, very intense interacting through social media with all circles, (3) expressive, tend to be tolerant with cultural differences and very concerned about the environment, and (4) quickly move from one thought / job to another thought / work [2].

For teenagers online social media is the main tool for networking especially when puberty the need to communicate with the opposite sex is felt to be most effective through cyberspace. The awkwardness of speaking, speaking and communicating with the opposite sex immediately decreases if it is assisted by social media which is equipped with various features such as photos, videos or emoticons [3].

A variety of language phenomena in the use of social media by teenagers requires further exploration. By conducting a study on the use of social media by adolescents, a description of the language patterns in adolescent social media will be obtained and how they will impact on language acquisition. The focus of this research study is to describe the impact of social media use on language acquisition in adolescents.

2 Literature Review

2.1 Social Media

Social media is a group of internet-based applications built on various ideologies. Website technology has enabled the creation and exchange of content between social media users [4]. Online social media is used to share, participate and create content in blogs or social networks [5]. The variety of social media is always growing, but in Indonesia only a number of online social media are widely used such as Facebook, Twitter, Instagram, Watshapp, and Line.

Social media is accused of being able to damage communication ethics. Besides that the media can be used as a tool to drop the image of a person or group with hoax news and inappropriate words [6]. On the other hand, social media also has two sides, positive and negative. The positive side is to make it easier for children to access schoolwork materials, find lecture materials, and expand networks of friends. The negative side is the lack of a child's social spirit towards the environment and people around. Children will be too cool with the social media world, become lazy and wasteful [7].

Social media for adolescents is often called complement to face-to-face interaction [8]. Because of that, in addition to friendship in real terms, social networking in cyberspace becomes a need for social media users, especially among teenagers. Social media for American teenagers is said to have more positive contributions because it is considered to facilitate interaction in choosing, adding or removing friends. In addition, social media makes it easy for teenagers to express freely in expressing their feelings. Directly or indirectly the ease of expression also reduces stress levels in adolescents. In addition, by expanding information networks can free teenagers from feeling bored [9].
Social media is not only intended for certain groups who utilize information technology in gaining popularity. Teenagers who have an introverted personality in their daily lives, can in cyberspace represent themselves as celebrities through social media [10].

2.1 Language acquisition

Language acquisition is the process of the child's brain in acquiring his mother tongue or first language. One of the stages of obtaining language is how from a baby, the child gets his mother's language stimuli unconsciously or there is no element of intentional learning of mother tongue [11]. Language acquisition differs from language learning. If language learning is a process that takes place when the child learns a second language after acquiring mother tongue. So the conclusion is that language acquisition is related to mother tongue or first language, while language learning is related to second language [12].

In the acquisition of language there are two categories, namely the acquisition of language that is sudden, sudden and unconscious, this acquisition is called the competency process. Second, language acquisition is gradual which grows from pralinguistic social, and cognitive achievement. This category is called the performance process. Although the competency process is brought from birth, but children still need guidance that will bring performance in language [12].

Language acquisition can be obtained from all activities, experiences, and the environment, so that it is very possible for language acquisition to take place through the social media used. Languages in social media can affect the language that has been obtained before. As for adolescents, the process of language acquisition does not take place naturally as fast as the golden age of childhood brain development. This is because at puberty it has reached lateralization maturation levels which impact from cognitive maturation [13]. Thus in this period adolescents apply the most complex linguistic results, namely pragmatic acquisition.

3 Methods

This research was conducted with a qualitative design to develop an understanding of the phenomenon of social media use and its impact on language acquisition in adolescents. Descriptive method was chosen because this study presented reality objectively in accordance with the context encountered, namely about the use of language in social media. This study intends to describe the facts or phenomena of language use in the form of words or sentences in the context of written and oral social media users from among teenagers.

The data in this study are written data from the renewal of status and comments by adolescents who actively use online social media whose data is obtained from observations. In addition, the techniques used to collect data are interviews with teenage subjects. The selected subjects are students of MTs Negeri Batu, Indonesia. Selection of subjects in the category of adolescents aged 12-13 years, actively using social media accounts every day, and having more than one social media account. As for studying this phenomenon, psycholinguistic theories of language acquisition are used [12].

4 Findings and Discussion
The first research subject, AM other than schools in MTs also lived in Islamic boarding schools. In everyday life it still takes time to communicate via social media. One of the statuses taken randomly from their social media accounts is:

“Alhamdulillah Bsk Otewe k bali semga bisa jadi momen terindh” dan “ikut manteman bli oleh2 jg ikut senang sekaleee”.

AM expressed his excitement to take a trip to Bali. In the expression of gratitude AM uses standard writing, but when stating the news the expression used emphasizes his identity as a teenager by abbreviating Bsk, semga, terind, bli, jg. The slang character appears in the words Otewe, manteman and sekaleee.

In the interview, the spoken language used by AM also shows the character of his identity. To answer one of the questions given about when the subject will return home, AM responds:

“Yaa... saya sih kalau pondok sudah libur juga langsung capcuss mas... iya gak bro” (while glancing at his friend).

In the utterance the word capcuss which means to go and bro which is commonly used as a friend, is this slang word that characterizes the subject's identity as a teenager who follows the present vocabulary variant. AM uses the greeting in responding to show the position of the younger speaker. AM also emphasized his character as a teenager who was the same age as when he confirmed with his friend, bro. Both written and oral phrases AM consistently characterizes the identities of speakers as teenagers who have high social networks represented by friends and bro.

In the second subject, AN represents students who live with family at home. The use of social media is more free because it is not limited to time after school hours. From the wrong status of a social media account taken randomly, AN wrote:

“Njiiirr jam segini baru pulang”.

In this status the subject expresses his feelings towards the current situation he experienced. There is the word slang "njiiirr” as an expression of surprise or disappointment.

In the interview, AN answered questions about activities carried out after school with the following responses:

“rehat mas, eh maem dulu ding... abis itu rehat mas”

AN’s speech has a similar pattern with its status which is concise and direct at its core. In responding to AN, it shows the identity as a child or speaker who is younger than the interlocutor with the greeting, and characterizes the cultural background of the choice of the word maem, ding. Subjects make corrections with utterances eh, ding. The rest break repetition clarifies the character who speaks directly to the point.

The third subject, the US has in common with the second subject who daily lives at home with family. On one of the status of his social media accounts, the subject writes:

“Ow em ji ... suka suka suka deh bonekanya”

At this status the expression of excitement on an object is shown from repetition like to like. The US also characterizes its teenage identities from its preferred object, namely dolls. In addition, teenage characters also appear from the expression ow em ji or Oh My God.

In answering questions about what activities the subject has attended in school lately, the US responds:

“Paskibra mas... tapi kadang bikin mager soalnya kakak kelas ada yang rese... bikin bete mas”

US response also shows the position of younger speakers with the word greeting mas. Not unlike the writing characters, in the US oral response also put forward the outpouring of feelings. If the writing about feelings of love in the US oral context reveals feelings of
annoyance with the word *mager* means lazy to move. Besides that, the US said that receipt meant annoying. The US also said that it means boring today or bored. Using a variety of words slang mager, rese, really shows the characterization of the identity of speakers as teenagers who follow the present variant of vocabulary.

The fourth subject, NM represents youth intra-school organizational activists. On one of the randomly selected social media account status, NM wrote:

“jadi orang kok ember banget si....huh”

The word *ember* means not be able to keep secrets or talk too much that should not. This status represents his opinion to someone who is not in accordance with the standards he considers better.

From the interview process, responses were obtained to the questions about the reasons why subjects chose to attend MTs. NM answered as follows:

“Secara gitu mas..... wong teman saya kebanyakan sekolah disini juga kok.”

NM response has a similar pattern with the written language which is characterized as concise and direct at its core. In oral speech, the identity as a teenager is shown by the use of the word slang as an insertion of sentences that cannot have direct meaning. In addition, the subject also uses the greeting to explain his position which is younger than the other person. Culture identity is also raised from the word *wong* meaning because.

From the pattern of language on the status of social media and speech in the response of research subjects, there is a similarity in the representation of identity as a teenager characterized by several linguistic markers. First, the use of concise and directive sentences is at its core. This is in accordance with the expressive characteristics of netizens so that they do not like long expressions, long-winded, small talk or not directly targeting the point. Second, the use of slang language that has been attached to every adolescent utterance, such as the word otewe, ow em ji, mager, bete, on, rese, and bucket are the characteristics of netizens' social nature.

Affirmation of adolescent character that is slang and follows the update of current vocabulary shows the breadth of online social networks that he has. Third, the consistency of speech patterns on status and interviews also indicates the use of language interference, namely the tendency to accustom the pronunciation of a language to other languages whether it be vocabulary or grammar [14]. In this case the subject places the interlocutor as an equivalent persona, so tends to choose slang. Whereas in the rules that should be slang language is not used in the context of talking to strangers or new conversational partners. Generally the style of formal language will be chosen.

Shortening of words / sentences or the use of slang words used in social media has become a separate language for teenagers, in the end the use of words / sentences is used in communicating daily in the school or outside the school. Adolescents consider the abbreviated language available in social media to be an affirmation of their identity as a teenager who usually uses slang language [15].

The assertion of identities as adolescent speakers causes reluctance to use formal language that is context-appropriate. The tendency to abandon standards is also more prevalent in the English context in America. Even though the use of non-standard language creates the impression of being ridiculous, lazy, educated, but this trend is even more prominent on online social media. Diachronic studies of language observations on American teen social media show that the tendency to leave standard language indirectly has a broad impact on the linguistic system [16].

If the consistency of the use of slang for various speech contexts is left continuously, it does not rule out the emergence of demotivation to develop the use of standard language. This
The phenomenon is also found among Swedish teenagers, making it difficult for teachers in the process of developing written and speech skills in the academic context [17].

The use of social media apparently is oriented for peer socializing but did not appear to voluntarily or independently integrate into learning as well as contributing to the language of teen [18]. However, if used in such a way as to implement a good strategy, the concern that social media does not support teenagers' academic progress will be eliminated. Social media such as Facebook, Edmodo, Canvas, Blackboard and other applications can be used to support the learning process by optimizing available networking features [19].

5 Conclusion

Based on the findings of this study, it can be concluded that the use of social media does not fully have a positive impact as stated in other studies, especially when viewed in terms of language acquisition in adolescents. The use of language in adolescents both in the status of social media and oral context shows the tendency of pragmatic consistency that does not heed the differentiation of language rules based on context. In addition, the use of social media has affected the interaction among teens compared to their real life interaction [20], therefore it strengthens the assumption that the language use in social media resembles that in real life context.

Social media gives users or netizens access to emphasize the identity as an expressive Z generation characterized by linguistic markers in the form of concise utterances, directive and direct to the core, and social Z generation that sets word choices according to slang. However, the limitations of cyberspace cause limitations in pragmatic acquisition so that the research subject cannot distinguish the context of speech so that it does not consider the speech rules according to context. This is the reason why it is necessary to monitor the use of social media for teenagers to balance their linguistic input so that it is adequate for the pragmatic acquisition process.

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References

[17] P. Sundqvist "Classroom vs. extramural English: Teachers dealing with demotivation” Language and Linguistics Compass vol. 7 no. 6, 2013, pp.329-338.
One Day One Hadith with Online Media: Challenges and Opportunities

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Abstract. Fathul Bari, an Islamic scholar from Indonesia, takes the benefits of the advancement of technology and social media to share knowledge and information. He initiates the program of ‘one day one hadith’, an online program of studying hadith about public-related issues and posting the discussion on the WhatsApp group chat. Presenting concise, dense and reliable discussions, Fathul Bari has been successfully popularised the hadith not only in Indonesia but also across countries, as well as attracted public interest in involving in this program. This paper, therefore, aims at discussing the challenges and opportunities of studying hadith in millennial era.

Keywords: Hadith; challenges; opportunities

1 Introduction

Alfatih Suryadilaga [1] stated that there has been a growing number of the study of Hadith with the use of technology, ranging from software applications, publishing online journals articles, to programs on television and youtube. The programs commonly include the study of the authenticity of hadith, the study of books of Hadith and the study of understanding the hadith. This phenomenon occurs in response to technological advances. Thus, this adaptation will go hand in hand as the creativity and innovation of technology bring plausible possibilities to the innovation in the study of hadith as what the writer expects to discuss in this paper.

Since 2016, digital hadith studies have begun to take advantage of other online applications namely WhatsApp Messenger, an online chat app that is compatible with several types of smartphones. The program is called One Day One Hadith (ODOH). In the beginning, it was just an act of posting

One hadith in a WhatsApp group chat of students and alumni of pesantren an-Nur 2 Al-Murtadlo Malang. However, it eventually has become a daily routine. The ODOH program, which is led by Fathul Bari who is also a pesantren principle, is meant to facilitate members in knowing and studying the hadith. This objective is then supported by the choosing WhatsApp Messenger as a medium of communication.

Learning method using digital mode of communication as previously mentioned is considered as sufficient. As evident, many WhatsApp users are interested in reading and even eager to learn more every day. In addition, the theme of discussion has been selected from everyday issues experienced by the community. Arguably, in this way, Gus Fathul, the
nickname of Fathul Bari, succeeded in popularising the hadith which has been less popular compared to the study of the Qur'an and *tafsir*.

This article attempts to trace back the One Day One Hadith program from its early history, its review system, the reader's response, its position and role in the development of the study of hadith in Indonesia as well as the opportunities and challenges of its implementation.

### 2 Review of Related Literature

Hadith studies are able to adapt to technological developments in the millennial era. One Day One Hadith phenomenon include in it. Therefore, the previous literature that we brought in this study is the writing with the theme of hadith studies in the millennial era.

Since 2014, there are at least four research that carry the theme of hadith studies, millennial eras and also technological developments. Such as:

*Kajian Hadis di Era Global* by Muhammad Alfatih Suryadilaga [1] presents a variety of hadith studies in present-day, from the type of media which is used, books in pdf, software application of hadith studies, online journals, television program of hadith studies to the study of hadith on youtube. However, this paper still only explain, not analyze. The study of hadith by online media like WA messenger has not been mentioned at all here.

*Application of Modern Technology in the Study of Hadith and Its Sciences: A Case Study*, a collection of research results compiled by Chowdhury Mesbahul Hoque and a team [2]. Based on the abstract, it is known that this study discusses the use of technology in the study of hadith. Here it says that using innovative technology makes studying hadith much simpler and enjoyable. For example, searching the source of Hadith and determining their authenticity have become more easily accessible. Even so, not all innovative technology is discussed, apps and websites for studying software Hadith are part of priority technology that is prioritized.

*The Profundity Of Hadith Materials On ‘Islam Itu Indah’ On Trans Tv* by Nurun Najwah [3]. This study discusses the hadith that are often displayed in a program television, ‘Islam Itu Indah’. The issue of authenticity, transmission and understanding of the hadith is still an highlighted part. Indirectly, this study concludes that the validation of hadith on a television program is still lacking, far from the minimum standard of Hadith transmission.

*User Awareness On The Authenticity Of Hadith In The Internet: A Case Study* by Nurul Nazaria Mohd Zaidi and Mesbahul Hoque Chowdhury [3]. This study provides insightful information about the usage of the Internet and user awareness on Hadith among Muslim students. Although Internet have been used by almost all of the participants in the study, they have collectively aware that certain criteria needed to be applied to ensure the Hadith and its information acquired is accurate and reliable. Among the important criteria need to be considered by the users about knowledge of Hadith on Internet are: the need to know the sources of information used, the need to verify the content of Hadith, the need to justify the authenticity of Hadith, the authenticity of hadith can be referred to or consulted with the more knowledgeable people in the field of Hadith. This study should benefit users of the Internet in the assessment of awareness on authenticity of Hadith on the Internet. With some criteria resulted in this study, awareness values can be increased and the risk of using false information can be reduced.

### 3 Methodology
The present study is conducted by descriptive qualitative method. As proposed by Donald Ary [4], this method is aiming to explain, illustrate, and analyze the phenomenon, One Day One Hadith (trending strategy in teaching hadith nowadays). Phenomenology method is also used as an approach in this research, to explore the benefits of this program, as well as the drawbacks.

Subjects of this study include all participants of the program, ranging from the author of hadith study (a.k.a Fathul Bari), members of ALVERS group, and common people receiving the hadith posts.

Some interviews used to collect the data. interview with Fathul Bari as founnder of ODOH, other interview are with students, alumni of An-Nur 2 and participants of One Day One Hadith. Data is collected based on various perspective, founder perspective, and also readers' perspective.

Analysis techniques used in this research was the analysis of qualitative data following the concept of Miles and Huberman [5]. Activities in data analysis were data reduction, data display, and drawing conclusion, these steps should be conducted systematically.

4 Result and Discussion

4.1 The Beginning of One Day One Hadith: From online world towards the real World

It is An-Nur 2 Al-Murtadlo Islamic boarding school in Bululawang Malang, East Java, Indonesia who has a significant role in the establishment of One Day One Hadith (a.k.a. ‘ODOH’). Following the development of the digital era, the members of this pesantren (Islamic boarding school) including principles, students, teachers, employees and alumni, create Whatsapp group chatting named ALVERS, the abbreviation of Al-Murtadlo Lovers. As the manager is none other than their own pesantren’s principle, Fathul Bari. The initial goal of this online group is as a medium to keep in touch among fellows, students and alumni of An-Nur 2. However, over time, many of the members of this online group chatting expect Fathul Bari, or it is commonly called as Gus Fathul to post one hadith every day as a reference to discuss current religious issues or problems in the society. This daily hadith online post inspires the creation of more formal and focused discussion as Fathul Bari said “this is the beginning of One day one hadith”.

In order to keep motivated and maintain the continuity of this activity, the adherents of this virtual group chatting have created new slogan namely 'make your mobile phone as the source of knowledge and goodness'. Interestingly, all members have agreed on Gus Fathul as the person who posted the hadith. Thus, the source of the hadith comes from one and reliable person. Initially, the study of hadith posted in the form of one selected topical hadith and its translation only. However, it then has developed to be an article which is longer in both of word accounts and the content involving a discussion of the hadith as a reference to the current issues in the society.

Similarly, the development also can be seen in the type and the number of the online group chatting members. In the first days, the group seemed to appear to be an exclusive group consisting of teachers, students, employees and alumni of the pesantren only. However, it then disseminates embracing publics who are interested in joining the group. Many of the members share the post with other groups, and the other group also forward it to their relatives and friends and so on. This is how the dissemination occurs by itself. However, the shared link tab available in the Whatsapp helps the spreading reaches even broader communities.
The persistence of ODOH attracted many public interests. It can be seen from the increase of WhatsApp group number which until recently there have been nine groups available. Seven out of the nine groups are aimed at particularly discussing the study of hadith, questioning and answering (Q&A) related religious issues, and others. The commitment to focusing on the study has been very seriously demonstrated by the group's managers, especially from the pesantren's own principles. There are some rules that must be obeyed and implemented by people who want to join the seven groups: group members are not allowed to post unrelated and inappropriate posts such as posts containing political issues, Wahhabism (the extremist group of Muslims) and Shi’ah (the opposition doctrine of Islam against Sunni), advertisements and hoaxes.

However, the principles of the pesantren do consider and accommodate the need of its members to develop and explore their interests and benefits other than studying the hadith. Therefore, the rest of two groups, namely free Alvers and ladies Alvers which is specifically provided for females, have been dedicated to facilitating this needs. Each group has 257 members, meaning there are already about two thousand members who joined in ODOH. Group members include people from Java, Madura, Sumatera, Kalimantan, and Indonesian diaspora who live across countries such as Yemen, Malaysia, Thailand and other South East Asian countries.

In its progress, ODOH program also launch the official website, http://www.onedayonehadith.net/. This further reinforces the effectiveness of social media in disseminating knowledge and information.

Nevertheless, there are some concerns conveyed by Alvers and ODOH members regarding ODOH programs in social media. First, social media are dynamic. They keep changing and upgrading. Todays, social media will be shifted with more sophisticated similar apps. They might be abandoned by users and eventually even disappear. Second, not everyone has considerable time to go online. Third, WhatsApp may be too small for some people to write and post articles and they are often overlapped by other more recent posts and conversations. For this reason, Alvers suggested that ODOH's postings were published into a book.

In addition, the accuracy of the source is also a matter of concern, the posts shared in social media must be ready to be plagiarism at any time. On the contrary, other people's posts are made in the same name as ODOH must also be alerted.

Fathul Bari have been writing four One Day One Hadith book series with different themes. They are Indahnya hidup bersama Rasulullah (Beautiful Living with the Messenger of Allah); Motivasi bahagia dari Rasulullah (Motivation of happiness from the Prophet); Taman Indah Musthafa (Beautiful Garden of Mustafa); and Tafakur Zaman Now (Reflection in millennial era).

The language and the structure of the discussion or the article are made to be less sophisticated so as it is understandable for all readers. Fathul Bari [6] said that the discussions start from daily human affairs such as the way of shake hand, emotional therapy, the views of Islam on matchmaker, and others, to be more specific involving the discussion of unique traditions among Muslims such as wiping the head of orphans in the month of Muharram (the first month in Islamic calendar), and the unlucky days of Shafar (the second month in Islamic calendar). The discussion also includes more general themes such as the study of the celebration and the reflection of the new year, mayday in Indonesia, April mop, and so on.

The rationale of this the explanation is to make the discussion is understandable by all member regardless of their status and academic level. It also aims at providing relaxing
nuance of learning and reading while they are discussing heavy matters *fiqh* (Islamic jurisprudence) in relevance to contemporary issues.

Therefore, the articles of One Day One Hadith are concise, dense, and reliable. They are concise because they are designed to be read at one go; They are dense because the explanation is straightforward to the core of the problems, and they are reliable because they refer to the valid and reliable sources.

The sources of the hadith discussed by Fathul Bari is *kutub as-sittah* (six reliable hadith books) and several other *syarh al-ḥadith* (explanation hadith references) which also reliable.

4.2 One Day One Hadith: Introducing and popularising the Hadith in ‘Z Generation’ era

al-Ramahurmuzi [7], the author of the first book of *ulumul hadith* started the first chapter of his book discussing al-Muhaddis al-Fasil Bayn ar-Rawi wa al- Wa’i or the virtue of the person who transmits the hadith of the Prophet. The discussion also included the explanation of some virtues of people who learn and teach the hadith. For example, they can receive a direct blessing from the chosen prophet Muhammad (may peace be upon him); also it is claimed that their faces will radiate happiness. Alvers consider this idea as motivation on which ODOH programs is aimed to carry.

Although ODOH is not the only program that carries this spirit, however, the ODOH program has contributed to providing different nuances in the study of hadith, especially in the millennial era. Fatai Owolabi Jamiu [8] said that The use of innovative technology by teachers will give the students the opportunities of becoming a part of the knowledge age and at the same time increase skills imparted to the young ones in an increasingly complex world.

After studying the hadiths in a traditional way for prolonged periods, this ODOH program made a breakthrough by studying the hadiths in a more modern way by utilising the media screen make it more interactive. Gus Fathul states that the initial and ultimate goal of this program is none other than to make his writings to be useful for everyone. A simple yet very noble goal as the program has positive influences for its members.

Using the concise, dense and reliable system, every post, the One Day One Hadith consists of: first, the theme of the hadith. The theme of the hadith raised adapts to the existing trending topic in society. Second, matan hadith (contents of hadith) without complete sanad. Matan hadith is only included in the first narration, but still says the mukharij. this indicates that when there are people who want to judge the sanad, he can use the first narrator and the mukharij. Third, the translation of hadith. This is the first step in giving an explanation of the hadith. Then the fourth is an explanation. In this part, Fathul Bari mention other hadiths are related with theme, also other information from many scholars.

In accordance with the delivery system, concise, dense and reliable, Fathul Bari tries to study the hadith as briefly and concisely as possible, but remains accurate, following the basic rules of transmission of basic hadith. As seen in his post, In his narration, Fathul Bari included rawi, although only one person, called the complete reference source of the book with the hadith number quoted. This is very useful for critical data sanad. As for matan, alluding to other traditions relating to the theme of hadith is one of the steps in the criticism of Islam, as well as the inclusion of the statement of the ulama.

Thus means *ODOH* educates the public about the hadith in a very simple way. From the beginning this was the goal of the ODOH program.

One day One Hadith which was initiated by Fathul Bari was different from the same study that was in the Darus Sunnah (Hadith Study Intitute that established by KH. Ali Mustafa Ya’qub in Jakarta). This difference can be seen from several points of the post. The Fathul
bari’s version contains five points, as described above. Whereas the Darus Sunnah’s version does not include no other hadith are relating to the core hadith theme. Besides that the explanation is still shorter than Fathul Bari’s version.

The ODOH program also offers some benefits in the study of hadith. Firstly, it helps to manage the time for discussion efficiently and to gain more readers or members. The use of WhatsApp certainly helps ODOH program to reach more numerous and diverse participants or readers than similar but offline programs. If 257 members of each group of Alvers group chatting read and forward the posts of the hadith to another group which also has about a similar number of members then immediately can multiply the number of people who study hadith.

Secondly, the themes and topics of discussion of the hadith are related to daily life issues which are familiar to the communities, as well as the presentation of the hadith narrated in concise, dense and accurate ways makes the program more accessible and attractive for everyone to learn. As the evidence, the member of Alvers group chatting keeps growing enriching people from other countries such as Malaysia, Yemen and Thailand. Furthermore, the effort of managers of ODOH program to persistently provide accurate information from reliable sources aims at minimising hoaxes which often easily shared through social media.

Third, since the source of the citation and the explanation of the hadiths come from a teacher that widely acceptable to be reliable and professional, namely Fathul Bari, the ODOH offers accessibility for further questions and discussions. In fact, ODOH program allows every member to access Fathul Bari through personal contact for confirmations and or questions.

Fourth, ODOH program can effectively popularise the study of hadith in the „Z generation’ era. It could generally be known that „Z generation’ era is the era where people are equipped with the use of technology to make their life easier even since the first days of their life. We are now living in those times. Inevitably, we must adapt to it but maintain our role as the subject that operates the technology and not the opposite. ODOH does adapt to this era by their program to posts the hadith and its discussion through a digital mode of communication as a daily routine. Since the establishment of ODOH program, many of Alvers member become more positive toward the use of WhatsApp messenger. More importantly, subsequently they can learn and contemplate the value of the hadith the posted in WhatsApp group chatting every day.

4.3 One Day One Hadith: The Development of the Study of Hadith in Indonesia

Studies of Hadith in Indonesia are relatively new compared to other religion-based studies. Berg -as cited in Danarta [9] states that in 1886 any pesantren in Indonesia did not mention the Hadith as one of the subjects taught in the school systems. However, Bruinessen–still from Danarta citation- further clarifies that students have learnt hadith in an integrated syllabus. In other words, they did not learn hadith as a separated subject, but it is often found to be included and learned in all other fields of studies. Mujamil Qomar [10] stated In the 20th century, books of hadiths started to be sufficiently recognised in pesantren.

Initially, the teachings of Hadith and must ah h al-hadith took place and included in the curriculum of the learning and teaching in Pesantren [11]. Agung Danarta [9] said that there are some Pesantren in Indonesia who are well-known for their hadith teaching, they are Pesantren Tebuireng, which is known as the “Pondok Hadiths” under the supervision of KH. Hasyim Asy'ari (1875-1947 AD), Pesantren of Tambak Beras managed and controlled by KH. A. Wahab Hashullah (1888-1971 AD), Pesantren of Denanyar supervised by KH. Bisri Syansuri (1886-1980 AD) and others. M. Habib Chirzin (1995) [14].
In the 2000s, there were two well-known Indonesian figures in the field of Hadith studies, namely Ali Mustafa Ya’qub with his popular program Darus Sunnah and Lutfi Fathullah with his famous program „study Center of Hadith”. Those two figures have been adapted the hadiths into the Indonesian context, as well as using Bahasa Indonesia as its instructional language. However, although relatively new, it might not be overwhelming to award Fathul Bari with his ODOH program, as a scholar whose expertise is in studying hadith as these two figures. Because he also studies and examines the hadiths concerning the Indonesian context, especially regarding reviewing the meaning and understanding of the hadith.

Compared to hermeneutics studies in Indonesia, the study of hadith is relatively rare, including the lack of the experts and the works of hadith. The series of „one day one hadith’ by Fathul Bari, therefore, enriches the study of Hadith in Indonesia. Not only because the author himself from is Indonesian but also because the discussion and the critics contain Indonesian values such as the discussion of halal and haram (forbidden) food. The explanation of hadith related to food and nutrition day was delivered on 25th of January. In his writing, Gus Fathul narrated the story of kyai Hamid, one of respected and influential Muslim figure and scholar from Pasuruan, Indonesia. It is told that Kyai Hamid once accepted a gift from the guest which turned out to be a sum of money. However, he dampened the money, and it disappeared. The only things left is the stinky smell from the water where the money sank.

Further, Gus Fathul [6] explains that the lesson learned from this story is that ones must always be aware of the source of their wealth and their possession. There are more other stories related to contextual values about explaining the meaning and understanding of the hadith in this series of the book of ODOH.

5 Conclusion

One Day One Hadith (ODOH) program is an online program of studying hadith about public-related issues and posting the discussion on the WhatsApp group chat. It is explained by concise, dense and reliable system. However, over time, many of the members of this online group chatting expect Fathul Bari suggested that ODOH’s postings were published into a book. This shows the positive and negative side of online program of studying hadith. As an early promotion, using online media, especially WhatsApp group chat to introducing and grounding hadith in the community is very effective. As in other things, such as writing storage will be very constrained, because it can be closed with other messages or even deleted. In this way, it is positively revealed that ODOH is a freshly-used strategy to introduce and teach hadith in this era. This study also points out the interactive situation between teachers and learners through technology. ODOH make people comprehend that they can gain a lot from their gadgets and Android apps, especially WhatsApp. Consequently, this will eliminate the negatively growing- perspective towards the media as hoax-spreader. Meanwhile, the drawbacks of the program is the minimum concerns of the participants towards the ODOH posts, often being skipped-unread, and the safety of posts documentation along with the smartphone memory and belonging. Henceforth, the periodic publication of ODOH in a serial book is really needed.

Thus, One Day One Hadith program has demonstrated the opportunities and challenges in the same time of the development of technology in hadis studies.
References

[8] Jamiu F O 2016 Enhancing Arabic And Islamic Studies Education In Yorubaland Through Innovation And Technology the 2nd Interdisciplinary Conference of TASUED-UCC
[10] Qomar M *Menuju Demokratisasi Institusi* (Jakarta: Erlangga)
Adaptive Mobile Learning Application As An Innovative Learning Media To Support The Quality Of Blended Learning Process

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Abstract. Adaptive mobile learning is a mobile learning application based on an Android operating system that can facilitate the diversity of student learning preferences. Adaptive mobile learning is a learning media innovation in the practice of mobile learning. This study aims to: (1) developing an Adaptive Mobile Learning (Amol) application based on Android system which meets the eligibility criteria according to media validators, materials and responses from users; and (2) knowing the benefits of Amol in improving student learning outcomes and Amol abilities in supporting quality blended learning processes. This study uses a research and development model developed by Alessi Trollip which consists of the planning, design and development stages. The initial product was validated by media and material experts and then revised (alpha test). Then in the beta phase, the product test was tested by several students and continued to test small class products to as many as 30 students. After that, the final test is done. The result of the research showed that: (1) Amol products meet the criteria of being eligible as an innovative learning media with the average score of 3.34 with category of “very good”; and (2) Amol product utilization is seen from the difference in student learning outcomes scores in pre-test and post-test with an average increase of 33.81 after using Amol products in all learning style groups, and the ability of Amol products to support the improvement of the quality of the blended learning process with an average score of 3.41 in the “very good” category.

Keywords: adaptive mobile learning, innovative learning media, quality of blended learning process.

1 Introduction

Learning is a process to achieve the specified competency targets. In achieving the lecture competency target, the right learning media and model is needed. The learning media that is considered suitable according to the results of the study in previous research is adaptive mobile learning and blended learning.

The rising number of smartphone and Android mobile devices has positive and negative effect. The positive effects are access to information and communication more fast, easy and efficient. Then, there are increasing of sending a document, promoting in internet and media social. It also helps the human work in many fields. In contrast, it also makes negative effects, such as wasting time, for example, social media activity, chatting via instant messaging and games.
It needs innovation on the media learning development to support the learning process and assist the student to reach the goal of learning. In the learning process, the media has an important role in delivering information to the student. Degeng explains the learning media is a component’s strategy in delivering and contain a message which is being delivered to student, i.e., person, tool or material [1].

Learning media has contributions on standard in learning process, learning process will be more interesting, learning process become more interactive by applying theory, shorter of learning’s time, increasing learning quality, learning process can be in anywhere and everywhere, increasing the students’ positive attitude toward the learning material and learning process, and the teacher’s role will be positively to change [2].

In developing multimedia, it needs some principle. Mayer explains six principles in learning media development. They are the principle of space, the principle of time, the principle of coherence, the principle of modality, the principle of redundancy and individual differentiate principle [3].

Based on the background, the problem statements of this research are; (1) How do to produce a feasible adaptive mobile learning product on Biology subject in Senior High School? (2) How are the usefulness of adaptive mobile learning product on Senior High School to increase the student learning outcome and support the blended learning process?

This research aims to: (1) producing Adaptive Mobile Learning (Amol) which meet the criteria and appropriateness based on assessment form media experts, material experts, and student as users; and (2) knowing the usefulness of the Amol product seen from the completeness of the student learning results and ability the product to support the quality blended learning process.

2 Literature Review

Mobile learning needs media with technology to make communication between teacher and student. Media in mobile learning should have the criteria; support the lifelong learning, is created based on the user mobility, able to privately used, is supported by technology in a certain activity, and applied student-centered learning.

Learning media not only has a function to deliver the learning information to the student but also to make ease for the student in understanding the material and increase the student’s motivation for learning [4]. In short, learning media will make ease the student in understanding the learning material and increase the students’ learning outcome.

Recently, the innovation in learning media is demanded to be creative and appropriate with the science and technology development. The development of mobile device gives an opportunity in developing the mobile learning media.

Mobile learning is learning through a mobile device. Mobile learning makes easy the student to learn in everywhere and whenever. The strategy makes easy the student in learning to understand completely in a shorter time than other media. Mobile learning is growing rapidly - not only in terms of applications but also in terms of philosophy and standards. [5].

The good development of mobile learning multimedia can fulfill the personalized learning principle [6]; which is according to the student’s characteristic [7]. One of student’s characteristic is the unique characteristic among the students in the initial capability, how long they mastery the material, and student learning style [8] [7]. Mobile learning multimedia
which able to adaptive with the differences of student learning style characteristic called as adaptive mobile learning.

Huang, Wang & Hsieh explain, to facilitate the various mobile devices, it needs to increase the learning’s comfort and efficiency in the mobile learning space [9]. Moreover, it needs to identify the capability of each mobile device and set the material content which provides a solution to various user of the mobile device. In summary, there needs a learning diagnostic mechanism to understand the student’s basic knowledge and learning style [10].

Adaptive mobile learning is learning program multimedia which displays the learning material through a mobile device and can adaptive to the student learning style. The capability is made through a special feature of instrument multimedia program to measure the user learning style before accessing the material room [8]. In short, users learn according to their learning style.

Ozyurt states that learning is a complex and difficult process [8]. Some parameters need to consider on student’s characteristic, such as students’ perception and knowledge, general skill, the developmental potency and environmental factor which has an important role on every single of the learning process. In the learning process, the teacher should understand the dominant character of their student. And then, the learning process can be appropriate with the dominant characteristic. One of the student characteristics that need to consider is the differences in learning style. Student learning style is different among the students [6].

The differences in student learning style may influence the time of understanding and mastering the information. Learning style is ways of student in learning something, related to the ways, approach, and learning experience of students in using information. There are many perspectives about the student learning style, whether it is the genetic factor or depend on the brain which is easy to receive and respond the information management [11]. But, there are some possibilities of learning style which are produced by the interaction between the genetic and learning experience.

In researches, it concluded that adaptive mobile learning was effective in helping the students to reach the learning goal in effective and efficient [6]. Moreover, adaptive mobile learning made ease the learning process because the learning process can be in everywhere and every time. Users can use the product to learn in everywhere and every time according to the need.

Developed adaptive mobile learning product aims to become alternative media in learning. And then, the media are expected able to support the blended learning. The blended learning process is learning process with blend the conventional learning model and learning media by information and communication technology (ICT) assisted. The ICT is the developed adaptive mobile learning product. According to Wahyuningisih & Budiningisih, blended learning can increase the conceptual understanding and independent learning [12].

Learning using mobile learning media makes the learning more interesting and fun [13] [4]. The learning process will be more effective if the students are fun and pleasant. In contrast, the learning is not optimal when the students are fear, worry, and not comfortable.

There are nine points in measuring the quality of learning multimedia. (1) involve the student in using media, (2) gives free choice of student learning style, (3) train almost on learning domains (cognitive, affective and psychomotor), (4) gives an realistic example by video slide, (5) raise the student learning motivation through composition, color, graph, sound, music, animation, and video, (6) more interactive through the availability buttons in giving the student’s respond, (7) aim on individual learning by giving free choice to student appropriate with capability, (8) consistent in media layout (9) able to control according to time of how fast the student think.
Based on previous statements, concluded that the evaluation criteria on adaptive mobile learning multimedia needs to consider the points of; (1) the appropriate between material and curriculum in syllabus and lesson plan, (2) the appropriateness of material and problem analysis and students need (3) the capability of developed adaptive mobile learning in giving free choice of learning styles to users, (4) the capability of developed adaptive mobile learning based on user ability level [14], (5) the clear instruction of the product, (6) the ease on navigate of the product, (7) the balancing among the elements on the product (text, picture, audio, video or animation), (8) User friendly to use the product (9) aim to individual learning, (10) able to train the users learning domains (cognitive, affective and psychomotor), (11) balancing in selecting the element of colors in the product, (12) loaded the material in concise and substantive, and (13) task and competence exam training are appropriate with material in the product.

To produce a good adaptive mobile learning product need validation. The product validation is conducted by material expert, media expert and candidate users [6]. Developed adaptive mobile learning is claimed as feasible by the expert after the product meets the feasibility criteria which are divided into five assessment aspects; learning aspect, content aspect, completeness aspect, fidelity, and message, and language and ease to understand aspect. In the criteria of feasibility product test of media expert are easy to operate aspect, easy to navigate aspect, aspect of adaptive ability toward the student learning of users, display quality aspect, and illustration quality aspect.

Meanwhile, the advantages of developed product and feasible according to expert can measure through the user’s response test. Moreover, competence task questionnaire is used to know the differences of learning outcome before and after the learning using adaptive mobile learning and the product’s capability to support the blended learning process.

Blended learning is a combination of characters from both traditional/conventional learning and electronic and online learning environment. It merges aspect of blended e-learning such as website learning based, streaming video, audio communication synchronous [7], and asynchronous web-based learning, internet-based learning, learning management system, massive open online courses (MOOCs) [5] [15], online learning [16], etc. with face to face learning.

The product advantages criteria based on user perspective are: easy to operate and navigate aspect, product interest aspect, support to blended learning process aspect, aspect of adaptive ability toward the differences of user learning styles and aspect of advantages of product.

3 Methods

3.1 Research Data

Data collection was carried out by conducting a survey using questionnaire both for validator expert and students as the user of the product. The data in this study were 37 records from two media experts and two material experts on alfa test, five students on beta test 1 and 29 students on the second beta test.

Instruments were divided into; questionnaire, interview, competence test task, and documentation. Questionnaire was filled by students on pre-survey, material experts, media experts, and student’s user. The interview was conducted on pre-survey. Competence test task
was used for pretest and posttest. And, documentation was used since pre-survey until the summative test.

The instrument has validated before to use to collect the data. The instruments are instrument for media experts, material experts, learning styles, and students. Meanwhile, the competency test task is validated by material expert together with material validation process.

Data types research was both qualitative and quantitative. Qualitative data is obtained from the need analysis result and interview on pre-survey. Qualitative data is obtained from media expert, material expert, and students through a questionnaire which is analyzed descriptively on four scales. And, quantitative data is obtained from pretest and posttest result of student learning outcomes.

The data is described as a consideration point to revise the adaptive mobile learning product. Moreover, the quantitative and qualitative data are used to measure the quality of product usefulness to support the learning process.

Data collection techniques are questionnaire, observation, interview, and competence test task. And the instruments in data collection are questionnaire, observation sheets, interview guideline, and items for pretest and posttest.

Qualitative data is suggestion and opinion from media expert, material expert, and students on beta 1 test. The data is collected and concluded to improve the quality of developed product. In contrast, quantitative data is questionnaire score from media expert, material expert, and students which is obtained from questionnaire on the Likert scale and convert into scale 4; strongly feasible, feasible, not feasible, and strongly not feasible.

The steps on Quantitative data analysis includes; (1) collecting the data; (2) scoring; (3) the score is converted into a score of scale four by using Mardapi’s criteria.

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<td>$X \leq 2.00$</td>
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### 3.2 Research Procedures of Alessi Trollip Models

The particular research used research and Development (R & D) approach. This research aimed to develop an adaptive mobile learning product on learning media Android-based for student Senior High School/Islamic High School grade XI of Science. The model of R&D in the particular research adopted the model of Stephen M. Alessi dan Stanley R. Trollip [17]. Generally, there are three steps; planning, design, and development.

Planning phase includes define the field/scope, identify the student characteristic, make the planning document, decide and collect the sources, perform the brainstorming. Planning phases includes conduct the concept analysis and material scope, decide the program component, make flowchart and storyboard, decide the software in developing process. Development phase includes the preparation of the material document, combine the media
parts (text, audio, video, animation, and picture) and combine materials to make the adaptive mobile learning program until do not find any bug and error which show the adaptive mobile learning are ready to continue to test by Alfa test. Alfa test is conducted by two media experts and two material experts. After that, the beta 1 test is conducted to 5 students as the users. Beta 2 test is conducted on small group (one class) to know the users’ opinion on the developed product. The last developed product is conducted by applying pretest and posttest on beta test participant in order to compare the product usefulness to achieve the learning goal; reaching the minimum target.

4 Research Result and Discussion

Research result of this research and development is a learning multimedia program adaptive mobile learning on Biology subject of Senior High School. The developed Program is an android application.

The difference between adaptive mobile learning and mobile learning is on the feature of user learning style test. By this feature, the user will direct to test for learning style before accessing the material menu.

The instrument of learning style adopted from instrument test of visual, auditorial and kinesthetic (VAK) developed by Victoria Chisslet & Alan Chapman [11]. They are 25 number of tasks.

After the product has finished, then continue to product validation by material expert and media expert. The validation has purpose to measure and assess the material validation degree and the learning aspect of Adaptive Mobile Learning (A-MoL). The validation has purpose to produce a good and feasible product on the aspect of material and learning.

Generally, four aspects validated by material expert; learning aspect, content validity aspect, completeness aspect, fidelity and message of the material, and easy to understand and language aspect in the product of Adaptive Mobile Learning (A-MoL).

Next, media validation aims to measure the feasibility degree of the product. The instrument is given to media experts to assess the media quality. Media validation is divided into five aspects; first, easy of media operation aspect; second, easy on navigation; third, adaptive ability to user learning style; fourth, display quality; and fifth, illustration quality.

Chart of material expert validation shows the score of validation result of material expert is on strongly feasible category based on the average score of 3.62. The score is obtained based on the average validation score of each aspect; learning aspect has average score of 3.79 on strongly feasible category, content completeness aspect has average score of 3.70 on strongly feasible category, aspects of completeness, fidelity, and material have average score of 3.25 on strongly feasible category, and aspects of ease to understand and language have average score of 3.75 on strongly feasible category.

The result of media expert validation shows the total score validation from two media experts that gained an average score of 3.54 and the score is on strongly feasible category. The average score explained on each aspect; first, easy of media operation aspect consisted of six items indicator, gained an average score of 3.50 with strongly feasible category. Second, aspect of ease on navigation consisted of four items indicator, gained an average score of 3.75 with strongly feasible category. Third, the adaptive ability to users’ learning style consisted of four items indicator, gained an average score of 4 with strongly feasible category. Then, display quality aspect consisted of six items indicator, gained an average score of 3.50 with
strongly feasible category. And, illustration quality aspect consisted of seven items indicator, gained an average score of 3.43 with strongly feasible category.

The beta test 1 result; tested to 5 students of Adaptive Mobile Learning (A-MoL) user, it gained an average score of 2.99 with strongly feasible category on 5 aspects. By the detail, aspect of ease to operate and navigating the program, five users gave score good/feasible on eight items indicator with an average score of 2.60. Meanwhile, aspect of program interest, five users gave score good/feasible on four items indicator with average score of 2.85.

Based on data of product test result in the group beta 2 tests, it obtained average score of 3.26 with very good/feasible. In the detail, the aspect ease in operating and navigating program, the entire sample of beta test gave score of very good/feasible on eight items indicator with average score of 3.15. Meanwhile, the aspect of program interest, the entire sample beta 2 test gave score very good/feasible on four items indicator with average score of 3.20.

Cognitive competence test to student of grade XI IPA 3 SMAN 1 Depok, Sleman, Special Region of Yogyakarta as user of Adaptive Mobile Learning (AMoL), was conducted on pretest dan posttest. Then, data of pretest and posttest was compared to find out the significance increasing of learning outcomes between pretest and posttest before and after using the developed program. The table of data comparison of cognitive competence test is presented on table 1 [18].

<table>
<thead>
<tr>
<th>No</th>
<th>Variable</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower Score</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>2</td>
<td>Highest Score</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Average Score</td>
<td>53.93</td>
<td>87.69</td>
</tr>
</tbody>
</table>

The visual data of competence test assessment on beta 2 test to student of Adaptive Mobile Learning (AMoL) user is presented in figure 1.

![Figure 1. Diagram of Data Comparison on Pretest and Posttest.](image)

Based on data analysis on pretest and posttest on figure 1, there are increasing score of competence before and after using program Adaptive Mobile Learning (AMoL). In summary,
indicator of learning completeness has been achieved. It based on data that all students obtained the minimum average score of 75.

The visual data of comparison of pretest and posttest average scores based on learning style groups of Adaptive Mobile Learning (AMoL) is presented in figure 2.

![Figure 2. Comparison of Pretest and Posttest Average Scores based on Learning Style Groups](image)

Based on the data of average score on group of visual learning style, there is comparison score between pretest and posttest on each learning style group of user Adaptive Mobile Learning (A-MoL). Generally, the average posttest score has increased up to 30%. But, the increasing percentage is different on each learning style. The increasing of posttest average score on visual learning style is 35%. The increasing of posttest average score on audio learning style is 31%. The increasing of posttest average score on kinesthetic learning style is 33%. Meanwhile, the increasing of posttests score of audio-visual learning style is 37.50, and the highest score of increasing average posttest is visual kinesthetic learning style of 40%.

5 Conclusion

Based on the research and development, concluded that Adaptive Mobile Learning (A-MoL) on Biology Subject SMA claimed as feasible category to be used as learning media based on material and media, and user’s response on beta 1 and 2 test. The feasibility category is according to average score by material expert is 3.62 with very feasible category, the average score by media expert is 3.53 with very feasible category, average score of beta 1 test is 2.99 with feasible category, and average score of beta 2 test is 3.29 with very feasible category. Adaptive Mobile Learning (A-MoL) product is claimed having beneficial and proven by the increasing of learning outcome of 33.80. The average score of pretest is 53.93, increased to 87.69 in posttest with percentage of KKM is 100%. Moreover, according to expert and student, the product can support the quality of blended learning process with average score of 3.42 and very feasible category.

The product of Adaptive Mobile Learning (A-MoL) needs to further implement on broad field. Hope, students and teachers both in informal or formal education use Adaptive Mobile
Learning (A-MoL) program in facilitating the learning process. Consider developing other material, especially support the learning through mobile learning approach. Able well facilitating the differences of student learning style characteristic beside visual, audio and kinesthetic learning style, such as global learning style, analytic, and read-write learning style. The development of Adaptive Mobile Learning (A-MoL) in facilitating material delivering to student, consider to the student characteristic such knowledge, area, and students’ condition in mastery the material.

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References

Inhibition Activity of Lung Cancer Cells A549 by Trigona Propolis From Indonesia

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Abstract. The results showed that propolis trigona has high content of flavonoids, vitamin C and β-carotene compounds. Therefore, the whole exploration effort of propolis properties becomes an important study and research especially anticancer activity of lung cancer. Trigona propolis samples which is used are from Indonesian beekeepers. Lung anticancer activity was measured by MTT method (3- (4,5-Dimethylthiazol-2-yl) -2,5-diphenyltetrazolium bromide) on A549 cell. The results showed the inhibition of A549 lung cancer cell by trigona propolis is higher with increasing concentration (0.625 to 100 ppm). The results of phytochemical analysis showed that the trigona propolis samples contained alkaloids, flavonoids, quinones and tannins. In addition, trigona propolis has the ability to inhibit A549 cells of 78.21 ± 0.02% at 100 ppm concentration. This inhibitory ability is higher in line with the increase in sample concentration. Therefore, Indonesian trigona propolis has potential as a lung anticancer.

Keywords: component; Cell A549, Lung cancer, trigona propolis

1 Introduction

Cancer is one of the leading causes of death in humans. By 2015, cancer ranks second (8.8 million or 22%) of the leading cause of death from non-contagious diseases in the global population [1]. In the last decade lung cancer is the most common cause of death around the world [2]. In 2012, it was estimated that 1.8 million new cases arose and reached 12.9% from whole cancer diagnostics [3]. In Indonesia during the year 2010-2013, lung cancer is one of the three most common cancer in Dharmais Cancer Hospital and the number of new cases and deaths from cancer continues to increase [4]. Other data also shown that the survival rate of lung cancer patients in Indonesia is only 12% [5].

Therefore therapeutic efforts for lung cancer need to be raised and get high attention from all parties. Therapeutic efforts can be done with the use of natural alternative materials such as propolis especially from trigona spp. The results of research on several samples of propolis prove the potential of anti-cancer and antiproliferation agents such as Turkish propolis in A549 lung cancel cells [6], propolis from Thailand against A549 cells and HeLa cells [7], propolis against AGS cells for gastric cancer [8], propolis from Poland against A549 and H23 cells [9]. Propolis has properties as anticancer, antiviral, antifungal and antibiotic [10].

Mahani et al. [11] states that the important active compound in pharmacology and biological activity of propolis are flavonoids, phenolic and aromatic compounds. The flavonoid compounds identified in Polish propolis include flavones, flavonones, flavonolol,
flavonols and phenolic acids. Multi-interaction of various complex chemical compounds in propolis is an important biological activity which related with its anticancer effects [12].

In Indonesia the anticancer ability of propolis on lung cancer using A549 cells has not been studied by many researchers, especially propolis produced from local Indonesia. It is expected that this research will enrich information about the inhibition capability of trigona propolis against A549 cells so it can be used as an alternative therapy of lung cancer.

2 Research Methods

2.1 Tools and Materials

Cells used are Cell Vero (ATCC CCL 81) obtained from IPB Primate Research Center (PSSP), DMSO, Cell Growing Media: Dulbecco's Modified Eagle's Medium (D-MEM), RPMI 1640, Fetal Bovine Serum (FBS) 10%, Penicillin 100U/mL and Streptomycin 100 μg/mL. Propolis samples derived from Indonesian commercial propolis which have been added with propylene glycol collected from local farmers in Indonesia.

2.2 Preparation of Propolis Extract

1 mg of the propolis fraction was weighed, then dissolved with 1000 μl of DMSO 99.5% and centrifuged until homogeneous. This is used as standard solution of the propolis fraction with a concentration of 1000 ppm. The base solution was diluted for a series of test solutions with concentrations of 50 ppm, 100 ppm, 200 ppm, 400 ppm and 800 ppm.

2.3 Quantitation of Total Phenolic Compound

The propolis sample was weighed as much as 100 mg and dissolved in 10 ml of distilled water. Subsequently 0.5 ml of mixture was taken and added with 0.3 ml of Folin-Ciocalteu, 2 ml of 15% Na₂CO₃ and 2.2 ml of distilled water. The solution homogenized and incubated for 2 hours then the uptake measured using Perkin Elmer Lambda UV-VIS Spectrophotometer at wavelength of 750 nm. Measurements are repeated 3 times. The total phenolic content is expressed as the equivalent amount of mg of the gallic acid (GAE) per 1 g sample.

2.4 Quantitation of Total Flavonoid Compound

Propolis samples were taken each of 100 mg dissolved in 10 ml of methanol in the test tube. Next the mixture was filtered, taken as much as 5 ml and added 5 ml AlCl₃ 2% (b / v) reagent. The solution homogenized and incubated for 10 minutes then the uptake measured using Perkin Elmer Lambda UV-VIS Spectrophotometer at wavelength of 415 nm [13]. Measurements are repeated 3 times. The flavonoid content is considered as the equivalent amount of mg of quercetin (QE) per 1 g sample.

2.5 Quantitation of Vitamin C compound

A total of 100 mg of propolis sample was added with 10 ml of 1% metaphosphoric acid then incubated at room temperature for 45 min. The solution is then filtered using Whatman No. 41 and 1 mL of filtrate was taken then added with 9 mL DCIP. The mixture was homogenized and incubated for 30 min at room temperature and then the uptake measured using Perkin Elmer Lambda UV-VIS Spectrophotometer at wavelength of 519 nm. Measurements are repeated 3 times. The vitamin C content is expressed as the equivalent amount of mg ascorbic acid (AA) per 1 g sample.
2.6 A549 Monolayer Cell Preparation

A549 cells that have grown should be subcultured. The cell media was discarded and PBS was added as much as 10 mL to clean the flask from the rest of the media, then PBS was discarded. 5 mL Trypsin (0.125%) was added to the flask, incubated at 37 ° C for 5 mins. The cell that had been released from the substrate was inserted into a 15 mL tube and centrifuged 500 g for 5 minutes. The supernatant was discarded. The calculation of cells using haemocytometer was then prepared in accordance with the importance for the test. Cells were incubated in CO2 incubator with concentration of 5%.

2.7 Cell Calculation

A total of 50 µl cell solutions was added with 50 µl trypan blue and passed into the haemocytometer, then observed and the living cells counted (not absorbing the color) of 2 large squares. The results obtained are calculated using the formula:

\[
\text{Cell per ml} = \text{mean of cell calculated} \times \text{dilution factor} \times 10^4
\]

2.8 MTT Assay

The grown cell on the T25 flask is subcultured and is moved on 96 wells tissue culture plate with the amount of 5000 cells / well and incubated for 24 hours in growth medium at 37 ° C and 5% CO2. The trigona propolis sample fraction of each concentration was added as much as 100µL / well, the cells without treatment were included as the cell control was subsequently incubated for 48 hours. Compound 3- (4,5-Dimethylthiazol-2-yl) -2,5-diphenyltetrazolium bromide (MTT) was added and incubated for 4 hours at 37 ° C and 5% CO2. Cell supernatant removed, formazan crystals formed dissolved with 70% ethanol. Optical density readings (OD) are performed using microplate reader at 565 nm wavelength.

\[
\% \text{ inhibition} = \frac{\text{OD cell control} - \text{OD treatment in cell}}{\text{OD cell control}} \times 100\%
\]

2.9 Data Analysis

The relationship between the concentration of the test preparation and the absorbance data were analyzed statistically using one-way variance analysis (ANOVA) followed by Duncan's Multiple Range Test.

3 Result and Discussion

3.1 Phytochemical Compound

The results showed that the propolis samples contained alkaloids, flavonoids, quinones and tannins (Table 1). This result is in line with Halim et al., [14] research which conducted a study comparing Indonesian Propolis (PI) and Brazilian Propolis (PB) and showed the presence of flavonoids, tannins, steroids, triterpenoids, saponins, alkaloids and glycosides.

<table>
<thead>
<tr>
<th>Phytochemical test</th>
<th>Result</th>
</tr>
</thead>
</table>

Table 1. Results of Phytochemical Screening of Trigona Sp. Propolis
Alkaloids +
Flavonoids +
Triterpenoids and steroids -
Quinones +
Tannins +
Saponins -

Table 2. Quantitative Test Results of Trigona Sp. Propolis Active Compound

<table>
<thead>
<tr>
<th>Active Compound</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Flavonoid</td>
<td>2.02 ± 1.13 mg quersetin equivalent/gram propolis</td>
</tr>
<tr>
<td>Total Phenolic</td>
<td>1.98 ± 0.06 mg GAE/gram propolis</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>22.07 ± 3.25 mg/gram propolis</td>
</tr>
</tbody>
</table>

The results of the analysis of total phenolics and flavonoids showed that the propolis samples contained each 1.98 ± 0.06 mg GAE / gram propolis; 2.02 ± 1.13 mg equivalent quercetin / gram propolis (Table 2). The content of phenolic compounds and vitamin C is related to its ability as bioactive. Ananda et al., [15] has conducted a study of propolis from Phayao Thailand Province found its flavonoid content is 20.49 ± 0.62 mg quercetin / g extract. In addition, there was also an inhibition of cell proliferation of A549 line and HeLa cell by propolis extract. Chang et al., [16] found that the total flavonoids of six samples of propolis from Taiwan, Brazil and China ranged from 10.38 ± 0.14% to 24.91 ± 0.53%. Other researchers have found that the total flavonoid content varies in propolis from Indonesia [17]. Huang et al., [18] discovered that flavonoid compounds with flavonoids, phenylpropanoids, terpene, stilbenes, lignans, coumarins was respectively found from 200 reported samples.

3.2 Anticancer Test (A549 lung cancer cell)

A cytotoxic test was performed on A549 lung cancer cells to investigate potential inhibition and toxic effects on cell growth due to the treatment of propolis extract at various concentrations. The test was performed to determine the levels of test samples that could have a toxic effect on the growth of lung cancer cells A549 to 50% of the cell population (IC50). The test results showed that the higher the concentration is (0.625-100 ppm) (Table 3) the more inhibitory ability increase. In this study the highest inhibitory activity at 100 ppm concentration was 78.21 ± 0.02% (Table 3).

Table 3. Test Results of A549 Cell Inhibition Activity

<table>
<thead>
<tr>
<th>Concentration of propolis (ppm)</th>
<th>Inhibition activity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>78.21 ± 0.02</td>
</tr>
<tr>
<td>50</td>
<td>49.64 ± 0.02</td>
</tr>
<tr>
<td>25</td>
<td>43.44 ± 0.01</td>
</tr>
<tr>
<td>10</td>
<td>33.97 ± 0.02</td>
</tr>
<tr>
<td>5</td>
<td>29.08 ± 0.02</td>
</tr>
</tbody>
</table>
The form of Propolis Trigona laeviceps, which is a stingless bee, can inhibit proliferation of colon cancer, breast, liver and lung cancers cell lines [19]. This shows that the propolis extract has the ability to inhibit A549 lung cancer cells and potential as a chemotherapy agent. This is in accordance with research conducted on ethanol extract of propolis by Kouidhi et al., [20] against Tunisian EEP propolis from Tunisia showed antiproliferative activity against HT-29, A549, Hep-2, RAW 264.7 cells and Vero cancer cells. Ananda et al., [15] also showed that the treatment of propolis extract on A549 cells affected cell histology. Ananda et al., [15] also tested the cytotoxicity of propolis on cell A549 using the MTT test. The results presented that A549 cells could be inhibited after 24, 48 and 72 hours of treatment with propolis extracts from two extraction methods at various doses given.

Presumably the inhibition mechanism as antiproliferative activity of cell is due to the presence of flavonoids may be associated with propolis in cancer cells. In this study the inhibition of A549 cells is thought to be due to the presence of flavonoids that are also measurable on the trigona propolis samples. Propolis consists of flavonoid groups including tectochrysin, galangin, pinocembrin and pinocembrin-7-methyleter, and these substances can inhibit the proliferation of HeLa cells over other substances [21]. In addition, the inhibition of cancer cell growth depends on the origin of geography and the source of propolis which affect the composition of the propolis [22].

The mechanism of action of flavonoids against A549 cancer cells has been investigated by Banerjee et al., [23] (2002) through the reaction of Prostaglandin E2 (PGE2). The result of study in Brazilian green propolis, Herrera et al., [24] uncovered an apoptosis mechanism of caspase-independent 549 cell through p53 mitochondrial independent pathways and cell cycle capture by p21 regulatory enhancement. It is the potential mechanism that sample of propolis from Indonesia can prevent or treat lung cancer. Li et al., [25] also emphasized the influence of flavon isohamnetin compounds in inhibiting the activity of cell proliferation A549.

4 Conclusion

The results of this study can be concluded that:
1. Phytochemically the trigona propolis sample contains alkaloids, flavonoids, quinones and tannins.
2. Trigona propolis has the ability to inhibit cell A549 of 78.21 ± 0.02%.
3. The higher the concentration of propolis samples, the inhibitory ability of A549 cells is also higher.
4. Trigona propolis used in research originating from Indonesia has the potential as a lung anticancer

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References


Effect of sintering temperature on the structural properties of La$_{0.7}$Sr$_{0.25}$Nd$_{0.05}$MnO$_3$

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Abstract. Crystalline structure of La$_{0.7}$Sr$_{0.25}$Nd$_{0.05}$MnO$_3$ (LSMNO) manganite have been investigated in order to study the effect of various sintering temperature. A series of LSMNO samples were prepared by citrate-nitrate sol-gel method followed by various sintering temperature at 700 oC, 800 oC, and 900 oC. The crystalline structure of the samples was investigated by using X-ray diffractometer (XRD). The XRD patterns obtained were then analyzed by means of Rietveld refinement method. According to the XRD results there was no secondary phase found in all samples. Furthermore, refinement process show that all samples crystallize with rhombohedral symmetry within the space group of R3c regardless the applied various sintering temperature. Further crystallographic study reveals that average Mn-O bond length increases meanwhile average Mn-O-Mn bond length decreases as sintering temperature were increased. To confirm chemical composition of LSMNO samples, we use X-ray fluorescence (XRF). XRF result reveal that all samples support stoichiometry design.

Keywords: Perovskite manganite; Sintering Temperature; Structure;

1 Introduction

Perovskite manganite with general formula La$_{1-x}A_x$MnO$_3$ ($A$ = Ca$^{2+}$, Ba$^{2+}$, Sr$^{2+}$, Nd$^{3+}$, Na$^+$, etc.) still remain to be one of the attractive material to be studied because its unique physical phenomenon such as colossal magnetoresistance (CMR) and magnetocaloric effect (MCE) [1, 2]. Furthermore, MCE phenomenon holds a massive importance to the development of renewable energy source especially to replace conventional refrigerator with magnetic refrigerator technology. During the last decade, modification to lanthanum based manganite have already advanced even further. One of the example of the advanced modification is by introducing more than one dopant on the A-site of the perovskite material [2 – 4]. When two ion will be doped into a modified perovskite manganite, an important thing to be considered is the physical properties of the basis material which have been selected. One of the example from the advanced modification in the lanthanum manganite is (La$_{1-x}$Nd$_x$)$_{0.7}$Sr$_{0.3}$MnO$_3$ manganite [4]. In this material, the basis material chosen was La$_{0.7}$Sr$_{0.3}$MnO$_3$. Earlier study on this material by some researchers reveals that La$_{0.7}$Sr$_{0.3}$MnO$_3$ has a high Curie temperature with low resistivity [5]. These two evident inspire other researchers to tune the physical phenomenon of La$_{0.7}$Sr$_{0.3}$MnO$_3$ according to what the material will be applied to. By
introducing neodymium to \( \text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3 \), it has been proven that Curie temperature of \((\text{La}_{1-x}\text{Nd}_x)_{0.7}\text{Sr}_{0.3}\text{MnO}_3\) decreases as the neodymium content increased \([2, 4]\). Furthermore, resistivity also increase when higher neodymium content was introduced to the material \([2, 4]\).

\( \text{La}_{1-x}\text{Sr}_x\text{Nd}_y\text{MnO}_3 \) is an interesting among perovskite manganite material because its physical phenomenon can be tuned by varying strontium content and neodymium content. Despite its interesting physical phenomenon, study regarding physical phenomenon of \( \text{La}_{1-x}\text{Sr}_x\text{Nd}_y\text{MnO}_3 \) material still scanty. Thus, in this research perovskite manganite with chemical formula \( \text{La}_{0.7}\text{Sr}_{0.25}\text{Nd}_{0.05}\text{MnO}_3 \) will be studied mainly to understand the effect of sintering temperature used during synthesis on its crystalline structure. Although some researches have been conducted to study the effect of sintering on the structure or even to the physical properties from perovskite manganite, its effect on the crystal structure still a matter to be discussed \([6,7]\). Furthermore, this study is essential because previous work have already proved that sintering process plays a major role on the physical properties of ceramic compounds \([8]\).

### 2 Experiments

Three different samples of \( \text{La}_{0.7}\text{Sr}_{0.25}\text{Nd}_{0.05}\text{MnO}_3 \) were prepared using citrate-nitrate sol-gel method. Stoichiometric amount of \( \text{Sr(NO}_3\text{)}_2 \), \( \text{Mn(NO}_3\text{)}_2 \cdot 4\text{H}_2\text{O} \), and \( \text{C}_6\text{H}_8\text{O}_7 \) (citric acid) were weighed and dissolved in double distilled water. The amount of citric acid that were used can be calculated using molar ratio of all metal ion to citric acid in 1 : 1.2 \([9]\). Precursors that were in oxide form such as \( \text{La}_2\text{O}_3 \) and \( \text{Nd}_2\text{O}_3 \) were diluted in nitric acid to convert metal oxide form into metal nitrate form following a chemical reaction

\[
\text{M}_2\text{O}_3 + 4\text{HNO}_3 \rightarrow 2\text{M(NO}_3\text{)}_2 + 2\text{H}_2\text{O}
\]

Where \( \text{M} \) is metal ion, in this particular case are lanthanum and neodymium. After all the precursor were diluted in double distilled, then all the precursor were mixed together followed by a constant stirring using spin bar on a magnetic hotplate. Shortly, the fine powder then sintered at three different temperature which are 700 °C, 800 °C, and 900 °C. After sintering process was done, all samples are characterized using XRD to study its phase purity and crystal structure with step size of 0.02° and scan rate more than one second for each step. Lastly, XRF measurement was carried out to ensure the stoichiometry of the samples.
Figure 1. Powder XRD patterns include Rietveld refinement for La$_{0.7}$Sr$_{0.25}$Nd$_{0.05}$MnO$_3$ sintered at (a) 700 °C, (b) 800 °C, and (c) 900 °C.

3 Result and Discussion

The crystal structure of each sample sintered at 700 °C, 800 °C, and 900 °C was investigated by X-ray powder diffraction. The diffraction pattern obtained were then analyzed
using Rietveld refinement and depicted in figure 1. Based on the miller indices of all the samples, it can be seen that all samples crystalline in rhombohedral structure with $R_3c$ space group regardless of the sintering temperature. This result met an agreement with several earlier study that have proven various sintering temperature does not affect crystalline structure of the sample [6, 10]. From figure 1, it can be seen that all sample have achieved a single phase state without any trace of impurities. This is proven as there are no diffraction peaks that were not matching with the database when observed diffraction pattern were compared to calculated pattern. The crystalline structural properties obtained using Rietveld refinement process detail explored on table 1.

The fitting process that compare observed diffraction pattern with database was good. This argument is supported with GOF value that close to unity and small Rwp and Rp value. There are almost no significant change in $c$-lattice parameter while there are a slight increasing trend in $a$-lattice parameter and $b$-lattice parameter. This change affect the unit cell volume which increase as sintering temperature increase. Similar result also reported by Oumezzine et. al when lanthanum manganite based sample were sintered at different temperature [6].

According to XRD pattern inspection, it can be seen that width of each diffraction peaks became narrower as sintering temperature increase. It will affect the average crystallite size of sample $La_{0.7}Sr_{0.25}Nd_{0.05}MnO_3$. We calculated the average crystallite size by using Scherrer equation.

$$D_{cryst} = \frac{0.9 \lambda}{\beta_{FWHM} \cos \theta}$$

Where $\lambda$ is Cu Kα wavelength (1.5406 Å), $\theta$ is the diffraction angle, and $\beta_{FWHM}$ is the full width at half-maximum (FWHM) of each diffraction peaks in radian. As sintering temperature increase, the average crystallite size also increase. This is a well-known phenomenon that happened when ceramic material is synthesized in various temperature. Similar result also reported the same phenomenon when ceramic material was sintered at different temperature [8, 10].

Table 1. Refined structural parameter of $La_{0.7}Sr_{0.25}Nd_{0.05}MnO_3$ after refinement process using Rietveld refinement

<table>
<thead>
<tr>
<th>Structural parameter</th>
<th>Sintering temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>700 °C</td>
</tr>
<tr>
<td>Crystal structure</td>
<td>rhombohedral</td>
</tr>
<tr>
<td>Space group</td>
<td>$R_3c$</td>
</tr>
<tr>
<td>Lattice parameter</td>
<td></td>
</tr>
<tr>
<td>$a$ (Å)</td>
<td>5.493(7)</td>
</tr>
<tr>
<td>$c$ (Å)</td>
<td>13.355(3)</td>
</tr>
<tr>
<td>unit cell volume (Å3)</td>
<td>348.971</td>
</tr>
<tr>
<td>Discrepancy factor</td>
<td></td>
</tr>
<tr>
<td>GOF</td>
<td>1.164</td>
</tr>
<tr>
<td>Rp (%)</td>
<td>4.877</td>
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</tbody>
</table>
Based on table 1, the average bond angle and average bond length of the samples are changing despite the same chemical composition. Reduction in average Mn-O bond length \( d_{\text{Mn-O}} \) and increasing value of average Mn-O-Mn bond angle \( \langle \text{Mn-O-Mn} \rangle \) which observed in the sample is an indication that there are a distortion in the crystal structure of the sample. It has been known that an ideal perovskite structure is a cubic structure. Distortion can happen to a perovskite cubic structure which will distort the structure into a more unstable structure like rhombohedral and orthorhombic. The distortion usually happened when the average bond length is increasing while the average bond angle is decreasing compared to ideal cubic structure. In this particular study, the change in average bond angle and average bond length can be addressed to the interplay of the sintering temperature. Based on table 2, it can be seen that higher temperature will distort the crystalline structure to a more unstable structure. This is due to the thermal energy that the sample received during manufacturing process of all the samples. Previous work already shown that change in average bond length and average bond angle will induce a change in the physical properties of the samples [11]. Thus, it can be predicted that different sintering temperature will cause a different physical properties of La_{0.7}Sr_{0.25}Nd_{0.05}MnO_{3}.

The stoichiometry of the samples synthesized was examined using X-ray fluorescence measurement. Figure 2 shows all the metal spectra which have been detected during XRF measurement. From figure 2, it can be seen that there are no significant difference in the XRF spectra of the three samples which synthesized with different temperature. This result is logical because from chemical point of view, sintering temperature does not change chemical composition. Thus, the XRF spectra of the three samples does not vary significantly. This results supports previous claim that all samples have achieved single-phase state without any trace of impurities.

Table 2 compares the metal concentration detected from XRF measurement with calculated value which have been calculated by stoichiometry approach. Difference in calculated value compared to measured value suggest that the samples studied in this research...
does not perfectly follow chemical stoichiometry value. This is due to the solution method which have been used to synthesize the samples. There are possibility that there exist a small amount of metal component left in one of the precursor’s container as it is nearly impossible to pour all the precursor perfectly in solution form to the reaction glass.

Table 2. Metal content in each sample from XRF result compared with calculation based on stoichiometry process

<table>
<thead>
<tr>
<th>Sintering temperature</th>
<th>700 °C</th>
<th>800 °C</th>
<th>900 °C</th>
<th>calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>27.54</td>
<td>27.53</td>
<td>27.30</td>
<td></td>
</tr>
<tr>
<td>Sr</td>
<td>11.47</td>
<td>11.44</td>
<td>11.88</td>
<td></td>
</tr>
<tr>
<td>La</td>
<td>55.92</td>
<td>55.98</td>
<td>53.63</td>
<td></td>
</tr>
<tr>
<td>Nd</td>
<td>5.0</td>
<td>5.05</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

4 Conclusion

In this research, doped lanthanum manganite system with chemical formula La0.7Sr0.25Nd0.05MnO3 have been studied mainly to study sintering temperature effect on its crystal structure. Three samples which have been synthesized using citrate-nitrate sol-gel method and sintered with different temperature does not show any trace of impurities. It has been shown that sintering does not affect the crystal structure of La0.7Sr0.25Nd0.05MnO3 which remain in the rhombohedral structure with R3c space group. Evidently, it has been shown that sintering temperature enlarge the unit cell volume of the same sample. Moreover, sintering temperature distorts the bond length and bond angle of La0.7Sr0.25Nd0.05MnO3. As commonly seen in other ceramic material, sintering effect increase the average crystallite size of La0.7Sr0.25Nd0.05MnO3. XRF spectra result shows that the sample which have been synthesized does not perfectly follow the chemical formula.

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References

Magnetoresistance in Manganites \((\text{La}_{1-x}\text{Nd}_x\text{Sr}_{0.33}\text{MnO}_3 \ (x \leq 0.3))\),” MATERIALS TRANSACTIONS, vol. 45, no. 4, pp. 1251–1254, 2004.

[3] K. Cherif, S. Zemni, J. Dhahri, J. Dhahri, M. Oumezzine, M. Ghedira, and H. Vincent, “Magnetocaloric effect in the doped perovskite manganese oxide \(\text{La}_{0.7}\text{Nd}_{0.3}\text{Sr}_{0.3}\text{MnO}_3\) \((x=0.42, 0.56\) and \(0.7)\),” Journal of Alloys and Compounds, vol. 396, no. 1–2, pp. 29–33, Jun. 2005.


Abstract. This paper explores the features of media buzzer in Indonesia when broadcasting Islamic issues. Media buzzer often becomes the compass of conversational discourse that develops in society that may contain various interests including religious interest. This study employs descriptive qualitative method in examining the media buzzer that placed itself as the 'mouthpiece' of Islam so that it became the focus of analysis. Islamic media buzzer is varied in its efforts to capture the sympathy of netizens. The finding shows the pattern that the posts make use of images or illustrations as visual support that manifests distinct modes of knowledge to reach reader’s better understanding. The media buzzers also make use of story to accentuate emotional and surprising element. Another obvious pattern deals with the length of the post. The longer postings are meant to remind readers using supports such as citation, Arabic quotes, prayers and final comment. Whereas, they tend to proscribe readers in shorter postings. By framing the features of the media buzzer conversing on Islamic issues in Indonesia, Islamic netizen needs to operate their higher order thinking skills to identify the distinct concept and point of view offered in the posts.

Keywords: critical thinking; Islamic issues; media buzzer; social media

1 Introduction

Today media buzzers challenge netizen’s critical thinking as their post in several social media. The posts lead to various controversies that demand critical readers to act appropriately, whether to forward, to respond or to ignore the message. The way the users of social media respond the posts of media buzzer is relied on the practice of critical thinking.

Critical thinking, etymologically, is rooted in the ancient Greek lexicon of *kriticos*: tracing decisions and criteria or standards, meaning that the process of developing a search of judgment is based on certain standards [1]. It is also defined as a careful analysis and determination that has implications for an objective decision in figuring out the merits and disadvantages [2]. In the last decade, critical thinking becomes a challenge in the discourse of social media as it requires the reasoning ability, systematically and logically in understanding concepts or beliefs, to take action and solve problems based on the mechanisms of conceptual analysis and argumentation [1].

Critical thinking is a literal human capability that requires deep exploration because of its dynamic and complex nature. The dynamic nature is because of the development according to the process of cognition maturation that begins from the awareness to reveal the results of
thought in a structured and systematic way to be understood by others. To build that awareness, it requires exposure and practice [3].

Critical thinking is also complex because it involves other factors such as interests, attitudes and personality. This is what needs to be sharpened so as to generate the expertise and interest to learn the field of expertise involving the community and collaboration with those of similar concern [4].

In the context of learning critical thinking, today's critical thinking patterns can be simply observed from the development of expressive abilities [3] to how systemically written expressions can be identified in student papers [Indah, 4]. Reflection on critical thinking is often constrained by writing skills. Therefore, integration between language learning and critical thinking skills is required [5]. Besides, it is also necessary to improve reading skill on various topics because it is related to the improvement of critical thinking skill [6].

In Indonesia the need to integrate critical thinking in education has begun since the implementation of the 2013 curriculum. However, its implementation at the elementary school stage is still constrained on material adequacy. The enrichment material provided still does not meet the communicative standards targeting the development of critical thinking [6]. As for the ideal level, a mapping of critical thinking areas that is appropriate to the context of learners in college [7] is required. Therefore, the study of the development of critical thinking skills in Indonesia still requires further exploration, especially in relation to the context of responding to massive information from social media.

Social media often becomes the compass of conversational discourse that develops in society. It also contains various interests such as political, social and religious interests. Since social media is seen as an effective means of achieving these diverse interests, media buzzers emerge. In this study, the media buzzer that placed itself as the 'mouthpiece' of Islam became the focus of analysis. Islamic media buzzer is varied in its efforts to capture the sympathy of netizens.

Generally, Islamic media buzzers present issues of Islam, nationality issues, issues of diversity and other issues by using verses texts. However, the meaning of the verse's passage is packed in different ways, giving rise to multiple interpretations and understandings. This is because netizens are very heterogeneous in their ability to understand the text they offer.

2 Literature Review

2.1 Critical Thinking and Media

What is critical thinking? Various definitions are revealed regarding critical thinking, yet it is not a matter of ability but how to control its barriers, that's more important [8]. The mind-related cognitive process with mental process mechanisms is co-ordinated by brain hemispheres [9]. In this case, it concerns with the language and brain of two schemes: "What to say" and "How to say it". Both can interfere with the process of critical thinking [8].

Critical thinking in Indonesia has emerged primarily since the rise of the reform era in 1998 within the context of freedom of expression [10]. In this case, critical thinking issues are relevant to the 4R basic competencies that include reading, writing, arithmetic, and reasoning or reading, writing, arithmetic and reasoning [11]. Each of these components is very important in balancing itself with the development of the times. Especially in the information age, the
The ability to reason in filtering information from media buzzer becomes increasingly important to recognize whether an information valid and reliable.

The ability to interpret and identify reason becomes the need of netizen as the target of media buzzer. It takes the skill to make the logical conclusion that underlies an argument regarding the specific issue raised. A logical conclusion or inference can answer whether a strong or weak argument [12]. Netizens or media users are called critical thinkers if they can recognize any logical or proposed mistakes broadcasted by the media buzzer. Media users require the ability to identify problems and connect with their assumptions; explain and narrow the problem; and analyzing, understanding and concluding by applying inductive and deductive logic; and establish the validity and reliability of assumptions, sources of data and information obtained [13]. This ability does not occur immediately, but is obtained through the process of achievement cycle or maturation of the continuum of critical thinking.

Critical thinking stages include basic skills such as asking questions and make predictions, defining problems, testing evidence, analyzing assumptions and recognizing the emergence of information biases. Further netizen as consumers of media buzzer should also be able to avoid emotional reasoning, distancing themselves from simplification or underestimation of certain things, considering different and fixed interpretations tolerate uncertainty [14]. This stage is important for anyone to raise their ability to think critically.

For netizens who are able to think critically, they will not easily fall in the absurd meaning offered by media buzzer. This is because they are able to implement reasoning as follows: monitoring and reviewing and measuring how issues and issues are formulated, how information, data and evidence are represented, and how the quality of reasoning is proposed. As the product is a clear, accurate, accurate, relevant, deep, logical outcome [15].

When faced to Islamic issues broadcasted by media buzzer, ideal netizen can examine the elements of the postings. First, the purpose of the text offered by the media buzzer. Second, the keywords that appear from the text. Third, important information in the form of facts, experiences, and supporting details. Fourth, the emergence of inference through its implied meaning. Fifth, the concept offered that may be different from other concepts. Sixth, the assumption that facilitates the generalization of the information contained in the text. The seventh, point of view, which the reader needs to recognize in order to have a common perspective with the idea arising from the text [16].

### 2.2 Indonesian Media Buzzer

One of the features of the posting of media buzzer is the short message which results in impartial content. The impartiality characterizes the discussion in social media, particularly when conversing controversial issues [17]. More issues resulted on media bias are related to political discourses [18]. However, in Indonesia issues related to religion come first as it is also linked to political interests. The bias in the posting of media buzzer is identifiable from its linguistic cues [19]. Media buzzer also employs effective strategies to catch people's attention and attract their clicks [20].

Despite the growing number of netizen, more people are aware that their literacy skills are being challenged. It is characterized by the decline of journalist’s valuation on social media [21]. Netizen today prefer social media to converse non-political issues because of the fear to face online harassment and to make use of social media as a tool for happy interaction [22]. In Indonesia, the non-political discourse taken into account in the dynamic of social media concerns with religion issues as it does not bring the negative consequence such as hatred and risk of harassment.
When conversing on religion issue, the posting still regards on politeness aspects. Politeness becomes a characteristic in the postings of Islamic media buzzer. When they represent their organization, they use higher politeness, while anonymous postings are lower in politeness [23].

3 Methods

This study examined the posting in current Indonesian social media conversing on Islamic issues. The posting taken as the data are those within the criteria of the discourse topic and virality. The topics are relevant to religion issues such as rituals, prayer, good deed, choosing leaders and facing life challenges. While on virality, the data cover the posting which is shared by at least a thousand of social media users.

The data are collected before, during and after the Ramadhan month where the social media take Islamic issues as their topic. Each posting is identified on it features such as number of words, the elements of its content and the implied meaning.

4 Finding & Discussion

From the current postings in several social media accounts such as Instagram, Facebook and Whatsapp, there are Islamic issues spread. The summary of the features of the postings is listed in Table 1.

Table 1. Features of The Postings

<table>
<thead>
<tr>
<th>Topics</th>
<th>Words</th>
<th>Elements</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking in Ramadhan</td>
<td>300</td>
<td>Illustration, greetings, introduction, Arabic citation, final comment</td>
<td>Reminder, Proscribe</td>
</tr>
<tr>
<td>Women &amp; Dajjal</td>
<td>100</td>
<td>Illustration, citation, prayer</td>
<td>Proscribe</td>
</tr>
<tr>
<td>KPOP &amp; Dajjal</td>
<td>150</td>
<td>Illustration, citation, final comment</td>
<td>Proscribe</td>
</tr>
<tr>
<td>Perfidious child</td>
<td>320</td>
<td>Introduction, prayer, final comment</td>
<td>Reminder</td>
</tr>
<tr>
<td>TikTok phenomenon</td>
<td>190</td>
<td>Illustration, Arabic citation</td>
<td>Proscribe</td>
</tr>
<tr>
<td>Prayers in Facebook</td>
<td>350</td>
<td>Illustration, introduction, final comment</td>
<td>Reminder</td>
</tr>
<tr>
<td>Negative choices</td>
<td>300</td>
<td>Illustration, introduction, Arabic citation, final comment</td>
<td>Reminder</td>
</tr>
<tr>
<td>Curse in short message</td>
<td>480</td>
<td>Introduction, citation, final comment, illustration</td>
<td>Reminder</td>
</tr>
<tr>
<td>Sunset demon</td>
<td>390</td>
<td>Introduction, prayer, illustration,</td>
<td>Reminder</td>
</tr>
<tr>
<td>Amarcement of black magic</td>
<td>180</td>
<td>Arabic citation, final comment</td>
<td>Reminder, Proscribe</td>
</tr>
<tr>
<td>Dialog with</td>
<td>370</td>
<td>Greeting, citation</td>
<td>Reminder</td>
</tr>
</tbody>
</table>
The postings on Islamic issues have ranged in length, from 80 to 480 words with the average 265 words. It characterizes the need of social media users that the posting is direct and short. The postings below 200 words cover some elements such as greeting, introduction, citation and final comment. While those above 300 words can only cover minimum elements such as greeting and citation only. This means that the length of the posting is not affected by the completeness of its element.

On the topic of smoking in Ramadhan, the posting starts with the illustration of smoking and its deadly danger. It captures the cover of cigarette stating the warning that smoking kills you. The author greets readers by saying Alhamdulillah expressing gratitude and being thankful to God and the messenger. The opening marks the identity of the author as well as the orientation of the posting that is directed to the Muslim. Then, he introduces the topic on how to optimize good deed during Ramadhan and not doing harmful thing such as smoking. He supports his claim by stating Arabic citation prohibiting smoking. He closes the posting by the final comment to warn readers not to smoke.

The next posting presents the illustration on the symbol of Dajjal or the evil demon and how a girl looks enthusiastic in a style of a Korean pop star representing the symbol of Dajjal. The posting directly states the citation from the hadith to avoid the coming of Dajjal. It is closed with the prayer to prevent Muslim from the appearance of Dajjal. Similar topic on dajjal that is linked to its symbol also starts with an illustration and followed with citation. It ends with the final comment to remind readers about the coming of Dajjal.

On good deed, another posting relates the issue of how child disregard their parents by not enough delivering prayers for parents. The posting describes how the prayer should be done each day. It is clarified in the final comment that the good deed is actually effortless but not seriously done.

Another posting criticizes the TikTok phenomenon that widespread among muslim. The posting starts with an illustration showing how in public sphere people become individualized since they are busy with their gadget. The posting warned muslim not to be busy with the application in their gadget, such as Tiktok which is considered useless. To support the claim that proscribe the use of Tiktok, the author inserts Arabic citation on prohibiting useless matters such as music and others.

The next posting discusses how to make use of Facebook wisely, not to share private matters and prayers. The author’s claim is supported by some citations from hadith. The final comment highlights the reminder to use Facebook in a better way.

On how to deal with negative choices in deciding something, a posting clarifies a statement that porn video is better than provocative video leading to radicalism. The posting shows the picture of the leader of an Islamic organization citing the essence of the religion to spread peaceful civilization. The author supports the clarification by citing some hadith and ends the posting with reminder to avoid radicalism.

The social media also discuss short message spreading the curse for those who do not forward its message to others. The author claims that it is forbidden to believe the curse. He supports his claim by using citation from hadith. The final comment reminds readers to use short message service for dakwah not for threatening others.

The next posting shares a story on what is happening during sunset where it is commonly believed that demons are coming out looking for a house to visit. The author supports the claim by using some citations to warn children and women to be careful during sunset. The
posting ends with a final comment offering others to share it and two illustrations showing the appearance of sunset demons.

Another posting covers the amarcement on watching TV show about black magic. It starts with the citations from the Koran and hadith concerning magic rituals and the danger for those believing in magic world. It ends with the final comment offering readers to join the media provider.

The next posting starts with greeting readers and asking them to finish their reading. The author shares the dialog between the Messenger and demon on what is happening when Muslim conducts prayers. It ends with a final comment that asks readers to forward the message to others.

The last posting is on the future leader that should be Islamic leader. The author introduces the topic by relating between the date of governmental election and an ayat in Koran namely Al Maidah 51. The author then uses Arabic citation and the translation of the Koran that dialsows Muslims to choose non-Islamic leaders.

From all the postings analyzed in this study, most of texts complete with illustrations that may either introduce the topic or summarize it at the end. The illustration as visual support in social media platform manifests distinct modes of knowledge that may reach a reader’s better understanding of the topic being covered [24]. When the image is presented earlier in the posting, it can attract readers to continue reading.

However, media buzzers also offers socio-culture aspect shown by the choice of the illustration. For instance, in the posting concerning sunset demon, the two illustrations given at the end of the text showing obviously the appearance of demons can be the real point to share, not importantly the content of the message. In this case, it is clear that visual information is used maximally by social media buzzers to expose readers into new experience and meaning. The image is structured, processed and presented in such a way to let readers understand and experience the same discourse given [24].

Another characteristic of the posting in Indonesian media buzzers sharing Islamic issue is the use of story to introduce the topic. For instance, the story of the author telling about perfidious child, the story of sunset demon and the dialog with the demon. The media buzzers apparently tries to accentuate the emotional and surprising story element in a post [25].

The elements within each posting work altogether to construct a meaning. In this case, the implied meaning refers to the orientation of the text in each topic. In general, the postings have the goal to remind readers or to proscribe them or both. By identifying the message, it can be inferred that the meaning clarifies the pattern and engagement with social media [26]. Media buzzers tend to proscribe readers by using short posts consisting less than 200 words. The longer postings are meant to remind readers using supports such as citation, Arabic quotes, prayers and final comment.

In Indonesian media buzzers conversing Islamic issues, it is identifiable that the purpose is to gain reader’s interest in controversial matters related to the current phenomenon. Netizen need to understand such purpose and challenge their critical skills before deciding to spread the posts. It is also noted that most of the posts use citation, either in Arabic or Bahasa Indonesia taken from the Koran, hadith or opinion of Islamic scholar.

However, as the main feature of the post is direct and short, some posts may lack in important information in the form of facts, experiences, and supporting details. In addition, some final comments imply that the media buzzers ‘force’ readers to forward the message. Critical netizen might be aware of the emergence of inference through such implied meaning.

It is expected that netizen who operate their higher order thinking skills can identify the concept offered in the posts that may be different from other concepts. Further, such netizens
are also aware of the point of view in the posts in order to have a common perspective with the idea arising from the text [16].

5 Conclusion

In this study, Indonesian media buzzers present issues of Islam regarding current phenomenon, good deeds, and socio-cultural aspects by using direct and short texts. However, the meaning of the passage is packed in different ways, through different features. It results in giving rise to multiple interpretations and understandings.

The finding shows the pattern that the posts make use of images or illustrations. They are used as visual support in social media platform that manifests distinct modes of knowledge that may reach a reader’s better understanding of the topic being covered. The media buzzers also make use of story as their effort to accentuate emotional and surprising element in the posts. Another obvious pattern deals with the length of the post. The longer postings are meant to remind readers using supports such as citation, Arabic quotes, prayers and final comment. Whereas, the media buzzers tend to proscribe readers in shorter postings.

As the implication of this study, Islamic netizen needs to operate their higher order thinking skills to identify the distinct concept offered in the posts. They are also required to be aware of the point of view reflected in the posts on Islamic issues in order to have a common perspective. Furthermore, the practice of higher order thinking skill as netizen can be a fruitful support for the process of media literacy, particularly in facing some issues like democracy, election and others [27]. The Islamic media buzzers should then compromises its goal to educate Islamic netizen by the three principles of adab-hikmah-‘adl namely spreading proper knowledge, producing wisdom and resulting in justice [28].

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References

[28] A. Ramli “Reframing Islamic educational concept for social justice” *Jurnal Pencerahan* vol 10, no 1 2016 pp.11-20
The Methodology of Qur’anic Message in The Website
(Case Study on https://muslim.or.id/)

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Abstract. Technological developments have affected every activity of people around the world, including Muslim communities in Indonesia who are beginning to use technology to spread Islamic teachings. The interpretation of the Qur’an have long utilized their increasingly sophisticated technology, by using electronic, media as a tool to spread Quranic interpretation. In this case, websites have become a form of online media that can be used to spread Qur’anic interpretation. This study aims to analyze the sources, methods, and patterns of the Qur’anic interpretation on websites, specifically in http://muslim.or.id. This research uses qualitative research method through literature study by using the descriptive-analytical method. The results of this study reveal the source of the Quranic interpretation on http//:muslim.or.id website is bi al-ma’tūr and bi al-ra’yī. In addition, this website uses two methods of Qur’anic interpretation, namely mauḍu’ī and muqaran. This inconsistency methods is due to the number of authors contribute to the articles posted on the website. The main characteristic of the website’s Qur’nic interpretation is ijtima’i because it published articles on the interpretation of trending themes or issues as its answers to problems facing Muslim communities in Indonesia.

Keywords: component; formatting; style; styling; insert (key words)

1 Introduction

In the last 20 years, technology has been developing and influencing various activities of people around the world. Due to this development, information can be accessed more easily than before [1]. Online media become alternative tools to meet the increasingly complex human needs, including spiritual needs of religious understanding [2]. We have seen Indonesian Muslim communities looking for answers or solutions to their personal problems by visiting online media. Currently, online media are used by users as tools to post articles about Islam such as about about fiqh, muamalah, morality, ‘aqidah, hadith and Qur’anic interpretation.

Various Muslim groups use online media as facilities to post articles on Quranic interpretation. Previously, the study of Quranic interpretation was conducted through e-book version of the works on Qur’anic interpretation which can be accessed from applications like Maktabat al-Shāmilah. Social networking media such as Facebook, Twitter, Instagram, and Whatsapp, are also used to spread studies on Qur’anic interpretation [3]. Currently, website is
a form of online media that play an important role in the dissemination of Qur'an interpretation. This medium can be accessed more easily and faster than other media. According to Andrey Andoko, in order to reach 60 million people, while radio requires 30 years and television requires 15 years, website only needs 3 years. This paper focuses its investigation on a website, http://muslim.or.id with some reasons. First, http://muslim.or.id is an official website that can be used as a source of reference for academics; second, it has a well organized managerial structure; third, it has been visited by 5.8 billion viewers in January 2008; and fourth, on October 2015, it earned the 4th place in Alexa for the keywords "Indonesian", "society", "religion", and "Islam".

This paper aims to analyze the sources, methods, and styles of the articles on interpretation of the Qur'an posted in http://muslim.or.id. The method used is library research. In this case, literature on the methodology of interpretation is described and analyzed critically.

2 Discussion

2.1 Tafseer and Interpretation

Tafseer is the highest science position, it is a science that is needed because the object of discussion is the Qur'an which became the source of Muslim life. People who serve God, seek the pleasure of God and obey God by carrying out the demands of God contained in the Qur'an. Therefore the Muslim must understand the content of Quranic verses properly and correctly [5]. The word "interpretation" is derived from the word "fassara-yufassiru" means interpretation. While the term by Abu Hayyan is the science which deals with the pronunciation of word (lafad) Qur'an, concerning directives, laws either as a stand-alone or as composed and meanings that make it up [3]. Meanwhile, according to Al-Zarkashi tafsir is a knowledge that with that knowledge can understand the Quranic verses that are revealed to the Prophet Muhammad, by explaining the intentions, issuing laws and wisdom [6].

In accordance with some interpretations that have been expressed, then the study of Quranic interpretation contained in the website Muslim.or.id is a form of interpretation of the Qur'an. Because the authors of the article Muslim.or.id is trying to explain the Quranic verses that became the discussion of each author though by quoting from some mufasir.

Paragraphs interpreted in the website Muslim.or.id are the required verses according to the theme raised by the article authors on the website. So not all Quranic verses are interpreted by the authors. Each author always provides the source or reference they use, be it in the form of footnotes or bibliography. There are approximately sixty-eight themes that have been written by the authors of the article with mentioning several verses used for each of them.

There are five ways to explain an article theme:

1) Interpreting the Quranic verses with their own thoughts. For example, a discussion of people always associates the number of verses with the date of the occurrence of volcanic eruptions. This discussion is explained in accordance with author"s ideas [7].

2) Explaining the interpretation of the results of the review that the author of the article had heard earlier. An example of this form is a discussion of the interpretation of the surah Al-Baqara [2]: 264 which the author of the article listened to Zaid Susanto who had lectured at ma'had Jamilul Rahman Bantul, Yogyakarta. Zaid himself uses the book of Nidā'a Al-Rahman li Ahli Al-Imān.

3) Interpreting the verse using the opinions of the mufasir. An example of this form is the interpretation of surah Al-Baqara[2]: 256 which explains the absence of compulsion in
religion. In explaining the interpretation the author uses the opinion of Al-Ṭabari, Abū Ḥātim, Al-Shaukani; 'Ali Al-Ṣabuni, Ibn Kathīr and Al-Qurṭūbi [8].

4) Summarizing from an Arabic book (not a book of tafsīr). An example of this form is the discussion of the degree of people who are studying. In this theme has included the verses namely; Surah of Al-Mujadalah [58]:11, Al-Anfāl [8]: 2-4, Tāhā [20]: 75 and Al-Nīsā [4]: 95-96. This interpretation uses the source of Faḍl Al-ʿIlmi wa Adabu Ṭalabatihi wa Ṭuruqu Tahsilihi wa Jamiʿhi by Shaykh Muhammad bin Saʿīd bin Ruslān.[9]

5) Interpretation of the results of the translation of interpretation studies on foreign Arabic-speaking websites. The example of the article is "Wisdom of creating Heaven and Earth for 6 Days". [10]

2.2 Various Types of Tafsīr

The interpretation of bi al-maʿthūr is divided into two groups; valid bi al-maʿthūr and invalid bi al-maʿthūr tafsīr. The interpretation of valid bi al-maʿthūr is the interpretation of the Qurʾān based on the narration of sanad and matan that can be accounted for by the science of hadith [11]. While the interpretation of invalid bi al-maʿthūris the interpretation of the Qurʾān based on an incorrect history [12].

The interpretation of bi al-raʿyi is the interpretation of the Qurʾān that results from the ijtihād of a mufassir who knows the Arabic and his knowledge, the jahiliyah poems, ashab al-nuzul, nasikh mansukh and other science required by a mufassir.[13] Although there are some scholars who oppose commentary using reason and some are permissible, Husein al-Dhahabi tried to find a middle ground. According to him the interpretation of the Qurʾān can be done by both bi al-maʿthūr and bi al-raʿyi. But otherwise if not according to the rules of the Arabic and Quranic arguments also hadith then it is forbidden. [14] The sources used by the website Muslim.or.id are bi al-maʿthūr and bi al-raʿyi. According to 'Ali Al-Ṣabuni such an approach is called Tafsīr lī Alquran Al-Karīm Jamiʿ baina Al-Maʿthūrwa Al-Maʿqūl. [15] Examples of interpretation of the Qurʾān in the website Muslim.or.id derived from the interpretation of bi al-maʿthūr using the Qurʾān; Interpretation of Al-ʿAnkabūt: 3: "We did test those before them, and Allah certainly know those who are true from those who are false."

The above verse is interpreted using Al-Taubah: 115, Ālī 'Imran: 119 and 29. The article discusses this entitled "Tafsīr Ayat" That Allah Know the Honest and the Lies. [16] According to the authors of the article that God knows all that is in the heavens and on earth and Allah always knows what His servants hide. In addition, to complete the interpretation, the author of the article also uses Al-Baqara: 143 to explain Al-ʿAnkabūt: 3. Referring to hadith of the Prophet also used by the author in some interpretation. For example the interpretation of Al-Baqarah:273, "... the ignorant thinks, because of their modesty, that they are free from want..." Explanation of the word "taʿaffuf" the author of the article using the hadith of the Prophet:"Whosoever behaves' ifah (keep the honor of self) Allah will keep his purity" [Hasan Shahīh HR. Al-Nasai 'i].

The evidence of bi al-raʿyi's interpretation in the Muslim.or.id website is visible from some of the authors who write the articles, they are using or quoting a book of exegesis as their sources from tafsīr categorized as bi al raʿyu like rūh al-maʿānī of al-Allūfī. For example in interpreting Al-Anbiya: 27 in an article entitled "Islam Rahmatan Lilʿalamiin", written by Yulian Purnama. In explaining this verse the author quotes Al-Ṣabuni as follows: "The meaning of this verse is" It is not We send you, O Muhammad, but as a mercy to all beings ". As in a hadis "Verily I am a mercy granted (by Allah)" (HR. Buhkari).
2.3 Based on Method

There are four acknowledged methods of interpretation, namely: *tahlili*, *ijmali*, *muqaran* and *maudlu'i*. Muslim.or.id using two method, *muqaran* method and *maudhui* method.

The steps of *muqaran* method that a mufassir needs to follow are as follows: [18]
1. Similar verses with different case, as follow:
   a. Searching and collecting the intended verses. Then, comparing and reviewing in accordance with the rules of interpretation to take a conclusion
2. Comparing Quranic verses with any contradictory hadith:
   a. Collecting the Qur'anic verses and matan hadith in question.
   b. Comparing sufficiently and take a conclusion after going through the analysis.
3. Comparing the interpretation of anulamato other interpretations of the same issue with several steps like:
   a. Give attention to a number of verses that discuss the issue to be discussed.
   b. Trace the opinions of the mufassirinon the issue.
   c. Examine similarities and differences of such interpretation

The *maudhu'i* method explain verses of the Qur'an according to certain themes. Then the verses are analyzed and understood by paying attention to *amm* and *khas* (general to specific), *mutlaq* and *muqayyaad* and others. The explanation is enriched with the hadiths related to the theme and then take the conclusion [19].

Al-Farmawi divided the *maudhu'i* method into two forms namely: First, a discussion of the full and complete interpretation of a surah in the Qur'an, explaining its general and specific intent (*waḥdah mawḍūluyyah fi surah*). Explain the relationship between the various problems in the surah carefully [20]. Second, collect a number of verses from various surah that also address one particular problem, then arrange them in theme and then interpreted thematically [21]. From the above explanation, and after analysing the website of Muslim.or.id, we found out that the method used is *maudhu'i* and *muqaran*. The argument for the existence of these two methods is because many of the authors who write articles in this website are inconsistency in use of both methods. Besides, each author has its own way of compiling and reviewing his interpretation.

The facts on the ground that not all articles of interpretation in this website are following the steps as explain before, although some are fall into the category of methods that have been presented.

Example of the interpretation using *maudlu'i* method is Surah Al-Zalzalah with entitled a devastating earthquake on the Day of Resurrection". This interpretation follow the steps explain in maudlu"i method.

The next interpretive method is *muqaran*. We found *muqaran* method in the website Muslim.or.id in two forms namely; (1) describing the verses in which the editorial is different but speaks of the same issue and (2) comparing the interpretation of the verse from the interpreters' opinions on the verse in question.

The example article using the *muqaran* method is the interpretation of Al-Anbiya:70, where the authors compare Ibn al-Qayyim al-Jauziyah's commentary on Ibn al-Qayyim, Al-Shaukani in the book of *Fatḥ Al-Qudr*. Al-Ṭabarī in the book of *Tafsīr Al-Ṭabarī*, Al-Qurtūbī in *Tafsīr Al-Qurtūbī*, 'Alī Al-Ṣabunī in the book *Ṣafwah Al-Tafsīr* after.. The next article is about the prohibition of the Muslims making the unbelievers as auliya. The author of the article listed several verses that have the same theme: Al-Imran [3]: 28, Al-Māidah [5]: 51, Al-Māidah [5]: 57, Al-Taubah [9]: 23, Al-Mumtaḥanah [60]: 1, Al-Nisā [4]: 89, Al-Nisā [4]: 139, Al-Nisā [4]: 144 and surat Al-Māidah [5]: 81.34
2.4 Based on Style

The style is a feature or characteristics coloring interpretation of the Qur’an. A mufassir explains Quranic verses with his abilities and describes his interest and horizontal knowledge. Therefore, a book of tafsir produced has a style that is in accordance with the disciplines that mufassir has. Among the famous tafsir styles are;

First, Tafsir Sufi is a style of interpretation of Tasawwuf which usually adopted shari’ah approach [22].

Second, jurisprudence interpretation is a dominant style of interpretation of the Qur'an to discuss the issue of fiqh [23]. Tafsir Jurisprudence is more oriented to the verses of the law in the Qur'an then to other issues. Al-dahabi in his book explains that the juristic interpretation always talks about the verses about the law, and always discusses the madhhab-madhhab schools of jurisprudence with their respective arguments [24].

Third, Falsafi interpretation is the interpretation of the Qur'an based on a logical approach or philosophical thought that is liberal and radical. The philosophical interpretations attempt to combine philosophy and religion [25].

Fourth, interpretation of ilmi style is the interpretation of the more focused discussion with the approach of general sciences. This interpretation strives to bear different branches of science and involves philosophical thought [26].

Fifth, adabi ijtima'i. tafsir which emphasizes the discussion taking consideration to social problems [27]. According to Muhammad Husain Al-Dzahabi, the pattern adab ijtima'i able to express the terms of balaghah Alquran and miracles, explaining the meanings and targets directed by the Qur'an, revealing the great laws of nature and order the society it contains. This style aims at paying attention to solve the problems of Muslims and other human beings, put forward the guidance of the Qur'an and its teachings. Further, it can give the happiness of the world and the hereafter by integrating the Quran and the correct scientific theories. This style shows that the Qur'an is an eternal and able to compete with the times, and reject the vagueness, misgivings and false allegations of the Qur'an [28].

The pattern used by the website Muslim.or.id is categorized as ijtima'I, without adaby. The reason is based on many interpretation refer more to social aspect faced in contemporary era than to Arabic and literary meaning. Examples of articles are about the veil [29].

3 Conclusion

The study of Qur’anic commentary on websites is relatively a new field of study. The above analysis of Qur’anic interpretation of http://muslim.or.id shows that the website adopts a simple and understandable ways of Qur’anic interpretation, which are accessible by ordinary Muslims. The interpretation of the Qur'an in the website takes a form of excerpts taken from classic and modern mufassir. The writers of posted article directly refer to the original sources of Qur’anic interpretation literature.

Therefore, http://muslim.or.id is a website that can be taken a source or reference by Muslims and non-Muslims who need to understand the Qur’an. It can also be used as a reference by common people for daily needs or by students for academic purposes.

References


Hadith Text Classification: A Literature Review

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Abstract. Hadith text classification is a domain specific research which requires involvement from both - science computer and hadith researcher. This paper presents literature on hadith text classification from different perspective in computer science such as classification process and issues related to it. This research therefore look into develop standard data set for hadith text classification with narrator chain part of the text as the basis. It will be the basis for future research on the classification of Malay-translated hadith text.

Keywords: text classification; hadith classification; hadith authentication

1 Introduction

A hadith is a record of the sayings or traditions of the Prophet Muhammad (Peace be Upon Him), revered and received as a major source of religious law and moral guidance, next to the authority of the Quran, the holy book of Islam [1]. Hadith classification is a process that supports hadith authentication. The process in hadith classification is being carried out by computer research community. Meanwhile, hadith authentication is carried out by hadith scholars. Hadith classification plays an important role in assisting hadith scholars in carrying their task [4].

Hadith text has two structures, such as sanad and matan [21] in Fig. 1. The figure shows the Malay translated hadith text from Hadith scholarly book Shahih Bukhari. Each Hadith there are two important things, namely the first real narrative text (Content / Matan), the second chronological list of people who were the transmitters of Content / Matan, known as the Narrator Chain / Isnad [4] [22] [2]. Sanad/Narrator Chain part in Fig. 1 is “Telah menceritakan kepada kami Abdullah bin Muhammad Al Ju'fi dia berkata, Telah menceritakan kepada kami Abu 'Amir Al 'Aqadi yang berkata, bahwa Telah menceritakan kepada kami Sulaiman bin Bilal dari Abdullah bin Dinar dari Abu Shalih dari Abu Hurairah dari Nabi shallallahu 'alaihi wasallam, beliau bersabda:’’. the narrator chain found in the hadith is "Nabi shallallahu 'alaihi wasallam → Abu Hurairah Abu Shalih → Abdullah bin Dinar → Sulaiman bin Baal → Abu 'Amir Al 'Aqadi → Abdullah bin Muhammad Al Ju'fi". The hadith in the Fig. 1 is “Iman memiliki lebih dari enam puluh cabang, dan malu adalah sebahagian
dari iman”. Between the content and the narrator chain in the diagram below are clear and marked with symbols ‘→’.

The Fig. 2 shows the hadith text that has two narrator chains in one hadith text. The first narrator chain in the hadith is “Rasulullah shallallahu ‘alaihi wasallam → Ibnu ‘Abbas → Ubaidullah bin Abdullah Az Zuhri → Yunus → Abdullah → Abdan”. While the second narrator chain is “Rasulullah shallallahu ‘alaihi wasallam → Ibnu ‘Abbas → Ubaidullah bin Abdullah → Az Zuhri → Yunus dan Ma’mar → Abdullah → Bisyir bin Muhammad-. Meanwhile for the hadith content is "Rasulullah shallallahu ‘alaihi wasallam adalah manusia yang paling lembut terutama pada bulan Ramadlan ketika malaikat Jibril ‘Alaihis Salam menemuiya, dan adalah Jibril ‘Alaihis Salam mendatanginya setiap malam di bulan Ramadlan, dimana Jibril ‘Alaihis Salam mengajarkan Al Qur’an. Sungguh Rasulullah shallallahu ‘alaihi wasallam lebih lembut daripada angin yang berhembus”. That hadith was ambiguous and referred to hadith researchers.

Hadith text is a form of story-based text with no specific formatting. There is no standard numbering of the hadith. This leads to different numbering of the same text, depending on the type of publication — hardbound or paperback. The numbering of hadith is done by hadith researchers, not the original author of the hadith compilation 'Shahih Bukhari'.
2 Hadith Classification in Computer Science

2.1 Hadith Text Classification Research

[11] stated the classification of hadith is divided into seven as shown in the Fig. 3 which is: the number of the narrator in each stage, reference to authority, links of isnad, reliability and memory of narrators, nature of matn and isnad receive manner and hidden defect found [12][24].

Hadith classification research mostly focused on classification as: sahih, hasan, or da’if [3]. Researchers that conducted the research were [2] and [3]. Therefore, there are six classifications of hadith that have yet to be explored as research.

The Table 1 shows the study which was conducted by [6] that differs hadith classification approaches. That table has several number of hadiths that have been researched, NLP tools / approaches, classification algorithm that have been used along with the results produced. The number of hadith used is different between one another and there no standard number of hadith need to be used.

In the hadith classification there is a major problem, namely how the documents being trained really belong to a particular class [10]. Most of previous study as in [6][3][18] [19][16][7][8] [10] this problem can be solved by classifying hadith which Al-Bukhari had previously classified, namely the very well-known Al-Hadith scientist.

2.2 Dataset

The compilation of Hadith Al-Bukhari has been widely published by various publishers in various languages. Shamela is a digital library which can help the process of classifying the hadith and contains details about narrators, but has not yet automated the process of classification of hadith, with the definition of the hadith validity (authenticity) and da ‘if (weak) cannot be distinguished [12]. All those systems are can see in [18][15 19][17][4]. The most important thing to fulfill end user needs is information retrieval [10].
Limited application about Hadith Retrieval. In non-Arabic language environment, this limitation is found [29] such as Malay language. Mutiara Hadith and Lidwa Pusaka [34] are the hadith retrieval in Malay that have been used within science computer research community mainly for topical classification of the hadith text [14][20][30][31][32][33]. Nevertheless, the system lacks automatic text classification function and each researcher utilizes data from various databases. This proves a lack of standardized data among research community as far as classification of the Malay translated hadith text is concerned.

2.3 Hadith Classification Process
Fig.4 shows [10] a proposed system consists of four phases for classification of hadith. From pre-processing phase, learning database which contains the weights of features representing a class is constructed in second phase using a set of pre-classified documents. Then the third phase will be carried out a classification method where the results of the training database will be used to classify the targeted hadith. in this phase query expansion is also carried out. the final stage is data analysis and evaluation. Hadith classification process phases are slightly different than TC process that uses machine learning approach [ML] because there is no testing phase.

<table>
<thead>
<tr>
<th>Reference</th>
<th>#hadith</th>
<th>Linguistic tools / approaches</th>
<th>Classification algorithm</th>
<th>Results</th>
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<td>Decision trees, Bayesian, Entropy and Vector space models</td>
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<td>[25]</td>
<td></td>
<td>Three stemming approaches: rule-based, root-based and light stemming</td>
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<td>Rocchio, K-NN, Naïve Bayes and SVM</td>
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</tr>
<tr>
<td>[24]</td>
<td>80 (for testing)</td>
<td>Vector Space Models with several similarity measures</td>
<td>F-measure: from 0.42 (Dice Factor) to 0.85 (Naïve Bayesian)</td>
<td></td>
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<td>[10]</td>
<td>1321</td>
<td>Removing chains of</td>
<td>The cosine coefficient</td>
<td>49% and 37% of</td>
</tr>
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</table>
2.4 K-Nearest Neighbor (K-NN)

K-NN was named as one of the ten most popular and most important algorithms. K-NN is known to be simple. K-NN is an example-based learning group of classification. K-NN is done by searching for the group of K objects in the closest training data to objects in new data or testing data [6]. Generally the Euclidean distance formula is used to define the distance between two training objects and testing [11], [18].

\[ d_{xy} = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2} \]  

(1)

2.5 Confusion Matrix

Confusion matrix used to evaluate classification models to estimate the true or false objects [10]. A matrix of prediction which will be compared with the original class of inputs or in other words contains information of actual and predicted value on classification [12].

3 Result and Analysis
Figure 4. An system consist of four phases for classification of hadith [10]

The Figure 5 shows hadith classification process for content which conducted by [1]. Hadith classification process for the content is started with hadith input. Afterwards
sanad/narrator chains, stop-words were removed from hadith text and find the stem for the term. Then, the term frequency and weight were counted to produce the result for the users.

Hadith classification process for content is appropriate when using BoW text representation model in TC. Hadith classification process for content is usually classifying the hadith according to the topic in the hadith books [31][32]. Research in hadith classification that used BoW text representation can see in [6][7][20][10][14][1]. In addition, [9] used BoW to classify narrators in hadith text to trustworthy and untrustworthy.

Excluding for searching, the entire hadith classification process is done manually [2] [9] consequently it is not only prone [21] to subjectivity but also takes a lot of time [9] and expensive [13]. Therefore, automatic text (or document) categorization becomes an important attempt to save human effort required in performing manual categorization [10]. TC is a necessity due to a large amount of text documents that users must deal with [10] whose accuracy and time efficiency is much better than manual TC [13].

3.1 Performance Measure

The performance of classification model is important in determining the performance of the model with new cases [2]. [6][1] research on different methods of TC evaluates the quality of this classification in terms of performance or accuracy metrics. The assessment of F-measure, recall and precision were used as classification of hadith based on content as in [6][8][10].

Meanwhile, the assessment for classification of hadith based on sanad uses Success Rate of the Judgment and Error Rate of the Judgment respectively [3]. [2] performed four measurement which is 1) Correct Classification Rate (CCR). CCR is the number of correctly predicted scores by the classifier. 2) Error Rate(ER) represents the mathematical form of the number of incorrect prediction. 3) Sensitivity is The True Positive Rate. 4) Specificity is The True Negative Rate.

Despite the great efforts and the variety of the algorithms which have been tested, it is hard to select the best model without unifying the assessment framework [6]. The assessment accuracy in hadith classification need 9 be done because the data used did not go through the complicated method and require extensive checking and verification [3].

The F-measure values cannot interpret and compare objectively in hadith classification because of their works did not use the same datasets [6]. Besides that, the quality of the data source may affect the performance of a classification algorithm, the irrelevant and redundant features of data may reduce the quality of the result [5]. As we can see from the above works, the interest of studying Hadith science was increased, and the attempts of utilizing the new techniques to serve it and give optimistic results [12].

4 Conclusion

At present, research on hadith classification mostly focuses on the content classification of hadith text using BoW technique. Classification of the hadith narrator chain can still be considered insufficient proving that there are many more types of hadith text classification left unexplored. The absence of standard data set has undoubtedly impeded potential researches in this field. This lack makes studies on performance measurement between researches impossible as researchers' use of different databases leads to inaccurate comparison. This
literature research will therefore look into develop standard data set for hadith text classification with narrator chain part of the text as the basis.

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References


Lidwa Pusaka Application in Learning Hadith

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Abstract. This study focuses on Lidwa Pusaka application in learning and teaching ḥadīth. Lidwa Pusaka or Lembaga Ilmu dan Da’wah serta Publikasi Sarana Keagamaan, The Institute of Islamic Science, Da’wa and Publication of Religious Facilities, is Indonesian computational application of ḥadīth that initiated by Indonesian students who studied in the Middle East. The application uses 62,000 ḥadīths that taken from nine books of ḥadīth collections (kutub al-tis’ah). It can be used to search the meaning of ḥadīth and its transmission. This study use the Lidwa Pusaka application in teaching ḥadīth among students of Hadith Department at UIN Sunan Gunung Djati Bandung, using learning media approach. It is a study that analyze the relationship of two variables and then simultaneously sharing rows and columns of contingency tables. This study shows that the use of Lidwa Pusaka application is very effective in supporting the success of learning ḥadīth and among students. There are 75% of students who satisfied in learning ḥadīth using the application, 21% who quite satisfied, and 4% who did not satisfy.

Keywords: Lidwa Pusaka application; hadith; student; Hadith Department.

1 Introduction

There is a new development of ḥadīth or Muhammad’s words collections in the early modern period. Since the twentieth century, ḥadīth scholars used some computational softwares and applications. These applications certainly can help researchers and common people in learning ḥadīth. Everyone who learn ḥadīth can more easier to search ḥadīth using the application [1].

It is different from the development of ḥadīth in the early period of Islam in seventh century. Muslims cannot get ḥadīth directly. It is no many Muslims who able to understand the ḥadīth.

Many scholars then compiled ḥadīth into several collections, such as Ṣaḥīḥ al-Bukhārī, Ṣaḥīḥ Muslim, Sunan Abū Dāwud, Sunan al-Tirmidhī, Sunan al-Nasā‘ī, Muwatta’ Mālik, Musnad Ahmad, Sunan al-Dārimī, and others [2].

Since the period of middle age of Islam, the ḥadīth knowledge have increased. It is a period when ḥadīth scholars can studied systematically and easier to search ḥadīth in some collections of ḥadīth. While, another ḥadīth scholars began to analyse and evaluate some ḥadīths in several collections [3].

However, the ḥadīth studies in classical period cannot be understood by students in modern period. The student of Islamic university cannot understand ḥadīth knowledge well. They do not have Arabic language skills. It is not easy to understand Arabic books of ḥadīth collectons.
This study will highlight the significance of computational program of ḥadīth application, such as Lidwa Pustaka. The application is very interesting. It is not only for common people, but also students at the Islamic university. Lidwa Pusaka is an Indonesian computational program of ḥadīth application which use 62,000 ḥadīths that taken from nine books of ḥadīth collections (kutub al-tis‘ah). The application can be used to support the understanding of ḥadīth and ḥadīth knowledge [4].

The study focuses on the use of Lidwa Pusaka application in learning ḥadīth among students of Hadīth Departement at UIN Sunan Gunung Djati Bandung. I used list of questionts on the student satisfaction in learning ḥadīth using Lidwa Pusaka application.

2 Result and Discussion

Lidwa Pusaka is an abbreviation of Lembaga Ilmu dan Da’wah serta Publikasi Sarana Keagamaan, The Institute of Islamic Science, Da’wa and Publication of Religious Facilities. It is an institution that engaged in the development of computational program and application of ḥadīth. Lidwa Pusaka was created by Indonesian students who studied in the Middle East [5].

The ḥadīth application contains 62,000 ḥadīth that taken from nine books of ḥadīth collections (kutub al-tis‘ah), such as Ṣaḥīḥ al-Bukhārī, Ṣaḥīḥ Muslim, Sunan Abū Dāwūd, Sunan al-Tirmidhī, Sunan al-Nasā’ī, Sunan Ibn Majah, Muwatta’ Mālik, Musnad Aḥmad, Sunan al-Dārimī [6].

There are some utilities of Lidwa Pusaka application that used by students in their learnings: 1) It can be accessed more easier using Laptop, PC, and android; 2) There is menu option to search ḥadīth; 3) The application already supported copy and paste menu of Arabic text and its translations into Indonesian; 4) It also displayed menu of type and font color that can be customized into user comfort; 5) It provides ḥadīth index based on certain theme; 6) Provides a menu to see Hadith's Hadith categorization degree, 7) The description of the narrators of hadith can be obtained easily, 8) Can add notes with user language, 9) Validation of books can be justified, because this software contains a complete source with, title, book name, page, juz, city published, publisher and year publication [4].

Lidwa Pusaka application can be used by both offline and online using the internet [7]. Following picture show the steps of Lidwa Pustaka application when used by offline:

1) Open the program of Kitab 9 Imam, the nine books of imam, that already installed:

![Figure 1. Kitab 9 Iman](image.png)
2) Use the search menu in order to search certain ḥadīth, the rawi or scholars who tale the ḥadīth, and book of ḥadīth collections which collected the ḥadīth. We can choose one of chapters of the collection of ḥadīth, such as the prayer, zakat, fasting etc. We can also use certain words relating to the list of rawi and its biography or index. You should put the cursor in the search field, then type the keyword that will be searched in Arabic or Indonesian language.

![Figure 2. Search Menu Display](image)

3) Following picture show the rawi names and their qualities in tale the ḥadīth:

![Figure 3. Rawi Names Display](image)

4) We also can choose the menu of collections of ḥadīth in order to know the variation of quality of ḥadīth, such as maqtu’, marfu’, mauquf, mu’allaq, munqathi’, mursal, etc:
5) Last step is copy the data of ḥadīth that can be pasted into the other application, such as Microsoft Office Word.

Another important part of Lidwa Pusaka application is the menu of science of ḥadīth or mustalah al-ḥadīth. It is a menu that students can find discussions on the science of ḥadīth briefly [5].

The menu of science of ḥadīth in Lidwa Pusaka application can be used by students to learn the mustalah al-ḥadīth. It is an application that supports the learning of ḥadīth in college and university.

It is interesting that student used the Lidwa Pusaka application in their learnings at UIN Sunan Gunung Djati Bandung. The study focuses on student’s satisfaction after using the Lidwa Pusaka in their learnings of ḥadīth. I distributed five questions to 32 students [6], [8]. They previously were given a task during first half semester to find certain ḥadīth from the nine books of ḥadīth at the library. They then was ordered to use Lidwa Pusaka application in second half semester. They should compare how their experiences when use the nine books of ḥadīth and the Lidwa Pusaka application.

Following list of step that ordered into student to search ḥadīth:
1) Determining the theme of Hadith Muamalah each one person;
2) Seeking Hadith conventionally by using Mu'jam Mufarras li alfadz al-Hadith;
3) Seeking the quality and quantity of Hadith by looking at Rawi Hadith from Rijal al-Hadith;
4) While digitally using the search for Hadith, which has been described previously;

After completion of the assignment, at the end of the course the researcher conducted a correspondence on the heirloom as below:

Lidwa (about attached) to 32 students. Then the results are reviewed from the correspondence analysis between software Lidwa Pusaka with satisfaction Student of fourth semester of Hadith Science Department at Faculty of Ushuluddin UIN SGD obtained contingency table:

Table 1. Contingency Table

<table>
<thead>
<tr>
<th>Lidwa Pusaka Application</th>
<th>Student Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Satisfied</td>
</tr>
<tr>
<td>Searching Hadith Particular</td>
<td>7</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>Mustalah Hadith</td>
<td>1</td>
</tr>
<tr>
<td>Explanation of Quantity-</td>
<td>6</td>
</tr>
<tr>
<td>Quality of Hadith</td>
<td></td>
</tr>
<tr>
<td>Time Efficiency</td>
<td>5</td>
</tr>
<tr>
<td>Efficiency in Learning Application</td>
<td>5</td>
</tr>
<tr>
<td>Amount</td>
<td>24</td>
</tr>
</tbody>
</table>
The chi-square value describes the proximity of each variable. At a chi-square value a positive or negative mark corresponds to the inverse of the sign at the difference value [9]. A positive sign indicates a strong relationship and a negative sign indicates a weak relationship. The value of chi-square between software Lidwa Pusaka with satisfaction Students semester IV Hadith Science Departemen at Faculty Ushuluddin UIN Sunan Gunung Djati Bandung, namely:

<table>
<thead>
<tr>
<th>Lidwa Pusaka Application</th>
<th>Student Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Satisfied</td>
</tr>
<tr>
<td>Searching of Specific Hadith</td>
<td>0.03</td>
</tr>
<tr>
<td>Discussion of Mustahalah Hadith</td>
<td>0.16</td>
</tr>
<tr>
<td>Explanation of Quantity-Quality of Hadith</td>
<td>0</td>
</tr>
<tr>
<td>Time Efficiency of Using Application</td>
<td>0.41</td>
</tr>
<tr>
<td>Time Efficiency in Dictation of Hadith</td>
<td>0.41</td>
</tr>
<tr>
<td>Efficiency in Learning Application</td>
<td>4.06</td>
</tr>
</tbody>
</table>

Meanwhile, if presented by students who feel satisfied that is 75%, feel quite satisfied 21% and not satisfied 4% with software Lidwa Pusaka that help in the understanding Hadith and Science of Hadith.

3 Conclusion

Lidwa Pusaka application is very effective in supporting the learning hadith among students. There are 75% of students who satisfied in learning ḥadīth using the application, 21% who quite satisfied, and 4% who did not satisfy. The application could helps student in understanding hadith. It can be considered that there is one student who did not satisfy for every seven students at the university.

References


Development of Android-Based Learning Media for Students on Electrochemistry Materials

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Abstract. This study is aimed at developing android-based learning media on the material of Electrochemistry. This study is conducted through Design and Development model which consist of: (1) planning, (2) design, and (3) development. At development stage, the researcher conduct media testing which is aimed at determining the worthiness of the learning media. The media testing performed are alpha test, beta test I, and beta test II. After that, the effectiveness test is conducted through alpha test to obtain value of 100% which shows that the media can be used as learning media. The results of on Beta test I get the average percentage of 78.4% with good remarks. While in the Beta test II, the media gets very good remark with the value of 85.16%. Based on the summative evaluation results, it can be concluded that the Android-based media can improve students’ competency on electrochemistry materials. This can be seen from the result of t-test which shows that there is a significant difference between control group and experimental group with Sig.(2-tailed) value or ρ-value on the value posttest of 0.014 < 0.05.

Keywords: component; learning media; electrochemistry; android; media development

1 Introduction

Indonesia has entered the era of free market within the scope of South East Asian or ASEAN Economic Community (Masyarakat Ekonomi Asean - MEA). That matter makes Indonesia competes with countries in Southeast Asia in all fields. Improving the quality of education is the key to be able to compete. The role of universities as implementors of education can not be separated from efforts to improve the quality of education. Thus, the lectures in universities need to be improved by innovating and making breakthroughs based on science technology and innovation [1].

The progress of technology makes it easy for us to make innovations in the learning process. One of the technologies that can be used is smartphone. Smartphones are devices that have features like computers and mobile devices (phones). Unlike the feature-phone, smartphones have larger storage and local memory such as computers [2]. Most of people use smartphones not just for communicating but also for internet browsing, email, blogging, and games [3]. The recent survey shows that 89.7% of university students in Indonesia use internet dan 47.6% of them use mobile devices. As for the 132.7 millions internet users, 25.3% of them use internet for information updates and 9.2% for education-related causes [4]. These data shows the low use of smartphones and internet for education or the learning process.
Goggin revealed that information technology (IT) has made students more computer literate. Increased use of these mobile devices such as mobile phones, iPads, smartphones, tablets and PDAs has become an international phenomenon [5]. Educational institutions must utilize this phenomenon to improve the learning process. One of the way is by using smartphones as learning media based on Mobile Learning (M-Leaning) which can provide opportunities for students to study anywhere and anytime.

Mobile learning is a distant learning and an extension of e-learning applications which has invaded the world with the use of audio, visual, cognitive, cooperative and interactive means via the use of smart and digital electronic devices in an attempt to create a direct, dynamic, ongoing learning environment, i.e. an environment that is not constrained by spatial and temporal boundaries, leading to the elimination of traditional classrooms, routines and imitation [6]. Callaway [7] defines mobile learning as “any sort of learning that happens when the learner is not at a fixed, predetermined location”.

The application of mobile learning can provide new experiences in the learning process. Research conducted by Kim, Rueckert, Kim, & Seo shows that mobile technology has the potential to provide new learning experiences and provide more learning opportunities [8]. Mobile learning can also influence students’ learning outcomes. This is in line with the results of research conducted by Elfeky and Masadeh that mobile learning has a significant influence on academic achievement [9].

The identification study on students in the Chemistry Education Study Program of UIN Syarif Hidayatullah shows that most students have smartphone devices and use the internet every day to get information or references for their needs in doing college assignments. Other research shows that in basic chemistry learning, the use of online media can improve students’ ability to do assignments as much as 66.67% [10]. The results of this identification and research support the author to develop an android-based learning media that is interesting and enables students to learn easier.

De Jong and Treagust mentioned that electrochemistry material is loaded with abstract concepts such as the process of releasing and receiving electrons that cannot be seen with the eye. Thus, learning media is needed to facilitate students in the process of learning electrochemistry material. Based on that, the authors conducted the development of Android-based learning media for students on electrochemistry material.

2 Methods

The development model used in this study is the Design and Development model. This model is usually used to produce simple computer-based media products [11]. This means that this model can also be used to develop Android-based media. This model consists of three stages, namely (1) Planning, (2) Design, (3) Development, and (4) Test of product effectiveness.

Development and Research was carried out in the Chemical Education Study Program of Syarif Hidayatullah State Islamic University.

The object of this research is android-based learning media on electrochemistry material. While the research subjects include: (1) 5 lecturers as experts consisting of 3 lecturers to validate the product and 2 lecturers to validate the research instrument in the form of questionnaires, (2) 31 students of Batch 2015 in Chemistry Education Program of UIN Syarif
Hidayatullah as respondents in the beta test, and (3) 30 students of Batch 2016 in Chemistry Education Program of UIN Syarif Hidayatullah as samples at the product testing stage.

Data collection procedure used to assess the feasibility of learning media is through alpha test, beta test, and learning outcomes test. Alpha test is done to get data about product assessment that has been developed by experts. The alpha test instrument model follows an evaluation sheet from Alessi & Trollip. While the beta test is a student assessment of the media. The instrument used is a closed question based on Walker & Hess criteria and uses a Likert scale. The analysis of learning outcomes is aimed at knowing the success of Android-based chemistry learning media on improving student learning competencies.

3 Result and Discussion

3.1 Planning Stage

This planning stage is the initial stage to develop learning media. In this stage, researchers begin by determining the purpose of making media and preparing some aspects that are used to begin the development of the media.

The development begins with defining the scope of the material to be presented in the learning media. The scope of the material presented is based on the Basic Competencies of Learning Outcomes of IQF on the element of knowledge (KD2), i.e. describing electrochemistry. The material scope is to explain the concept of galvanic cells, calculate standard reduction potential, connect galvanic cells with changes in free energy gibbs, equilibrium constants, and Nernst equations, explain the concept of electrolysis cells, connect the quantitative aspects of the current supplied with the products formed.

After that, the students’ characteristics are analyzed. This is done so that the results of the development are as expected and in line with the opinion of Frey & Sulton [12] that if the three components of the objectives, objectives, and audience analysis are carried out, it will ensure that the products developed will meet the expected results. Based on the identification results by using a questionnaire, there are some descriptions of the characteristics of 2017 Chemistry Education Program UIN Syarif Hidayatullah level one students:

a. All students have a smartphone.
b. Students rarely use smartphones during lectures.
c. Students often use smartphones to browse lecture materials outside of class or when studying independently.
d. The lack of learning media applications makes students lazy to use smartphones as a medium for learning.
e. Most students are very enthusiastic if the smartphone device is installed in the learning media application.

The next step is to find and create images for media and audio display for the media background to make it interesting. In addition, animated images and videos are used as visual aids in the delivery of material to the media. Visual aids are used to arise students’ interests and to help explain concepts easily [13]. The source material used was the three basic chemistry books of the university written by Raymond Chang, Keenan, and Ralph Petrucci. The three books were chosen because they are books that are often used for reference by students and lecturers in the Chemistry Education Program of UIN Syarif Hidayatullah. Whereas the selected development resources are tailored to the needs. CorelDraw X7 was chosen to help develop the appearance of the media. Whereas Android Studio is used to
develop learning media in the form of applications. Google firebase is also used as a place to store material data that will be displayed on the media.

3.2 Design Stage

Based on the identification of basic competencies and indicators of basic chemistry courses, the sub-courses that will be explained in the media are: electrochemistry and electrochemistry cells, voltaic or galvanic cells, cell notation, cell potential, voltaic series, spontaneity of redox reactions, thermodynamic equilibrium constants of standard cell potential, influence of concentration on cell potential, cell concentration, cell electrolysis, reaction on electrolysis cells and quantitative aspects of electrolysis cells.

After that, a concept analysis is carried out to find out the basics that will be presented with reference to the competencies and indicators that have been set. Concept analysis is conducted by identifying the characteristics of the concept, which include; concept labels, concept definitions, concept types, concept attributes, concept hierarchies, examples and non-examples [14]. In addition, a task analysis is also carried out to get an overview of the steps taken by students when conducting learning using learning media to understand the concept of electrochemistry.

Text material and questions on the media are compiled from various relevant sources. Presentation of the material is also equipped with visual video. Visual video can help to clarify abstract materials [15]. Practice questions are presented in the quiz menu. The questions given have varying cognitive levels. In the quiz menu there is also feedback so students can measure and know their level of mastery of electrochemistry material.

3.3 Development Stage

At the development stage, media production, evaluation and revision are carried out. Media production is carried out according to the design that has been made. Media revisions are carried out based on the results of media evaluation to get improvements. The result of advisability trial on Android based learning media is obtained from alpha test, beta test, and analysis of learning outcomes.

Alpha test produces an average assessment of material and media experts in the first alpha test resulting in an assessment of 80.25%. After a revision of the changes, the second alpha test was carried out and resulted in an average rating of 82.22% to be revised. The third alpha test obtained 100% result which means the media can be used.

The next test is beta test, which is conducted by testing the learning media to the 2015 Chemistry Education students to be given an assessment. At this stage, the assessment results are obtained. The assessment results of the students determine the feasibility of the developed learning media, while the data in the form of suggestions and comments are used as material for the final revision of the product. In order to produce better learning media, Beta tests were conducted twice.

<p>| Table 1. Beta Test Result |
|---|---|---|
| Aspect | Indicator | Beta test I (%) | Beta test II (%) |
| Quality of content and purpose | Accuracy | 83.87 | 83.23 |
| | Interests | 79.35 | 81.94 |
| | Completeness | 76.13 | 83.23 |
| | Interest and attention | 70.32 | 85.16 |</p>
<table>
<thead>
<tr>
<th>Quality of learning</th>
<th>Provide learning opportunities</th>
<th>81.94</th>
<th>89.68</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provide assistance for learning</td>
<td>80</td>
<td>84.52</td>
</tr>
<tr>
<td></td>
<td>Motivating quality</td>
<td>76.77</td>
<td>84.52</td>
</tr>
<tr>
<td></td>
<td>Flexibility of learning</td>
<td>84.52</td>
<td>91.61</td>
</tr>
<tr>
<td></td>
<td>Relationship with other learning programs</td>
<td>82.58</td>
<td>85.81</td>
</tr>
<tr>
<td></td>
<td>Social quality of learning interaction</td>
<td>70.32</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Test quality and assessment</td>
<td>80.65</td>
<td>85.81</td>
</tr>
<tr>
<td></td>
<td>Can have an impact on students</td>
<td>76.12</td>
<td>86.45</td>
</tr>
<tr>
<td></td>
<td>Can have an impact on teachers and learning</td>
<td>76.77</td>
<td>83.87</td>
</tr>
<tr>
<td>Technical Quality</td>
<td>Legibility</td>
<td>81.94</td>
<td>88.39</td>
</tr>
<tr>
<td></td>
<td>Easy to use</td>
<td>80.65</td>
<td>89.68</td>
</tr>
<tr>
<td></td>
<td>Display quality or impressions</td>
<td>73.55</td>
<td>84.52</td>
</tr>
<tr>
<td></td>
<td>Quality of handling answers</td>
<td>75.48</td>
<td>83.87</td>
</tr>
<tr>
<td></td>
<td>Quality of documentation</td>
<td>78.06</td>
<td>84.52</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>78.28</td>
<td>85.38</td>
</tr>
</tbody>
</table>

Table 1 shows that media based android is very good to be used in learning process. Indicators with the highest percentage of aspects of content quality and purpose are interests and attention that get a percentage of 85.16%. The table shows that the development of chemistry lecture learning media application is able to attract students' interest and attention. This result is in line with the results of Hanafi and Samsudin’s research that using the android application boosts students’ motivation because it is interactive and simple [16].

Indicators that also get a large percentage in the aspects of content and purpose quality are the completeness of the contents of the learning media with a value of 83.23%. It shows that the content of the material and other features in the media are complete so it helps students in studying electrochemistry. This is in line with the theory which states that learning media can facilitate the mastery of a student's basic skills and help understand abstract concepts [17].

In the aspect of learning quality, the indicator that has the highest percentage is the learning flexibility, which has a percentage of 91.61%. This value is obtained because the Android-based learning media is able to implement mobile learning so that learning becomes flexible. Mobile learning that involves smartphone devices can provide learning that can be done anytime and anywhere [18].

Learning opportunity indicators also have the highest percentage with a value of 89.68% and have a very good category. These results prove that the nature of learning media on Android-based learning media paired on smartphone devices is able to provide learning opportunities to students anywhere and anytime. This is reinforced by the opinion of Mehdipour and Zarehkafi that mobile learning will provide learning opportunities anywhere...
and anytime [19]. Park's research also shows that mobile devices will greatly help students learn independently [20].

The third aspect assessed from the Chemistry Lecture learning media is technical quality. The ease indicator gets the highest percentage value of 89.68%. Mobile devices are easier to use and are not a hassle. The major advantage of using mobile device based service is that users need not procure computer equipments [21]. In addition, the indicator that has a large percentage value is the quality of legibility, i.e. 88.39%. This means that the readability is very good. This shows that the type and size of the fonts are easy to read.

### 3.4 Effectiveness Test Stage

After the entire series of development and revision is complete, the study proceed with summative evaluation or effectiveness testing. Summative evaluation is conducted to determine the effectiveness of the media. The evaluation was conducted by measuring the students’ skills or knowledge about the material taught before and after learning [12].

Test of product effectiveness is carried out in two groups, i.e. control group and the experimental group. The experimental group was given an Android-based learning media namely the chemistry lecture application to be used as their independent learning media. Meanwhile, control group study without chemistry lecture application. The result of pretest and posttest was tested using t-test trial to know the effectiveness of learning media based on android. The t-test was carried out to study the differences in the average criterion variables of the two groups or which could be classified into two groups. The hypothesis used in this t-test is:

- H0 = There is no difference in the average value of learning outcomes between the experimental group and the control group.
- H1 = There is a difference in the average value of learning outcomes between the experimental group and the control group.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>16</td>
<td>32.81</td>
<td>6.047</td>
<td>1.512</td>
</tr>
<tr>
<td>Experiment</td>
<td>16</td>
<td>30.94</td>
<td>6.115</td>
<td>1.529</td>
</tr>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>16</td>
<td>80.62</td>
<td>5.123</td>
<td>1.280</td>
</tr>
<tr>
<td>Experiment</td>
<td>16</td>
<td>85.94</td>
<td>6.382</td>
<td>1.595</td>
</tr>
</tbody>
</table>

Table 2 shows that the average value of the pre-test in the control class is greater than the value in the experimental class. As for the average post-test value, the experimental class that uses Android-based learning media has a higher average value than the control class that does not use media.

<table>
<thead>
<tr>
<th>Group</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>30</td>
<td>0.390</td>
<td>0.05</td>
</tr>
<tr>
<td>Posttest</td>
<td>30</td>
<td>0.014</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Based on the Independent sample t-test on the pretest value of both groups, the value of Sig. (2-tailed) is greater than α = 0.05. it’s found that H0 is accepted and H1 is rejected because
\( \rho > \alpha \). The table shows that there is no difference in the average between the pretest value of the control group and the experimental group. Whereas in the analysis of posttest results it is known that Sig. (2-tailed) is smaller than \( \alpha = 0.05 \). Thus \( H_0 \) is rejected and \( H_1 \) is accepted because \( \rho < \alpha \). This means that there is a difference in the average between the posttest value of the control group and the experimental group.

There are two factors that influence learning outcomes, i.e. intrinsic factors and extrinsic factors. One of the extrinsic factors that influence learning outcomes is the use of learning media. The use of Android-based learning media makes it easy to access learning so students can get more material. The mobile self-regulated learning approach significantly enhanced students’ learning outcomes and self-regulated learning skills [22]. This is also in line with the research of De-Marcos et al, who designed an application for mobile phones and the results showed an improvement in terms of student learning achievement, especially among young students [23].

4 Conclusion

Based on the validation results of learning media from several validators in the alpha test, the android-based learning media are categorized as very good and can be used. Whereas from the results of the response test in the second beta test by students, the media are categorized as very good with an average percentage of 85.38%. Thus, Android-based learning media on electrochemistry material can be used as a learning medium for students. Effectiveness testing using the t-test posttest results obtained Sig. (2-tailed) value of 0.422, which is smaller than \( \alpha = 0.05 \), meaning that \( H_0 \) is rejected and \( H_1 \) is accepted. So, it can be concluded that the learning process using Android-based learning media is effective to improve learning outcomes, because there are significant differences in learning outcomes between the experimental group and the control group.

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References

organization challenges within the SMEs tourism field of activity,” in Procedia - Social and Behavioral Sciences, 2011.
Social Media Usage for Supporting Learning Process in Higher Education: Student’s Perspective

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Abstract. This study aimed to describe the use of social media to support the learning process in higher education from student perspective. This study describes how the use of social media among students and what benefit they got from the use of social media for their learning in the college. This study used a mixed method; quantitative and qualitative approaches together. The quantitative analysis employed to describe the students’ perceptions of the use of social media in their learning activities and qualitative analysis is used to analyze the data obtained through interviews with several students who have been selected as a Focus Group Discussion (FGD) to ensure the quantitative findings. This study found that the use of social media is a trend that can’t be avoided in today’s world of higher education. Social media provides a major contribution in supporting the student learning activities.

Keywords: social media, higher education, high technology, focus group discussion, social media benefit.

1 Introduction

Now days, adoption of many types of technologies in higher education become an established trend. Academician has realized that the use of technology in higher education context become more important in present time [1]. Teachers have pushed to be able to keep up with the technological knowledge of their students [2], who quite competent and dependent to the computer and other online instruments [3]. This included digital communication technologies [4] and web technology [5].

In the past, computer was determined as the need of classroom technology [6], but today adult learners and also their instructors carry powerful digital communication technologies with them everywhere they go [4]. In today’s classroom, laptops have started to take the second row to allow space for smartphones, tablets, and other mobile devices to take place [7]. Since digital communication technology, especially mobile technology, today have features that are comparable but far more dynamic ways than a personal computer, majority internet users used this to conduct their online activities. Data showed that sales of mobile technology to end users increase quarterly every year. The most common mobile technology used for communication is social media. Research found that the sixth of top ten most-used mobile apps globally are social media apps [8].

The fast-growing of social media and the entrance of mobile communication technology in the community of higher education presented a unique challenge for academician and researchers to examine and explore this exciting development. Since it is suggested that social
media has revolutionized the way people interact and communicate [9] and provides new opportunities both for increased participation and to change the way people learn [3] they tried to examine this trend using among college in the university [10]. The trend of using social media among university students seems to be increasing day by day particularly at higher education level for interactions and communication usage [11].

Moreover, this explosive popularity also interest universities to reflect critically on its use. They explore this success to include offline results such as student engagement, and increased participation. The study did by Heiberger & Harper [12] and Hurtado [13] found a positive correlation between social networking website use and college student engagement. Not just student engagement, the study also found that social media can increase interactivity. Concerning in the effectiveness of the use of social networks in attitudinal training courses, study did by Ortega [14] demonstrate that students who used social media tools participated 11 times more in discussion and obtained better learning outcomes than those who did not. They also explore the value of social media technology for higher education institutions. Combine with the mobile technology they explore many possibilities of the use of social media technology in institutions. Academicians propose social media are promising technologies to support and enhance teaching-learning processes, supporting marketing tool for retaining and attracting new students and supporting administrative services.

However, although many researchers have suggested social media as powerful resources for teaching-learning and the need of adopting mobile technology in education, many of them also remain the student and faculty’s faggard when it comes adopting these technology innovations. For example study conducted by Rodriguez [15] on the effect of the usage of a social network site (SNS) (www.grouply.com) for a class related group project on the development of individual abilities and performance in group work at an intermediate macroeconomic class at a Spanish university. The results indicated the negative impacts of SNS usage for group projects because although students are in general attracted by the idea of social media, but they didn’t familiar with that tools. Those examples give insight that there are technology characteristics that must be considered to higher rates of acceptance by both students and faculty. In this case, the faculty has to understand what the most prominent mobile technology and social media tools that students have been using.

Such broad presentation of social media usage above present a relevant facts about the fast-growing aspect of student’s communication patterns and emphasize that social media has been studied on different level. However, since the massive and rapid development of social media via mobile technology, there seems the necessity to make advancements studies in this fields to provide frequently insight of trend and development of social media usage among students in the higher education context. It is critical to examine what and how students of higher education institutions practiced using social media for their academic activities. This study aimed to explore the trend of social media usage among master student program and what benefit they get of using it to facilitate their education activities. The result may help university both to understand the trend of using social media among student and to inform the best social media tool for university to connect with and facilitated student academic success.

2 Research Method

This study employed both quantitative and qualitative approaches. The survey was conducted to examine the trend of using social media among students of the university, while
focus group discussion was conducted for data triangulation. A questionnaire was constructed and employed to collect data. Participant of this study were the master student studying in Islamic Education Management Program at UIN Maliki Malang, Indonesia. The population of the study was 329 students, who still take a course in the first, second and third semester. 200 questionnaires distributed to students randomly and invite 10 students to be the informants of FGD. A total 167 filled questionnaires were good for the next analysis. FGD, on the other hand, was conducted with 10 selected participants, who used social media daily via mobile devices, such as smartphone and tablet. The purposes of FGD were both for confirming of survey data and to explore what was the benefit of social media toward their academic activities.

3 Results and Discussions

A total 167 master students responded to the survey. The respondent comprised of 91 males (54%) and 76 females (46%). This data of survey findings then are presented together with the findings obtained from focus group discussion with 10 participants.

3.1 Student Familiarity With Social Media

The first question of the survey is intended to investigate student knowledge about the social media concept. As seen at table 1, overall 100 % of students were familiar with social media at varying different levels. Even, 70% of students were very familiar with social media and 20% of students familiar with social media and 10% little familiar with social media.

<table>
<thead>
<tr>
<th>Familiarity</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all familiar</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Somewhat familiar</td>
<td>17</td>
<td>10%</td>
</tr>
<tr>
<td>Familiar</td>
<td>34</td>
<td>20%</td>
</tr>
<tr>
<td>Very familiar</td>
<td>116</td>
<td>70%</td>
</tr>
<tr>
<td>Total</td>
<td>167</td>
<td>100%</td>
</tr>
</tbody>
</table>

For a better understanding of this familiarity, the students were asked regarding the device that they use to the online activity of using social media. Most of the master students access social media account via mobile devices such as the laptop (20%); tablet (15%) and the biggest was via phone (65%). It can be concluded that all student familiar with social media, in which more than half of them use the mobile phone to access it.

The qualitative data confirmed the survey outcome in term of their habit in using social media via the mobile device. They explained:

“I am very familiar with social media because I need and used it in everyday life to communicate with my family and my friends, especially in the group…”

“I choose to use smartphone for my networking activity. It makes me easy to move anywhere, while I still can continue to online anytime...and uses social media to communicate and share anything in the group or just with someone”.

Table 1. Student Familiarity With Social Media
Social media has given many facilities that make our communication more effective in time and money. We can know something new faster. We can share new thing faster too. For me...”

“Using social media via smartphone is a way of life. You know...we can take in our pocket, so easy to online anytime. When we have free time or boring with our task, we can just open our phone and say hai to our friend...or sometimes I share what I was done and upload photo.

From those quotes can be concluded that what makes students familiar with social media is because they need it, especially for communication. Combine with the mobile device (such as smartphone and tablet), social media has become students’ way of life. It means that basically social media has come to fulfil the simple basic of human desire that is the need to connect or be a part of a group of other humans.

3.2 Frequency of Using Social Media

It is interesting that one of master student states that they use social media via smartphone as the way of life, besides for communication. This reason then contributes to support the next result of the survey finding of the frequency of use of social media interface by master students (table 2). In order to obtain the frequency of using social media, an expressed question was asked: ‘How often have you used social media?’. The answer showed that most of the master students (79%) used social media on the daily basis, few students (16%) used in weekly basis, and only 4% use in monthly basis.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Every day</td>
<td>132</td>
<td>79%</td>
</tr>
<tr>
<td>Several times a week</td>
<td>26</td>
<td>16%</td>
</tr>
<tr>
<td>Several times a month</td>
<td>7</td>
<td>4%</td>
</tr>
<tr>
<td>Less often</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>167</td>
<td>100%</td>
</tr>
</tbody>
</table>

Data from FGD indicated that some of the master students seem that they take social media as necessity in their life. For example, some participants of FGD explained their frequency of using social media as following quotes;

“Every day I check my social media. If I have free time, I will see my social media for seeing what new information in my groups, or just for changing my display picture or my status. I will be sad if my internet connection was poor”

“I need social media in my daily activities. I check it every day. It makes me feel have many friends...even if I am alone in some places, such as at home.”

“Social media is like a home for me...I can do more and more with social media. Chatting, sharing, gaming, and many else we can do with social media. I used it every day because I need it. But, when I feel need to focus on some projects... I make limitation to access my social media.”

3.3 Social Media Engagement

Survey also trying to explore how many social media accounts that student has engaged. The answer indicates that 84% of students have engaged at least with three social media
account. As seen in table 3, 54% have three accounts, and 30% have more than three accounts. Only a few of them have two (13%) or one (4%) account. Some student trying to explain why they engage many social media accounts, as quotes follow:

“in the past...I just engage one social media sites, i.e facebook, and I check it just twice a week. But then I have a smartphone and begin to trying many social media application. For now, I have installed four applications in my phone: Facebook, WhatsApp, BBM, and telegram. I like to try the new one of social media application”.

“actually... I have three social media application because of my necessity to keep in touch with many of my friends and my family, especially in my class and my work. Most of my friends in my class using WhatsApp for group communication, so I install it.”

Table 3. Student Engagement Of Social Media

<table>
<thead>
<tr>
<th>Frequency</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>One</td>
<td>7</td>
<td>4%</td>
</tr>
<tr>
<td>Two</td>
<td>23</td>
<td>13%</td>
</tr>
<tr>
<td>Three</td>
<td>97</td>
<td>54%</td>
</tr>
<tr>
<td>More than three</td>
<td>54</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>167</td>
<td>100%</td>
</tr>
</tbody>
</table>

For better understanding what social media sites or application that student has engaged, researcher asked the participant to list the name of social media that they have engaged. The answer display that all of the informants have WhatsApp and Facebook (10 participants), 8 informants have ‘BBM’ and ‘Facebook messenger’, 5 informants have ‘Twitter’, 3 informants have ‘Instagram’ and few of them have ‘Line’ application (2). This result then demonstrate that most of the social media applications that student use basically is for communication.

Keep in touch with this finding, the participant of FGD also asked to count how many group community they follow in their social media account. In line with the amount of social media they engage, most of the participant (8 peoples) said that they have at least three group communities. When clarifying in the discussion, some students state their reason as follow:

“I follow four groups of social media, especially in WhatsApp...two of them were the old friend from my past education in high school and university, while others were my family and workgroup. It is very helpful for me to find any information that I need. My friend in my group will share it fastly.”

“I join the group on my facebook for my hobby...music community. Other was in WhatsApp and BBM for communication in a group. I need those groups for getting and sharing much information.”

“We can’t ignore the necessity to follow several groups, such as class, alumni, work, and family. Class group is the most important we should follow. We need to always get new information about academic activities. Alumni group is important to build a network to get possibility of many opportunities in our life. Family group, no less important is to communicate with them whenever and wherever we are”.

3.4 Benefit of Social Media for Learning Activities

The last question of the survey is asking to the students about the most benefit of social media use for their daily activities in the classroom. As seen in table 4, the results do not indicate the salience of one of the benefits. However, many students (28%) placed ‘supporting
academic and learning activities’ as the most benefit of social media use for their learning daily activities. 17% students getting the benefit for pleasure, enjoyment, and for killing the time, 12% for searching and making friends, and 11% for build networking. Few of them feel benefit for ‘getting information’ (7%), and sharing and discuss new ideas, issues and events with community (4%).

To confirm and enlarge the survey findings, group discussion then asked to explain the benefit of social media in supporting their learning and academic activities. They give expression as follows:

“We have used social media for many class activities such as discussion on task distribution, rescheduling class meeting, and sharing much information. With group, it is more effective to coordinate many class activities”

“Sometimes we discuss hot topics and new material of some subject. We are sharing possibility of reference source since we sometimes don’t have time to go to the library.”

“Since our library has limited source of book or journal... We find many sources from internet and then share it to our friend in WhatsApp group... all student in my class follow the WhatsApp class group.

“Social media help us very much to coordinate the class activity. Sometimes, our professor can’t attend the class for particular reason...or suddenly we must move to other classrooms because the room has been used by other class.

“By using social media, we get new information fastly and simultaneously. Our class leader informs new announcement, news and information as soon he gets from the university. So do with all members in the class. Anyone who gets new information or announcement will distribute to the group class in social media.”

Table 4. Benefit of Social Media Use

<table>
<thead>
<tr>
<th>Benefit</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicating with Lecturers</td>
<td>35</td>
<td>21%</td>
</tr>
<tr>
<td>Searching and making friends</td>
<td>20</td>
<td>12%</td>
</tr>
<tr>
<td>Supporting academic and learning activities</td>
<td>47</td>
<td>28%</td>
</tr>
<tr>
<td>Build networking</td>
<td>19</td>
<td>11%</td>
</tr>
<tr>
<td>Killing the time and pleasure</td>
<td>29</td>
<td>17%</td>
</tr>
<tr>
<td>Sharing and discuss new ideas, issues, and events with community</td>
<td>6</td>
<td>4%</td>
</tr>
<tr>
<td>Getting information</td>
<td>11</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>167</td>
<td>100%</td>
</tr>
</tbody>
</table>

Those expressions indicate that social media has the important role in student activities in the university. Not only for building a network between them but also for supporting academic and learning activities in the class, sharing information about books and references, and managing lecture activities between student and lecturer. This finding confirms the research conducted by DeAndrea et.al. [16] and Lee & Lee [17] that aligns that social media usage benefit for improving student’s adjustment to college and increased students' perceptions that they would have a diverse social support network during their first semester at college [18][19].
4 Conclusions and Implications

This study has resulted in many important findings. First, the finding reports the popularity of social media among masters student of the university. Majority of students were familiar with social media and use it every day online via mobile phone. Indeed, the majority have at least three accounts of social media.

The result of group discussion findings also confirms that communication using social media has being the necessity and the new way of life.

The second finding is that student has used social media to support their academic activities. Student has felt the benefit of using social media for supporting their academic activities, especially for class management, such as, discussing subject, task coordinating, rescheduling class meeting, and material planning for class discussion.

Those finding should imply some implications; first, the university has to integrate social media as a tool to assist the current educational system, i.e. in management and also in teaching-learning activities. For management, they can build university group in which all students of the university can join to that group to deliver many new rules, information, invoices and so on faster and more efficient. These groups will also give two-way communication between student and university. It will give students opportunity for giving their opinion about the goodness or the badness about university, and also give university to listen what student wants. Usually, the student has to visit university website for knowing the new information. It means that students must be active to know the new one. If management uses social media and builds social group in which all student must join on that group, they can deliver any new information via social media and engage their students until student becoming alumni.

For teaching-learning, social media can be used to assist the process of curriculum delivery. If student and lecturer join together in one group, it will give extended teaching-learning process. There will be two-way communication anytime and anyplace between student and lecturer. They can together discuss materials, schedules, tasks, references, etc. without limitation in time and place.

The finding also shows the most popular social media being used by the student in Indonesia was WhatsApp. All participant of FGD states that they have Facebook and WhatsApp used to support their educational activities. This finding might be helping the university to find the appropriate social media tool to integrate with the educational system. But the university needs to concern about features of that tools. Each social media tool or application has their own strength and weakness. University needs to make sure that social media has appropriate facilities, contents, and features for learning activities.

Finally, this study shows the huge opportunity of social media trend among university student. It means that there is the challenge for the university to keep up with this new technology trend. Whatever interesting this social media technology in education, it must be underlined that social media technology just a tool that should not replace education it’s self, but assists the process of education.

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References
Predicting User Satisfaction Using an Extended EUCS Model (The Case of Customer Application System in Telkom)

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Abstract. The user satisfaction construct is an important aspect of the Information Systems field either both research and practice. Additionally, the manner in which to evaluate the user satisfaction of an information system has changed over time as the context and purpose has evolved. Therefore, the various of evaluation model is essential to understand the trends in user satisfaction measurement and what they mean for the future. Measuring user satisfaction in IS research indicated the multidimension approach. This study proposed an extended End-User Computing Satisfaction (EUCS) model that used to predict the user satisfaction in the context of internet service company in Indonesia known as Telkom. Two variables such as security and response speed were incorporated in the inventive EUCS variable model based on past literature. This research employ a quantitative approach with the selected customers were sampled using survey method. The answer from the respondents then analyzed using the IBM-Statistical Package for the Social Sciences (SPSS) software version 20. As a result, the level of user satisfaction of the current system is at a fairly satisfied level.

Keywords: User satisfaction, Telkom, EUCS, PLS-SEM.

1 Introduction

Effective management of information systems within a company is very important as it can be an underpinning to gain competitive advantage. Therefore, many companies begin to develop and pay special attention to the information system as a source that facilitates the effective collection and use of information. In actual implementation, IT innovation is much more difficult to control because it involves complex interaction between human, technology and environment. Often there are barriers in using new technology and in many situations and organizations have to face the failure of IT implementation [1].

One of the IT application system employed by Telkom's company that used to maintain close relationship with customer was Indihome. During providing services to the customers there were sometimes complaints arise from potential customers. The kind of complaints such as related to the accuracy of the system, where sometimes the billing of payment is not in accordance with the system. The other aspect of user satisfaction related to the security and speed of access is also questioned by users of the system. Given the large number of information systems and users involved, it is necessary to consider a scoring system that measures the extent of the interactions. The interactions referred to here may represent by how
much users’ benefit can be obtained or the extent to which level of user satisfaction to the enterprise information systems. However, based on the internal information, this system has never been evaluated related to user satisfaction, especially customer parts system. So, there is no study that describes how much user satisfaction in using the system and what factors that affect user satisfaction with the system.

In recent years, researchers have investigated a variety of approaches to measure the user satisfaction but, the study not focus on security aspect and speed of response of the application system. Another thing is, a little progress has been made in the field of measurement user satisfaction in this company. Based on the above background then the research has been undertaken for predicting of the User Satisfaction. This study employ an extended End User Computing Satisfaction Model that cover 8 variables, those are: content, accuracy, format, timeliness, ease of use, security, access speed, and user satisfaction itself. The purpose of this research is to predict the level of user satisfaction for using the application of My Indihome.

2 Literature Review

2.1 Measurement of System User Satisfaction

Measurement of the user satisfaction related to the user behavior in terms of their response to several factors related to the delivery of information about products and services [2]. The mission of developing an Information System as the effective use and impact of IT in organizations and society[15]. Based on this view of information systems, predicting user satisfaction of an IT application is an important aspect of the field of information systems both in research and practice.

2.2 Information Systems CRM MyIndihome

Telkom is one of the main Indonesian companies in terms of market capitalization. It is the holding company of the Telkom Group, which is engaged in a wide range of businesses including telecommunication and multimedia. One of Telkom's products on internet services called by Indihome. The IT application that has been implemented for customer relationship management called by My Indihome. Using this application through subscribing requirement, the registered customer may access the system to request any services provided by Telkom, such as activation Video Streaming, registration various additional features, reporting IndiHome service interruption, checking the billing, checking point reward, usage info, and providing free music as well as other interesting services. My Indihome has a tagline with a theme that is easy, comfortable, can be done anywhere and anytime. The registered user and customer can access easily the application at https://my.indihome.co.id.

3 End User Computing Satisfaction (eucs)

The original model that was underpinning of the study is End User Computing Satisfaction model developed by Doll and Torkzadeh (1988) consisting of 5 variables: Content, Format, Accuracy, Timeliness and Ease of Use [3]. In addition, there are two additional variables: security and speed for predicting user satisfaction adopted from previous research model [4]. Given the need for information security in a system, in the sense of
security required at the time the information is transmitted, in order to maintain the authenticity of the data when transmitted through electronic transmission, the researcher uses the theory / concept of security [5], which states the higher the quality of information, information, and ease of use of information systems, the higher the level of user satisfaction. Researchers also use the theory or concept of speed [6] because the speed of media response such as access speed and loading speed in information technology can provide its own convenience for users, so users can get satisfaction in using information technology services.

This study uses 8 variables in the research model that includes Content, Accuracy, Format, Ease of Use, Timeliness, Security, Speed of Response and End-User Satisfaction.

![Figure 1. User Satisfaction](image)

4 Research Method

This research itself is generally done with quantitative approach according to its purpose that is predicting end user satisfaction from the side of contents, accuracy, ease, shape, timeliness, security and speed of information system. Data collection used in this research is in the form of interview, literature study and survey by distributing questionnaires.

The Simple Random Sampling method was employed in this study without regard to the strata of current population [7], by determining the number of samples using the PLS-SEM techniques [8].

4.1 Data Collection

In the process of data collection, this research is done by distributing the questionnaire indirectly, that is by requesting assistance to supervisor of the branch of Plasa Telkom KebonSirih. The respondents have been accessed through their email address to respond the questionnaires using google forms feature. The researcher realized that the spreading of the questionnaire through online system will reduce the interesting of respondents in filling the questionnaire. To appreciate the respondent that have been involved in this survey, the Plasa Telkom will give discounted 1% for once billing payment their Indihomes’ subscriber.
4.2 Population and Sample

In this study the target population is the user MyIndihome in Plasa Telkom KebunSirihi who play a direct role in using the system MyIndihome, where Plasa Telkom KebunSirihi is one of the Plasa Telkom which has the most customers from local and foreign customers. Based on the report dated January 31, 2018, the number of MyIndihome users obtained from Supervisor of Plasa Telkom KebunSirihi is 5,340 people. To determine the number of samples is done based on the criteria of the number of samples with the approach of PLS SEM, which is at least 10 times the number of paths in the research model [9], where in this study there are seven hypotheses so that the minimum sample is 70.

4.3 Instruments

Instrument of this research using Questionnaire which consist of explanation of research questions. The questionnaire consisted of five questions about the respondent's profile, 4 questions about using MyIndihome, and 25 test questions that had been adapted to the variables that existed in the expanded EUCS model. To ensure the validity and reliability of this questionnaire, researchers adopted a number of indicator items from a number of previous related studies [10] [11] [12] [13].

5 The Result

This section presents the findings that have been done by spreading the questionnaire indirectly (online).

5.1 Gender

Table 1. Shows the Characteristics of Respondents by Gender

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer Gender Characteristics</th>
<th>Frequency</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Female</td>
<td>87</td>
<td>52%</td>
</tr>
<tr>
<td>2.</td>
<td>Male</td>
<td>80</td>
<td>48%</td>
</tr>
</tbody>
</table>

Female respondents that is 52% or as many as 87 people have a higher frequency than male respondents who have 48% or as many as 80 people, this is because researchers provide Indihome payment discounts for those who fill the questionnaire, while the interest of women will be discounts offered in more questionnaires attractive to women than men.

5.2 Age

Table 2. Shows The Characteristics of Respondents by Age

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer Age Characteristics</th>
<th>Frequency</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>12-20Year</td>
<td>25</td>
<td>15%</td>
</tr>
<tr>
<td>2.</td>
<td>21-29Year</td>
<td>57</td>
<td>34%</td>
</tr>
</tbody>
</table>
Respondents who have the highest frequency of respondents with age between 30-38 years 35% or as many as 59 people and the lowest respondent is the respondent age between 12-20 years that is equal to 15% or as many as 25 people. This is because the majority of MyIndihome users are workers with a population of 5,340 who are in the productive age range of the age of 30-38 years.

5.3 Education

Table 3. Shows The Characteristics of Respondents Based on Latest Education

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer Education</th>
<th>Characteristics</th>
<th>Frequency</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>22</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SMP</td>
<td>29</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SMA</td>
<td>40</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Akademik/Perguruan Tinggi</td>
<td>76</td>
<td>46%</td>
</tr>
</tbody>
</table>

Respondents who have the highest frequency of respondents with the last education Academic / Higher Education of 46% or as many as 76 people and the lowest respondent is the respondent with the last elementary education that is 13% or as many as 22 people. This result is because the user MyIndihome better understand will use system which educated Academic / Higher Education, while for education of SD, user more difficult to understand or reluctant to use system. Students are generally self-sufficient and more accustomed to Internet-based and more educated technology services than casual users [14].

5.4 Length of Use

Table 4. Shows Respondent Characteristics Based on Length of Use

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer Length of Use</th>
<th>Characteristics</th>
<th>Frequency</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt; 1 Year</td>
<td>57</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-2 Year</td>
<td>52</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3-4 Year</td>
<td>16</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 4 Year</td>
<td>42</td>
<td>25%</td>
</tr>
</tbody>
</table>

Respondents with the old system using <1 year of 34% or as many as 57 people and the lowest respondents are respondents with a long time using the system between 3-4 years of 10% or as many as 16 people, this is causing new Indihome customers after 35% in 2017.
5.5 Usage Requirement.

Table 5. Shows Respondent Characteristics Based on Usage Requirement

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer Usage Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>Frequency</td>
</tr>
<tr>
<td>1.</td>
<td>Personal</td>
</tr>
<tr>
<td>2.</td>
<td>Education</td>
</tr>
<tr>
<td>3.</td>
<td>Business</td>
</tr>
</tbody>
</table>

Respondents who have the highest frequency of respondents with the needs of the use of the system for personal that is equal to 55% or as many as 92 people and the lowest respondent is the respondent with the use of the system for education that is equal to 17% or as many as 29 people. When viewed from job demographics, private employees and students have the highest percentage, this leads to the need to use the system itself more for personal.

5.6 Role of the System.

Table 6. Shows The Characteristics Respondents Based on The Role of The System

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer Role of the System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>Frequency</td>
</tr>
<tr>
<td>1.</td>
<td>Very Helpful</td>
</tr>
<tr>
<td>2.</td>
<td>Helpful</td>
</tr>
<tr>
<td>3.</td>
<td>Quite Helpful</td>
</tr>
<tr>
<td>4.</td>
<td>Less Helpful</td>
</tr>
<tr>
<td>5.</td>
<td>Not Helpful</td>
</tr>
</tbody>
</table>

Respondents who have the highest frequency of respondents with the level of application system that is considered to help that is equal to 68% or as many as 114 people and the lowest respondent is the respondent with the level of system implementation is considered not helpful that is equal to 1% or as much as 1 person.

5.7 User System Satisfaction Status

Table 7. Shows The Characteristics of Respondents by Work

<table>
<thead>
<tr>
<th>NO</th>
<th>Frequency of Answer System Satisfaction Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>Frequency</td>
</tr>
<tr>
<td>1.</td>
<td>Very Satisfied</td>
</tr>
<tr>
<td>2.</td>
<td>Satisfied</td>
</tr>
<tr>
<td>3.</td>
<td>Quite Satisfied</td>
</tr>
<tr>
<td>4.</td>
<td>Less Satisfied</td>
</tr>
<tr>
<td>5.</td>
<td>Not Satisfied</td>
</tr>
</tbody>
</table>
Respondents who have the highest frequency of respondents with satisfaction level of satisfied system users that is equal to 54% or as many as 90 people and the lowest respondent is the respondent with the satisfaction level of system users who are not satisfied that is equal to 1% or as much as 1 person.

5 Conclusion

From the results of demographic data processing is known that as many as 54% of respondents feel satisfied when using MyIndihome, this is because respondents feel helped by the system in the completion of tasks / their work, in addition reinforced by the number of users who are in vulnerable productive age of 30-38 and the last educated academic / college, so users will feel more benefit and usefulness of the system.

While on the other hand there are 6% of respondents feel less satisfied and 1% of respondents feel not satisfied, this is because respondents feel the system is less helpful in completing their task / job. efforts to be made by Plasa Telkom to improve user satisfaction is to improve or develop the system so that the presentation of information produced more accurate, one of them by adjusting the output screen results with what the user ordered, so the system produces reliable and reliable information by users.

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References


A Cloud Computing Based for Clinical Information System

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Abstract. This In general, a health care clinic provides effective, safe, quality, ability to always prioritize the best interest of patients. Currently there are many health care clinics use papers for patient’s medical records for information exchange that may cause vulnerability data misused. This case is caused by a cost limitation of particular clinic, time and human resources in providing information technology resources for several clinics connection. Cloud computing technology offers a great potential for a quick access for clinical information systems and solves problem in providing information technology resources. This paper focuses on the design of integrated clinical information systems along with the adoption of cloud computing services. The combination between information system development and cloud computing adoption methods is applied with four different steps including planning, analysis, design, and implementation. The result of this study is a clinical information system, such as patient administration systems, patient diagnosis services, pharmacy systems, laboratory service systems and medical record management systems that are integrated in each brand along with the adoption of cloud computing technology. The significant impact of the system implementation is reducing the clinic's operational costs, improving performance, easy and flexible use of the system as needed.

Keywords: Information Systems, System Development, Clinic, Cloud Computing

1 Introduction

Cloud computing is a form of internet service that can be accessed anywhere on demand that provides users comfort and quickly run with minimal management of service providers [1] [2].

Roadmap for Cloud Computing Adoption Model (ROCCA) for analyzing and determining the stages of the application process that can be applied to several cloud computing domains, as well as organizations, platforms and any cloud computing infrastructure. Thus, it can open the opportunity to utilize the model framework in various forms of organization including health services in clinics [3].

Cloud computing in the health sector offers great potential for quick access to clinical information. It maintains the confidentiality and integrity of information stored in all forms and provides data backup and recovery processes in extreme
Cases that are very important in this field. A quick access to patient’s medical history in any location can speed up the diagnosis process and quality of treatment, avoid complications, improve quality and save human lives [4].

A clinic is one of the health service providers that covers diagnosis, pharmacy, laboratory services, and patients’ medical records [5]. The increasing demand for health services impacts on improving clinics services. There are many clinics with limited cost, time, and human resources in providing information technology resources to connect with all existing clinics, thus the utilization of cloud computing is an important requirement in providing the availability of information technology resources.

Past research has carried out clinical management information systems with medical records including drug management system, medical records, examinations, and services fees [6], while developed applications that can be printed on web-based patient medical records so it can backups data when the computer experiences any damages [7].

Research and development of cloud computing and interoperability in health information systems [4] and rubbish bank application development using cloud computing services [8]. Whereas the adoption of cloud computing for Small Medium Enterprise (SME) [9] and the implementation of private cloud for education institutions [10] [11].

Based on previous research, the development of information system uses rapid application development method [12] [13], however there are only few research on clinical medical record information that utilizes cloud computing. In this study, researchers conducted a research and development of clinical information system based on cloud computing with a combination of Rapid Application Development (RAD) method [14] and roadmap for cloud computing adoption (ROCCA) [3]. ROCCA is used as a cloud computing adoption roadmap and developed into a framework called the RAF (ROCCA Achievement Framework) [3]. The programming language used during the system development are PHP, JavaScript, HTML and Cascading Style Sheet (CSS), and MySQL used as database management system.

The purpose of this study is to design a clinical information system along with the adoption of cloud computing services that can creates a better management system with high speed for medical processes and improves a clinic service quality. At the end of this study, an information system clinic is produced that consists of patient administration system, nurse services, diagnosis of doctors or midwives, laboratory services, and clinical pharmacies that are integrated in each branch along with the adoption of cloud computing technology. This, it is expected that the clinical management will be better with a high speed for the information integration to improve the quality of clinical services.

2 Methods

RAD is used during the development of this system, it has four different phases starting from planning, analysis, design, and implementation. However, during the design to implementation phase, there is a combination with ROCCA as a roadmap to guide in adopting cloud computing technology. The cloud computing service on the clinic’s information system applies the platform as a service (PaaS) service model with a private cloud deployment model.

The ROCCA adoption model has been chosen based on system design requirements and implementation into cloud computing. It is shown in the Figure 1 below.
There were four phases that are described in the sections below.

2.1 Planning Phase

A general description of organization is a basic process stage for understanding an overall view of organization, including profile, both vision and mission, structure, and project initiation. A project initiation in the organization summarizes a desire information system needed by a clinic.

2.2 Analysis Phase

An analysis phase is a stage when the study questions were answered. For example, the stakeholders involve in the system, people who will use the system, time and location where the system will be implemented. In this phase also researchers understand user’s needs, work culture, readiness of organization to adopt cloud computing technology. It also produces a determination requirement that provides an overview of the requirements of the system design process, furthermore strengths weaknesses opportunities and threats (SWOT) analysis [3] [5] used to analyze the strength, weakness, opportunity and obstacle of the implementation organization of cloud computing-based clinic information system.

2.3 Design Phase

The result of the previous phase produces a proposed system requirements and specifications. Those information is described using the Unified Modelling Language (UML) use case diagram for business process and functional modeling. The design phase also generates a database schema as a database design and file specification and produces an interface picture of system.

2.4 Implementation Phase

This phase produces system construction, choice of cloud infrastructure, and adoption and migration plan. In the system construction stage, black-box testing technique is used to test the code during the development process. The choice of cloud infrastructure is used during this phase along with the adoption and migration plan planning.

In the application and data integration phase, it prepares the process of migrating to cloud computing by integrating and adapting applications and data that will be migrated with the target cloud platform and infrastructure.

The final step in this phase is the system user evaluation that involves user application testing and completion of satisfaction evaluation by users [16] [17][18]. The evaluation is in a form of questionnaire deployed by researchers where the responses is analyzed using a percentage calculation to retrieve evaluation results.
3 Results and Discussion

The results of the application integration of the ROCCA and RAD methods resulted in the design and implementation of a cloud based clinical information system in the form of patient administration systems, patient diagnosis services, pharmacy systems, laboratory service systems, and medical record management systems.

There were four results that are described in the sections below.

3.1 Planning Phase

This phase identifies business reasons and expected value from Clinics in developing a system. In general, system requirement includes five elements, including project sponsor, business needs, business requirements, business value, and specific requirements.

3.2 Analysis Phase

Analysis phase consists of three main activities, namely requirement determination, SWOT and business process analysis, and functional modelling. Those activities are described in the following sections.

3.2.1 Requirement Determination

Requirement determination consists of functional requirements and non-functional requirements. The functional requirements include:

The system can manage, store, and integrate all patients’ history data properly. There are three functions in the managing the systems, namely add, edit, and print out. The system can manage patient queues based on health service requests. Clinical service data and all information about clinic can be arranged easily the system administrator. The system provides notification that facilitates doctors, midwives, and clinics for patient queue information.

The system provides user authentication when logged in and distribution of authority. The non-functional requirements include: The system can streamline the time in the clinical health service process. The system display is a user friendly, so it is easily learned and used. The system can reduce human errors. The system presents actual and accurate data and information. The system can reduce the occurrence of misuse of medical record data.

3.2.1 SWOT Analysis

Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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The directors have agreed to develop a medical record system and adopt cloud computing technology.

Maternity hospital already has an internet network in each of its branches.

The majority of clinic employees have utilized the internet technology.

There is no department that handle information technology in the clinic.

The directors provide a limited budget for system development.

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
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<tr>
<td>Many vendors provide a cloud computing service at affordable prices.</td>
<td>The need for a stable internet connection.</td>
</tr>
<tr>
<td>Research about cloud computing is still open widely, specifically in the health sector.</td>
<td>The risk of security of medical record data which is fatal to the clinic.</td>
</tr>
<tr>
<td>The government intensively promotes the use of information technology in health institutions to improve health services to the community.</td>
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The description of analysis of SWOT metrics is described in the following section.

a. Strength and Opportunity Strategy

The strategy uses parts of strength and opportunity to maintain, build, and increase the potential that the exists.

The board of directors has agreed to develop a medical record system and adopt cloud computing technology in line with the government which is aggressively promoting the use of information technology in health institutions to improve health services to the community.

Computer facilities that use the internet technology supported by cloud computing service provider vendors that are increasingly developing.

Researchers will more easily implement their research in the clinic because it is supported by employee knowledge about the use of internet technology.

b. Strength and Threat Strategy

This strategy will use a part of excellence and threat aiming to use the power that is owned to reduce the impact of threats that may occur.

The commitment of clinic managers to meet the needs of internet services in clinic is highly needed due to the necessary needs of stable internet services.

Employee knowledge about the internet usage a utilization of medical record data is very important to anticipate the risk of security for medical record data.
c. Weakness and Opportunity Strategy

This strategy uses weaknesses and opportunity to diminish and minimize the weaknesses using the opportunities. The existence of cloud computing services vendor that offers many solution of the general problems, such as a minimum number of employee to manage information technology, reduction in operational costs, and inadequate infrastructure.

d. Weakness and Threat Strategy

This strategy uses weakness and threat to counteract the worst that will arise from the impending threat.

A stable internet needs can be overcome by the commitment of clinic managers to collaborate with good service provider vendors.

Establish a particular department to handle information technology issues used to maintain and monitoring systems.

Provide training to employees for the use of the system and utilization of medical record data

3.3 Design Phase

This phase consists of business process and functional modelling, database schema, and user interface design. The details for each activity is described in the following section.

1. Business Process and Functional Modeling

Business clinic process information system consists of objects, receptionists, nurses, midwives, doctors, cashiers, pharmacies, directors, and administrators. The user can do nine activities: (1) login process to enter the system, (2) service registration process to print out patient number, (3) the process of printing the patients queue number based on the selected service, (4) laboratory service process, (5) midwife process or doctor preview the queue list based on patient registration number, (6) the process of inputting the diagnosis data and medicine prescription, (7) the pharmacy previews the list of queue after midwives or doctors observation and then pharmacy confirms the medicine for patient, (8) pharmacy drug management, (9) bill overviewed by cashier and payment confirmation.

The business process information system clinic consists of a patient administration system, a patient diagnostic system, a pharmacy system, a laboratory service system, and a medical record management system.

2. A Patient Administration System

This system is operated by two actors (Figure 2): receptionist and cashier. A Receptionist has an authorization to register both a former patient and a new patient, then print out the medical record number so that a cashier able to confirm the service fee and payment.

![Figure 2. A Patient Administration System](image)

3. A Patient Diagnosis System
This system is operated by three actors (Figure 3): a nurse, a midwife, and a doctor. Those actors are able to login to the system to view patient queue, entry a result of diagnosis, and print out a patient health certificate.

Figure 3. A Patient Diagnosis System

4. A Pharmacy System
This system is operated by three actors (Figure 3): a nurse, a midwife, and a doctor. Those actors are able to login to the system to view patient queue, entry a result of diagnosis, and print out a patient health certificate.

Figure 4. A Pharmacy System

5. A Laboratory Service System
In Figure 5. A laboratorian is the only actor for this system who can view patient queue, laboratory test result, entry laboratory result, print out the laboratory result, and manage any services of laboratory test.

Figure 5. A Laboratory Service System

6. A Medical Record Management System
In the medical record management system there are two actors namely directors and administrators as in Figure 6. Administrators are super users who have a full access to view patient data, view medical record data, manage users, manage clinical service schedules, manage drug data, manage laboratory test service data, organize clinic profiles and see clinical services. In addition, administrator can also manage data types of actions to patients for the purposes of diagnostic data by doctors. And the director has access to view patient data, view medical record data, print medical record reports, and view clinical services.
7. Database Schema

The researchers develop database to store data that supports the system so that it can run properly. The database schema developed consists of 16 tables. There are clinical_profile, branch_clinic, patient, medical_record, registration_service, bill_finance, operational_hour, type_clinical_service, prescription_medicine, drug_receipt, drug, diagnosis, check, lab_test_result, lab_test_detail, lab_type_service.

3.4 Implementation Phase

There are five activities in the implementation phase, including system construction, choice of cloud computing infrastructure, adoption and migration plan, application and data integration, and system evaluation.

a. System Construction

The proposed system is a web-based application. The system was built using the PHP programming language using the Codeigniter framework, MySQL as a database management system, XAMPP as a web server, bracket as a text editor, and Mozilla Firefox edition as a browser to run the system. The main purpose of the system, the researchers used the black-box method to conduct testing on the information system of the clinical medical record based on cloud computing at the maternity hospital.

b. Choice of Cloud Computing Infrastructure

Clinics must choose a cloud service model that suits their information system needs. There are three cloud computing service models that can be chosen, namely SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service). In addition, for the implementation model, you can choose Private Cloud or Public Cloud. Based on the results of the SWOT analysis there is support from the internal clinic for information technology information and along with clinical conditions, then SWOT strategy analysts produce infrastructure services that are easily implemented and can be considered data security services, then the chosen cloud infrastructure is PaaS services (Platform as a Service) with the private cloud deployment model. Because the PaaS service does not need to control the basic cloud infrastructure. Including network, server, operating system, or storage, but has control over the application deployed and possible configuration settings for the application-hosting environment.

c. Adoption and Migration Plan

Based on the needs of cloud service providers such as those in the SWOT analysis, the deployment of the private cloud and service model (PaaS) Platform as a Service will be implemented. So, at this stage the writer will determine for the needs of the cloud computing service provider vendors accordingly. Strategy analysts produce strategies for the needs of cloud service provider vendors that are able to meet the varied and easy service requirements for their use. Cloud computing service providers make it possible to build and host web applications in suitable programming languages without managing infrastructure, so as to support the operating system used and enable rapid and precise dissemination of information and cost efficiency.

So, for cloud computing needs focused on the clinical information system that will be built. So, the specifications needed for cloud computing are at minimum core 1, ram 1.75 GB, 10 GB storage according to the standard B1 package. But in this information system prototype uses a free and shared package. Because this package is intended for the development and
testing of the system to be built. The cloud system scheme for clinical information systems can be seen in Figure 7. Cloud service providers use Microsoft Azure with PaaS (Platform as a Service) services for Web Apps. In the WEB Apps service, we install the cloud server and its database. Each branch of the clinic must be connected to the internet to be able to access WEB Apps services. The cloud distribution model uses private cloud namely infrastructure and applications are only used for internal clinics, this can reduce the risk of existing data security.

![Figure 7. Cloud Computing Based for Clinic Information System Infrastructure](image)

d. Application and Data Integration

In this stage, it prepares the process of migrating to cloud computing by integrating and adapting applications and databases that will be migrated with the target cloud platform and infrastructure. Based on the existing system development, explain the specifications needed for the system development stage. Then explaining the provider of cloud computing with the services used, namely PaaS (Platform as a Service) for WEB Apps, it is necessary to adjust it for data integration and application. There are several different configurations from local servers with XAMPP that use Apache WEB Server with Microsoft's WEB Server. So for the development of applications with PHP language must be adjusted from Microsoft-IIS / 10 and the database using the MySQL server type. As is known, the IIS web server is made by Microsoft and can only run on Windows, of course different for setting up the web server configuration. As in Apache, using .htaccess must be translated in IIS to become a Web.config file. While for the PHP programming language and MySQL database there is not much that must be adjusted.

e. Application and Data Migration

The next step is the migration process for applications and data into the Microsoft Azure WEB Apps as determined and
integrated. Previously to deploy the system we must have an account from Microsoft Azure to be able to enter porta.azure.com. To get an account can be individual or on behalf of the organization.

After entering the azure portal, then create a new WEB Apps service by adding a service and then selecting WEB Apps and selecting WEB App and MySQL. Figure 7 above shows the process of determining the service configuration for the WEB App that will be used. Starting from determining domain names, types of server services, and services for databases. For this reason, the author uses an unpaid trial service to try to use the Microsoft Azure WEB App. After the process is successful in determining service configuration then you will get detailed service configuration for the application and database.

f. System Evaluation

The following is the recapitulation of the results of the evaluation. This questionnaire uses respondents according to the number of actors, namely 36 (thirty six) people according to the employee class.

Figure 8 above shows that based on the performance effectiveness aspect, the highest average value is 55% who agreed. On the efficiency aspect, the highest average score is 60%. In the aspect of ease in using the highest average value, with a value of 40%, it was agreed. Whereas in the aspect of system flexibility the highest average value is 55% of the respondents agree. Thus, it can be concluded that not many agree with the ease of use. This is realized in the application there are still shortcomings, namely there is no help information on using the application. But with this system the user agrees that the system effectively helps users and the system is also able to improve the efficiency of the user's work. In addition, the system can also be used flexibly. Support with the presence of many branches in the clinic.

4 Conclusion

This study is successfully developed a cloud computing information system based on a combination of the RAD method and the roadmap for ROCCA model. This clinic information
system consists of a patient administration system, a patient diagnostic system, a pharmacy system, a laboratory service system, and a medical record management system.

This cloud-based clinic information system is able to reduce paper usage to overcome data loss, misuse of data, and make exchange and data searching between clinics easier. This system is also able to integrate information between clinics so that it can cut operational costs. Using a cloud computing technology, the implementation of the system becomes easier, flexible, and can be used as needed. It is expected that the future researchers will develop a system that is integrated with the finance, insurance, and inventory parts of the pharmacy section. Likewise, the implementation of security systems in networks and databases for this clinical information system.

References


Improving Photosynthesis Learning with Adventure 3D Games Based on Augmented Reality Experience

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Abstract. 3D Games based on Augmented Reality is a new innovation in conventional learning process to describe photosynthesis process of Nature Science subjects. Utilization of learning media with Augmented Reality is due to the rapid growth of technology in education. 3D games based on Augmented Reality on the mobile is expected to facilitate teachers in providing photosynthesis material to students. This game will explain how the plant process makes its own food through the help of sunlight. Students will immediately play, learn and feel the process of how photosynthesis works. The learning process by utilize mobile games will make students become more active in the learning process.

Keywords: Augmented Reality, Photosynthesis, Mobile Game

1 Introduction

The world of education, especially in Indonesia is very concerned about the quality of education. The quality of education itself is influenced by many factors, students, school managers (principal, employees and school committees or committee), environment (parents, community, school), learning quality, and curriculum. Thus, one important factor to achieve the goal of education is the process of learning. The learning process certainly can’t be separated from the role of media that is being used to teach the student. Especially for one lesson in elementary school that utilizes the development of Science and Technology (Science and Technology) IPA, these subjects require interactive learning media with visual aids as a tool to educate and facilitate in achieving the competence of learning [1].

Based on the Minister of Education and Culture of the Republic of Indonesia, Educational Field in the concept and implementation of 2013 curriculum presented the result of PISA (Program for International Student Assessment) reflection science in 2007 and 2011 stated that Indonesian students are only able to reach intermediate level, therefore the Indonesian government prepare some efforts to restore the state of the PISA science results. [2] One of the efforts of the Indonesian government in the science of providing visual aids to be more optimal in directing students to a form of understanding, the role of teachers as well as facilitators who designed the lesson to be better understood by students.

That is called photosynthesis subject in school. This subject explains the process by which green plants use light energy to make their own food, that is what is called photosynthesis. [3] However, the photosynthetic subject described in schools generally uses lecture or storytelling
methods. So that children can only listen, see pictures and imagine it without any practice of physical equipment about the process of photosynthesis that results in boredom for students.

Therefore, to overcome boredom and assist students in understanding the subject matter of science especially photosynthesis subject, we make the Design of Photosynthesis Games for Students of Class V SD which is packed with Adventure 3D Game concept and Augmented Reality based. The reason we choose games because some groups such as educators, businessmen and jobs like the military use video games for information and develop skills. Video games can develop and very effective media at providing variations in school subjects such as algebra, geometry, and biology. The game is an effective medium for teaching because it contains effective instructional principles and instructional techniques used in reinforcement at difficult levels.

2 Use of Augmented Reality

Augmented Reality (AR) is a variation of the Virtual Environment (VE) or so-called Virtual Reality. Augmented Reality is defined as a technology that can combine the real world with the virtual world, interactive in real time, and 3D animated. Augmented Reality has been applied into two versions, using markers or marker less.

Augmented reality that is using marker is a combination of the real world and the virtual world. We can see an interactive virtual world from mobile phone. As in children's food products that use a lot of branding products by utilizing this augmented reality technology. The branding includes AR card, education, or interactive game that attract children to play it. The camera captures an image in the environment, then detects the marker and deducts location and camera orientation, then the virtual image appears above the marker grid and is displayed on the monitor screen.

Augmented Reality technology is a very famous topic because users can interact with the real world. Augmented Reality can be applied in some experiences such as health visualization, maintenance and repair, annotation, robot path planning, entertainment, and military aircraft navigation and targeting. [4]

This lesson is presented by creating a marker of a book that has content on photosynthesis. The photosynthesis book will be the marker to show the object and games. This marker book is compiled based on the material reference on the textbook of Natural Science of Elementary School Children at school. This book contains all kinds of photosynthetic materials, photosynthetic simulation videos, photosynthesis mini-games and some quizzes. The marker used in books designed on CorelDraw software.

Markers that have a lot of shapes and the more complicated the picture then it can be regarded as a good marker because it could be worth five stars, a sign that the marker is good to be a marker.

3 Related Works

There are several works that related to our works. Here we reviewed the work and gave some comparison with our work.
3.1 Three-dimensional Visualization of Plant Photosynthesis Process using Particle System

This research designs an interactive multimedia learning system in the form of visualization of the photosynthesis process which will be included in an interactive learning app for 5th-grade elementary school. This learning media contains information about the photosynthesis process that comes with a 3D animated video created with the help of existing effects in 3DMax software to produce rain animation in photosynthesis process and material about the role of green plants for other living creatures [5].

3.2 3D Game-Like Virtual Environment for chemistry Learning

This research was conducted by Eman Ahmad who showed the concept of implementation and experience in the 3D educational game for interactive chemistry learning. This educational game is real-time and multiuser with technical "learning by playing" which will become a powerful learning strategy in learning chemistry. In this study players tend to learn by playing the virtual world, easier to understand with 3D, a nice 3D effect makes the player involved playing and overall fun [6].

3.3 Implementation of Augmented Reality in the Development of Photosynthetic Material Interactive Learning Media for Students in Grade 5 of SD Budi Luhur Pondok Aren

This research produces Plant AR products that focus on visualization of the photosynthesis process, in addition there is other supporting content in applications that include the introduction of green plants, about photosynthesis, the benefits of photosynthesis for living things and the question of evaluation.

Students tested the Plant AR interface and against Augmented Reality. The results of questionnaires to 60 respondents consisting of 5th-grade elementary school concluded that the application is in accordance with the eight rules of interface design so that users feel the increased interest in learning [7]. In 83% of students stated that 3D animation design on Plant AR learning media is easy to use and attract interest in learning.

4 Basic Interactive Game

Augmented Reality Photosynthesis application will be presented in the form of simple games such as click and choose the required options, directing the movement to the right and left to achieve the mission of the game. In this app there are some features like mini-game, simulation video, and quiz. This in-app game explains each process of photosynthesis for learning in school. This photosynthesis game is 3D-based and made in Unity software.
Figure 1. The photosynthetic chapter (a) is selected and scanned the marker so that it displays a 3D photosynthesis object consisting of trees, sunlight, carbon dioxide and water.

The photosynthetic chapter as seen above illustrates the photosynthesis materials with sounds that explain the process of photosynthesis.
Figure 2. The chapter Level 1 Game Photosynthesis (b) is selected and scanned the marker so that it displays a photosynthetic game that directs the character of the water to take minerals in the soil. This photosynthesis chapter explains how this water character picks up some of the minerals in the soil. Minerals consist of Iron, Magnesium, Calcium, Silicon. The character of water is required to take all the minerals in the soil to continue on the next process.

Figure 3. The book on chapter Level five Photosynthesis (c) is selected and scanned the marker so that it displays photosynthesis games in the distribution of photosynthesis results. In this chapter explains the distribution of photosynthesis results. Photosynthesis results are Oxygen and Glucose (carbohydrates). Oxygen will be inhaled and a need for living things like humans and animals. Glucose (carbohydrates) will return to the plant body as a food reserve.

5 Research Question
In this study, it aims to obtain information about whether photosynthesis learning with presentation using Augmented Reality technology is an appropriate medium for conveying learning to children.

5.1 Methods

The method used in this research that there are two, using quantitative and qualitative. Quantitative research is based on the provisions made in the questionnaire in obtaining data of interest information from students to retry the application, and the teacher needs information on the progress of the students about the material that has been tested in using the application. Additionally, quantitative is usually obtained from pretest and post test work on paper sheets such as exams using pencil on paper. In order to pre-test and post-test, it allows us to assess that the level of understanding of children before and after learning using the application can be seen.

While in qualitative research conducted aims to find out about the ease of the application for the development again. Qualitative is done directly to students and interviews to classroom teachers to get information about responses and suggestions for application development.

5.2 Respondent

There are two respondents in this research, namely:

- Student
  Elementary School students are 11 people who the author took for questionnaire data. Elementary School students have a lot to understand about technology and games because the age of students now has entered in the era of technology.

- Teacher
  The teacher was a homeroom teacher from the fifth grade and the author got criticism and advice from the related teacher for application development.

5.3 Scenario

Scenarios in the data retrieval are done first by using the response of the pre-test that contains the related material to be discussed about photosynthesis and the student has never at all received this material, even just glance knowing.

The student respondents will use our application in the process of photosynthesis and then the authors will perform an analysis of before students use the application until students use the application.

After the application test, it will be held post test in order to measure the level of understanding of children about photosynthesis material that students used. Posttest is used as the end result of the students in understanding the material photosynthesis.

Respondent the teacher is done by interviewing and trying the writer application the same as done by the students.

5.4 Result and Discussion

From the results of research that can be taken conclusion, students who use the application more interested to learn about photosynthesis. According to them this app is useful for their learning. They can explore and get to know more closely using Augmented Reality technology.

User of Augmented Reality technology has a positive impact on student learning progress. This technology is expected to be a child's learning companion so that children do not learn on objects that are monotonous like a regular textbook. With the provision of several mini-games
in the application of Augmented Reality Photosynthesis is helping children while learning to understand the material taught.

Interface design obtained from student respondents MI Muhammadiyah 5 Surabaya:

**Figure 4. User Interface: “How to display the Augmented Reality Photosynthesis application”**

From the percentage above, it can be seen that this application has a very attractive interface design. Votes with 68.6% of respondents said very interesting, and 20% of respondents said interesting, and 8.6% said less interesting.

The results of calculating the ease of use of the application:

**Figure 5. Ease to use the application “How is the ease of application use?”**

From the above percentage, it can be seen that this application is very easy. Results based on the convenience of this application equal to the previous percentage.

The results of testing in the application’s usefulness:

**Figure 6. Usefulness “Whether the application is useful for your learning process?”**
From the percentage above, it can be seen that this application has very useful results. Votes with 45.5% of respondents said very useful, and 54.5% of respondents stated useful.

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References

Eco-tech Design Application on Campus Development  
(A Case Study of Stain Majene, Indonesia)

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Abstract. The development of STAIN Majene campus with an Eco-tech approach aims to provide functional and visual comfort. The design of campus buildings with the application of the eco-tech concept is expected to be a supporting element of the STAIN Majene Campus towards world class university. The concept of Eco-tech is carried out with a problem approach from a holistic point of view and is realized using environmentally friendly technology that is efficient and accordance with local conditions. By using exploratory research methods to review the shape, orientation, structure and building materials that can strengthen the application of eco-tech in the STAIN Majene campus design. The design results are realized by expressing the structure and construction that is integrated with the environment, the use of building materials in accordance with the demands of the times, having continuity with the surrounding environment, not having a negative impact, as well as the long life of durable materials, a cooling system that uses natural ventilation by utilizing building design and outside air processing to be used as artificial insulation in buildings, as well as lighting systems by utilizing natural lighting as much as possible as lighting in buildings. The specialty of campus design lies in the transformation of forms that apply the element of calligraphy as a form of implementation of the STAIN Majene's vision and mission as the center of Islamic civilization in West Sulawesi.

Keywords: campus design; eco-tech; sustainable; calligraphy; environment.

1 Introduction

The presence of the campus in middle of the society is a enlighten source for social activity in the context of nation and state. Consequently, campus is a gathering place for scientists and certainly become a positive inspiration source for the nation to manage all aspect of human life. Campus is a center of education and learning in the development of science, technology, and socio-culture. Campus expected as a innovation references that would create a nation becoming a dignified and competitive nation when the science and technology has rapid development. Campus is also become a competitiveness resource as the attribute of the actual civilization value.

Campus should produce the intellectual policy maker with nationalistic insight who adhere to ethic and culture to create national civilization and nationality that submit with the value of Unity in Diversity (Bhinneka Tunggal Ika) to strengthen the Unitary State of the Republic of Indonesia. This condition will always threat by a lost of nationality civilization by ignoring the Pancasila philosophy values as Indonesian state principle.
Campus is a wide dimension entity in its development process and completely support on the preservation of people civilization prestige. This condition is a reality of life and become the challenge of campus principals to return campus civilization values as a fountain of life. The value should contain a life values and harmony [1][2][3]. Presently, the actual condition of campus is not only a source of inspiration but a source of struggling power for a great civilization. Consequently, building a conducive academic environment in every campus become preferred options and one of them is from building architectural aspect.

STAIN Majene or Majene State Islamic Institute is one of Islamic higher education in West Sulawesi province. The campus has development potency, because the Tanah Mandar or West Sulawesi land area has an intellectual history. Tanah Mandar has a long historical relationship with educational history development, either in general or specific history. Kalumpang Site in Mamuju believed as the oldest site with comprehensive artefact in the Indonesian Archipelago, even in South-East Asia. STAIN Majene commitment is to integrate the secular and religious science in unitary of comprehensiveness.

The vision and mission statement of STAIN Majene is creating an intelligent, excellent, glorious values (mala’bi), and socially student based on religious value [4][5][6] by implementation of religious and social values, providing a student place to develop student individual potency, and creating a center of learning and research in the society to create a collective change with the STAIN Majene student. The vision and mission is not apart from the relationship of an appropriate facility and campus infrastructure. Therefore, STAIN Majene campus should developed a stepping-stone to create student and its graduates with competent and creative characteristic. The case aforementioned is related to the experience in campus environment that support creative idea from architecture art presence in the STAIN Majene campus design.

Aim of this project is to present a comfortable, one of them is revitalization of the old building into a new and better building. The building should become a new icon of STAIN Majene Campus with the application of eco-tech concept. The eco-tech concept approaches from the holistic point of view and realized by an efficiency in sustainable development and adapted the local environment.

According to the theory of architecture, eco-tech is an architecture with environment-oriented technology. Currently, a development of eco-tech principles is the combination between two principles in design the architectural plan, sustainable and high technology [7][8][9]. Catherine Slessor argue an Eco-tech as: Sustainable architecture and high technology, a building with eco-tech concept characteristics are:

1. Expressing the structure and construction with environment integration.
2. An application of building material based on the requirements of the time, natural sustainability connection, does not has negative impact, and application on long-lasting material.
3. The ventilation system developed with a natural ventilation through the building design advantage and exterior air management as an artificial ventilation for building interior.
4. The lighting system take advantage of natural illumination as much as possible for interior illuminance.

Therefore, the development on the campus design with eco-tech approach must practices the eco-tech characteristics above. Furthermore, a development of STAIN Majene Campus should comply with security standard for all occupant. Zoning management and building mass positioning are consider with the potency and obstacle of the local environment, related on the relationship of public, private, and also the function of the building.
2 Methods

The research practice qualitative method. Qualitative method is the research that refers to the post-positivism philosophy to observe the object in natural condition. The researcher is the key instrument in the sampling of data source purposively. The method in design approach are consist of data collection, data analysis, and design method.

2.1 Data Collection Method

A data collections method consists of observation, interview, and literature study. Observation activity is observing the condition of existing location by identifying the potency and site problem. Interview activity will collect a related information to the existing problem by asking the related party. The literature study is a investigation activity or collecting the data and basic thing of the design through the references, either in book, journal, or printing media or electronic media.

2.2 Data Analysis Method

The normative analysis method applied in this research, adapting the theory of eco-tech building characteristic as the basic in design strategy. The analysis data processes are:

1. Object typology approach
   Typology approach design has two activity processes, identifying the type of typology and processing the type.

2. Site plan and environment study approach
   Analysis of site plan location performed in this approach and analyzing the selected site location and its environment.

3. Thematic approach (Eco-Tech Architecture)
   The theme presentation required more knowledge to create a dialog between space dimensional connection with psychology relationship and emotional of architectural space.

2.3 The Design Method

The design method guideline in theme application design is Islamic civilization campus that express calligraphy symbol in the building form of STAIN Majene campus. From the data collecting result, the steps of design are:

1. Structural Expression
   Most of eco-tech building design prioritizes a high technology structural building and implements a natural integration.

2. Sculpting with Light
   The eco-tech building focus on the lighting system, a building will become impressive and take advantage of natural lighting for interior building illumination.

3. Energy Matters
   The eco-tech building focus on the energy efficiency practice for the building application with existing technology.

4. Urban Responses
   The study of eco-tech building concern on the urban environment context or based on the urban response.

5. Making Connections
   The focus of eco-tech building study is making a connection between the environment design or form analogy or the building function.

6. Civic Symbolism
The design representing the building role as a public symbol with different design to find a new value.

Figure 1. Stages of research and design

3 Result and Discussions

3.1 Site design approach

The STAIN Majene campus master plan consist of some building functions to support the basic function [10][11][12] of the campus. STAIN Majene campus presents the mosque and library as the center of the area, surrounded by campus facility such as study room, presidency or rectorate building, canteen, parking area, and sport center.
In order to create friendly environment condition, STAIN Majene campus design practices a vegetation area development as a shading or a park. Concerning the existing land condition before development is leafy vegetation, then the design of campus area preserve as much as possible the existing vegetation. Vegetation plan in area of STAIN Majene campus are below.
3.2 Thematic Approach (eco-tech)

**Structural Expression**
The structural systems implement the concentrate structural system. There is a column element (pile) and beam as the pile connection horizontally and supporting the floor. The concentrate brick wall covers the non-structural characteristic. The building concentrate structural systems has 30 cm x 60 cm column and the gap is 7 m. The concrete class for the column and beam structure is K-300. The reinforcing bar concrete is solid structure to improve the structure strengthen.

The roof frame construction is light steel truss to support the roof load, including steel load and creates a form of the roof. The type of the truss is light weight steel C profile and the plafond material is gypsum and wood (lammersering). Moreover, the floor material is ceramic tiles, because its high flexibility application and applicable on all part of the building. In addition, the ceramic floor material does not require a polish process and easy maintenance. The ceramic material could provide a warm impression.
Sculpting with Light
The campus building uses a secondary skin as a building secondary skin. The element is not only for aesthetic element but also intentionally creates a natural shading art pattern that follows the sun path orientation and reducing the heat and block the flash. The sun exposure will not directly hit the building because of the secondary skin but blocks by the skin. The secondary skin reduces an excessive sun exposure to the building facade and has important role for the aesthetic of building 'surface'.

Figure 6. Room ambiance with the natural lighting advantage from the building facade.

Energy Matters
The building designed with passive cooling concept to reduce energy consumption. The concept applied in the design of the building that track the sun path and maximize the natural air circulation. The building design provide sufficient opening to maximize the illuminance and natural ventilation. The design become one of the efforts to reduce excessive electrical consumption. The application of secondary skin, providing a window in every building room with cross ventilation system, light color applications are the effort to maximize the lighting distribution in all building area. Moreover, artificial energy applied as a supporting energy resource with eco-friendly and energy saving characteristics.

Urban Responses
In accordance with the development instruction from South Sulawesi government, the green building development should practice built-up and green open space area is 60:40 and become the basic consideration in determining the mass layout of STAIN Majene campus building. The application and preservation on green open space area has a function as water infiltration of campus communal area, reduction of noise and solar radiation, and a guides of circulation lane.

Making Connections
The design of STAIN Majene campus is the example of calligraphy art development in architecture[13][14][15]. Calligraphy is not only as something that only read and write but the society may enter and feels the calligraphy in form of the space. As a result, a beauty of calligraphy is not only as building ornament but calligraphy could impress physically and spiritually. The function of the building is the place of study, strengthen the meaning of Alif Lām Mīm as a medium to approach to Allah as a God and motivates the user to study the religion continuously.
The building expression is similar with Alif Lām Mīm as a reflection of Islamic campus. This visualization should improve student understanding where calligraphy is not only as a two-dimensions art but also applicable into the building form as Quran that contain a beautiful verses reflection but presenting a benefit to all aspect of life [16][17][18]. In addition, the land percentage is equal between the building and green open space as a realization of harmony between human needs and other living things with mutualism relationship.

**Civic Symbolism**

Calligraphy element applied in the form transformation to the building facade to emphasize the Islamic campus theme. The element highlights STAIN Majene as one of Islamic collage in Majene Regency, West Sulawesi. The building design adapts calligraphy that generates pleasant and peaceful atmosphere. This impression produces from space chronological as calligraphy essence achievement through sign reading (semiotic) [19] [20] meaning of the calligraphy symbol.

**Discussion**

Eco-tech concept express in structure and construction with environment integration, application of building material in accordance with prefabrication material availability but consistently sustainable with the nature, does not has negative impact, and calculating the
long-lasting material usage according to natural condition in STAIN Majene campus. Additionally, the ventilation system maximizes the natural ventilation by the advantage of building design and exterior air management as an artificial ventilation for the building interior through cross ventilation. The lighting system utilizes the natural illumination as much as possible as interior building with optimizing the opening function, window and secondary skin pattern.

4 Conclusion

The eco-tech concept approach is one of the harmonization forms in development and natural sustainability and balance but consistently keep abreast of the time. The STAIN Majene campus design is not only fulfill the space needs for society of academicians and the student but it also an effort to protect and preserve green open space. As a result, the percentage on built-up land application proportion and public space are equal. The application of technology transformation includes building design transformation and building facade, adapted the calligraphy form as a reflection of Islamic campus. The advantage of eco-tech design is the capability in utilizing the natural potency to support architectural element, such as lighting, ventilation, and acoustic (noise). The trees around the building will reduce the solar radiation level, controlling the air quality, and reducing the vehicle noise. However, maintenance management in high technology application become the problem in some design area.

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References

Islamic Vocabulary Enrichment for Autistic Children through Visual Support

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Abstract. For children, vocabulary enrichment needs exposure as it is related to several factors including the role of parents to facilitate their increase in both receptive and expressive vocabulary. This paper discusses language of autistic children and the use of visual support to facilitate vocabulary enrichment related to Islamic terms. It explores the visual support used by teachers of a primary school for special need students in Malang, Indonesia. The finding shows that teachers employed several types of visual support used as teaching media during both one-on-one learning and class interaction with the purpose of vocabulary enrichment. One of the set of vocabularies students need to acquire is religion related terms that in this paper concerns with Islamic vocabulary, some of which are loan words from Arabic language. Therefore, acquiring Islamic vocabulary is not always easy especially when it is introduced to children with special need or those with specific language impairment. Some suggested techniques are also given when implementing visual support to introduce Islamic vocabulary to students with special needs.

Keywords: autism; Islamic vocabulary; special need students; visual support

1 Introduction

Vocabulary enrichment belongs to a big task for children as they need to build meaningful relationships among words. They need help to understand words as they relate to concepts and further they should develop it through self learning process [1]. It is not about loading words in the gigantic storage in their mind because vocabulary enrichment also concerns with how children add, organize, use and reuse their daily vocabulary.

Autistic children struggle to cope with the various daily vocabulary that always develop in numbers and usage. They have difficulties to relate the vocabulary with their understanding as they have different ability to acquire language syntactically and pragmatically [2]. However, it does not mean that they have limitation to learn about Islam [3].

Acquiring vocabulary is one of the biggest challenges for autistic children in learning the second language. Meaningful and contextualized vocabulary will guide them to have a great improvement in their vocabulary growth. With contextualized vocabulary, they are able to make connection between the vocabulary and its usage in daily life.

2 Literature Review
2.1 Children Vocabulary Acquisition

Children vocabulary acquisition deals with several factors such as age of acquisition, frequency of conversation and parental vocabulary [4]. It shows that despite the language introduced to the children, acquiring the vocabulary is related to the role of parents not only to model the language but also to facilitate them to enrich their vocabulary using several supports.

There are some risk factors such as non-English speaking background, low school readiness, low reading habit, more siblings, low family income, low maternal education, maternal mental health distress, and low maternal parenting consistency exist in children vocabulary acquisition [5]. It indicates that those social elements in children's developmental outcomes increase over time. Despite of those social elements, multiple cognitive and language skills were directly related to vocabulary acquisition. Furthermore, working memory and attention also made indirect contributions [6]. In this context, introducing Islamic vocabulary to children with language difficulties should start from the basic level within the level of their understanding.

2.2 Islamic Vocabulary

Children learn vocabulary related to their daily life. The concept they need to acquire involves religion related words. In this case, such vocabulary commonly consists of abstract words which are not easy to acquire. Acquiring nouns or words in this context might also require different languages, for instance in Islamic vocabulary some terms belong to loan words from Arabic language. While children in general longitudinally acquire or develop their first vocabulary that formulated in Verb-Subject-Object word order and semantically rich preposition [7]. Their vocabulary on religion terms are also built through this pattern. A systematic and structured contextualized word family model on children’s vocabulary acquisition results in a statistically significant improvement [8].

3 Methods

The participants of this study is ten teachers of a primary school for special need students in Malang. The selected teachers are those with at least five years teaching experience and have certificate on teaching special need students. They were interviewed on the information concerning their difficulty in teaching special need students particularly those with autistic spectrum disorder, their experience in teaching language and religion to these students, and their expectations for the learning programs.

This study employed a general inductive approach that provides systematic procedure for analyzing qualitative data which are in the form of interview result and documentation of teaching instruments. In doing data reduction, the focus is on describing the complex data through establishment of summary themes [9]. The result of this procedure is to capture the key aspects to be analysed further in terms of the teacher’s experience in teaching language and religion using the teaching media for students with special need.

4 Visual Support For Autistic Children
4.1 Language of Autistic Children

Teachers reported that their students are mostly emphasis on non verbal communication rather than verbal expression. It shows that autistic children have special linguistic function regarding their specific communicative engagement. In this case, it would be a big difference between “literal language” and “concrete thinking” among persons with autism [10]. The later is easier for these children to cope with.

Another feature of their communication is predictable conversation or interaction flow. Most teacher agreed that their expressions are monotonous, easily predicted as they tend to repeat similar responses. This is obvious that these special need children have formulaic expression or formulaic language [11]. Teachers believe that it can be a shortcoming as well as highlight when it is related to vocabulary enrichment. The shortcoming lies in limitation to develop conversation but the highlight is they will use consistent vocabulary that they are familiar with. For example when they were introduced to the sequence of wudhu, the students will recall consistent words as told in the drills.

However it is understandable that the language acquisition including the vocabulary improvement varied among the students. Accordingly, treating the language difficulties of children with autism is not only based on their Autistic-spectrum Quotient (AQ) but also on the domination of lateralisation. Therefore understanding their ability in language supports the notion of autism as continuum, not as categorical diagnosis [12].

4.2 Visual Support for Autistic Children

Visual support is highly recommended for developing the communication ability and assisting the children to understand as well as to express themselves. As reported in the interview session, teachers commonly believe that the success of their teaching is really determined by the support from the parents. Some of the teachers shared the media of visual support with the parents to be practised at home. Student’s communication ability is significantly influenced by parent’s role for instance using visual support to tell stories that will be more emotionally available to these children [13].

Another reason why visual support is more beneficial concerns with the main feature of autistic children namely visual learners. These children are very good in their visual despite their poor listening skill. They are often thought to be deaf as well as hard to be listenable to people [14]. They are obviously respond better using pictorial cues rather than verbal cues [15]. Accordingly they need more playfully receptive tools in communication, one of which is visual support engaged in various contexts.

It must be highlighted that language disorder in autistic children does not have relation to dysphasia combined with visual impairment causing failure to develop visual language system [16]. The use of visual support can help them to encounter their language difficulty in general since there is not specific deficit in language such as what assumed earlier in some studies [17]. Therefore, the use of visual support is very potential when it is integrated to various learning goals, for instance to enrich the vocabulary on Islamic terms.

Not only for language support, visual tools can be used for several purposes, for instance through social story to prevent autistic children from tantrum as a behavioral intervention [18]. This strategy is effective as reported by most teachers using visual media. Once the behavior can be controlled well, it can facilitate the learning to develop several basic skills such as social functioning and practical communication.
Stories and songs have been popular and effective resources in the special need school. Listening to stories, songs and the combination of both have great effect on children’s vocabulary growth. However, the story affected the highest scores and the most effective [19].

For children with special needs, increasing receptive vocabulary belongs to the initial stage of developing literacy skills that requires special technique in reading instruction [20]. Reading instruction by merely focuses on verbal command is not effective. Some suggested techniques cover the use of sign language, modelling, prompt and visual support.

Visual support can help bridging the gap between literal language and concrete thinking [10] by taking part to aid transition in a communication setting. For instance when autistic children need to understand an instruction, it can be used as a transition between the verbal instruction or command with the physical transition prompt [21]. In addition, visual supports in handled electronics such as handphone or tablet are also effective for autistic children aged 8 to 14 to increase the use of verbs and nouns [22].

4.3 Visual Support on Islamic Vocabulary

Visual support based on the teaching experience reported is effective not only for autistic children but also to students with other difficulties. This tool also works well with those with specific language impairment [23]. It gives significant benefits to working memory performance especially when it is employed in the context of learning for various purposes, including learning to enrich vocabulary in Islam. Therefore, teachers stated that preparing visual support for any classes becomes a priority to support student’s learning.

Autistic children with deficits in social understanding need various techniques in their intervention programs. Visual support applied in portraiture-based intervention can be used to improve their understanding on social functioning [24]. This aspect also includes how to understand the social practices related to religion. Another technique such as portrait drawing session also has a great potential to be an intervention for ASDs children developing communication and vocabularies [25].

![Figure 1. First Islamic words](image)

First Islamic vocabulary for children with or without language difficulties is characterized by concrete words which are observable and easy to visualize through pictures. The difference
is on the way to present the visual information. For autistic children the vocabulary is given one by one based on the order of familiarity, for instance familiarizing the word mosque (masjid) in first day followed by the Koran on the next day. Then introducing hijab for girls and some other Islamic outfits in different meetings. In the poster of fig. 1, Ka’bah is introduced the last as it is not available in their surrounding [26]. In this case teacher cannot rely on one poster as the students need more visual support. Teacher can make use of photos or videos on Ka’bah available online.

Figure 2. Procedural action words

Teaching some vocabularies involved in Islamic prayer is also a special challenge as prompting is not enough. In this case, the use of visual support is necessary as bridging between the verbal instruction to do salat and its actual prompt. For instance to introduce niyyat and takbiratul ihram is given with the combination among modelling-verbal instruction-visual support-actual prompt-practice. The set of procedural action words using cue cards [27] are presented in a fixed order, for instance the procedural action words on taking ablution (wudhu) are given before those on salat. On salat, the understanding of its procedure is required before teaching the procedure for jama’ah prayer. Then the next step is introducing procedural action words for praying at the mosque. However teaching procedural action words using cue cards only is not enough. Teacher can add the visual support with photos or videos available online.
Islamic vocabularies are not only words relevant to Islam but also on worship (ibadah). Abstract word such as fasting needs elaboration on several aspect such as what it does not deal with, when it is done and how to do it. Fig. 3 illustrates the social story on fasting during Ramadhan month. Fasting is defined in simplest way by using the pictures. For the advanced learners the definition of fasting that also involves preventing from anger also can make use of social story. Some pictures available online might not be exactly the same with the targeted words, accordingly teacher can also use photo of the student’s context to be more realistic. The social story on fasting can be completed with other vocabulary target such as sahur, adzan, niyyat for fasting, tarawih prayer and so on.

Not all Islamic vocabulary can be taught directly, for example in describing aurat as private part of body to uncover or unexposed, the social story should begin with the verb not the noun of the words. The consequence of defining aurat is not to touch as it is prohibited. Therefore in fig. 4 the goal of the social story is not defining what aurat is but to build understanding that it is socially unacceptable to touch somebody else’s aurat. The intervention of such a social story is more effective when it is relevant to the current situation of the learner. For the case in fig. 4, the social story is used as a behavior intervention that indirectly will further support the goal to enrich student’s vocabulary on the word aurat.
Figure 4. Social story for intervention

However, the use of visual support also has limitations, for instance to describe proper name which in Islam it belongs to infinity. Therefore, the teaching of specific abstract vocabulary still relies on formulaic expression. The following is an excerpt of formulaic question-answer of an autistic student (JJ) and his teacher:

\[ T: \text{H* JJ, siapa } \text{nama Tuhanmu? (Who’s your God?)} \]
\[ S: \text{(. ) Allah} \]
\[ T: \text{Siapa } \text{nama Nabimu? (Who’s your messenger?)} \]
\[ S: \text{(. ) Muhammad} \]
\[ T: \text{L% Bagus, H* anak hebat (Great, good boy)} \]

In the formulaic conversation above, teacher addressed the student’s name using high pitch to gain his attention. Asking “who” uses rising intonation and ends with longer falling intonation. The student needs pause to answer each question. Different word order such as \text{Nama Tuhanmu siapa JJ? (Your God’s name, JJ?)} will not be responded similarly as it violates the formula. The formulaic conversation ends with compliment in lower pitch then higher pitch sometimes with clapping altogether. This conversation is repeated several times for retention.

5 Conclusion

The use of visual support for acquiring vocabulary is considered an effective technique for vocabulary growth. At-risk children involving those with special need and those with specific language impairment, visual support has helped them to contextualize the vocabulary for day-to-day usage. Visual support strengthens autistic children’s working memory to process the vocabulary. The systematic pattern from visual support facilitates the autistic children to the connected sequence of vocabulary. Then, repeated action of the sequence familiarizes autistic children with similar pattern which is beneficial for the retention.
Acquiring Islamic vocabulary from visual support exposes autistic children with their sociocultural context in term of religion practices. Meanwhile, it also simultaneously provides multiple effects on the ability to find the bridge between the new vocabulary and their daily practice, on fully communicative engagement, and on social understanding. The use of procedural action words and social story can transform the acquisition into positive learning environments where autistic children academically, socially, and emotionally settled. Providing autistic children with structured visual support creates a sense of connection as one of bases for vocabulary growth and development of their communication skill.

Teaching Islamic vocabulary provides some challenges when it deals with abstract ideas. Visual support should carefully designed and given. Therefore, the implications should be taken into consideration for enriching autistic children’s vocabulary are the sequence of the visual support and the operationalization of the vocabulary to autistic children real life. The use of visual support through procedural action words and social story for vocabulary enrichment is not free from limitation. Further researches on other diverse visual supports will be worth-investigating.

Acknowledgements. This paper in conjunction with The 1st International Conference on Islam, Science and Technology (ICONIST 2018) in Malang, East Java.

References

[27] The shalat prayer ritual posters (https://www.twinkl.co.uk/resource/t-t-2212-the-salat-prayer-ritual)
The Use of Concrete Ponds As a Medium to Spiny Lobster Rearing In Marine Aquaculture Installation
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Abstract. Lobster is an important economic species and is an export commodity. One of the marine lobsters that is the mainstay of the export market is the spiny lobster (Panulirus ornatus). This study aims to determine the effect of using concrete ponds to improve the survival rate of spiny lobsters. The stages in the spiny lobster maintenance activities include pond preparation, seed selection, water quality management, feeding management and pest and disease control. The survival rate of spiny lobster at the end of this study is 90%.

Keywords: concrete pond; spiny lobster; rearing

1 Introduction

The high intensity of fishing and the large number of lobster fishermen caused a lack of management of the availability of lobster stocks in the waters. Lack of the information about the peak season of the lobster capture also causes fishing efforts in certain months to a decline in production [1].

According to Moosa (1984) in [2] that rock and sand lobsters are a type of crayfish (Panulirus spp.) found in Indonesian waters because of the presence of good habitats in the form of coral reefs and coral reefs that thrive because of their tropical climate and have an average temperature of 28°C. Tropical rock lobster, Panulirus ornatus, is a commercial coral lobster in the north-east Australia. Over the past decade, joint research and development in Australia has examined various stages of life history, specifically the complex and larval phases [3].

In recent years, the demand for marine commodities including lobster has continued to increase. Demand both for local consumption and for export, which is so high, makes fishermen intensively catch lobster. Catching lobsters from the wild and using feed in the form of trash fish is a pressure for lobster cultivation [4]. A high market value, increasing global demand, and concern for the sustainability of wild stocks have created significant interest in the development of spiny lobster aquaculture [5]. Seeing the importance of lobster commodities, including spiny lobster (P. ornatus), a good rearing technique must be held to produce products according to consumer demand. Thus, the supply of lobster needs can also be met. Lobster aquaculture has been developed with the floating net cage system in the last three years in several coastal areas in Indonesia by requiring clear, calm and far from water
pollution [6]. However, some regions in Indonesia do not all have waters that are suitable for lobster cultivation with floating net cage systems, so it needs to be studied to cultivate lobsters in controlled tanks as well as those that have developed in Australia and Vietnam with very high success [7].

2 Methods

This study held in June to September 2016 in Marine Aquaculture Installation Boncong, Tuban. This study was descriptive qualitative starting with pond preparation, seed selection, water quality management, feeding management and pest and disease control. This study was contain from four stages that is pond preparation, seed selection, feeding management, and water quality management.

2.1 Pond Preparation

Activities carried out before rearing, should prepare the pond first. This is because the ponds that are used must be clean and free of pests and other impurities which attached to the floor and walls of the pond. The next step is to dry the pond and fill the pond with 45 cm of sea water.

Ponds for rearing activities for lobster spinys are made of concrete and rectangular (Fig. 1). The size of each pool is 2.5 x 1 x 1 m with a thickness of 16 cm. Have an outlet with a diameter of 8 cm. Inlet pipe diameters of 2.5 cm. The pool is equipped with an aerator with an air pipe with a diameter of 2.5 cm. each pond is stocked with a density of 60 lobsters.

2.2 Seed Selection

Seeds are obtained from collectors. The selection is done in the form of complete body parts. The Characteristics of a good seed that is not deformed and complete limbs. In addition, salinity adaptation was carried out for 1 week by reducing salinity. Seed weight is usually less than 100 g with a body length of 8-10 cm. Seeds are maintained for 3 months until they reach a consumption size of 300 grams.

Figure 1. Concrete Ponds construction

2.3 Feeding Management
The main feed of seeds and adult lobsters should be from the bivalves, but because the procurement is difficult, it is replaced with trash fish cut into small pieces and do not use pellets as said by Smith et al (2003) in [8] that lobster growth is better when using fresh fish feed than using pellets. The use of trash fish instead of bivalves in accordance with what is stated by [9] that lobster tends to be carnivorous so it will grow better if fed with animal protein. Feeding rate is 10-15% of lobster body weight. The most feed is given at night because lobsters are nocturnal and to avoid cannibalism. Reference [10] stated that cannibalism is the nature of eating each other, in this case a lobster.

2.4 Water Quality Management

Management of the water quality in lobster rearing activities include of temperature measurement, dissolved oxygen (DO), and salinity. These parameters will affect the body's metabolic processes, such as the activity of looking for feed, digestion, and shrimp growth. Measurements are made at 07.00 WIB; 12.00 WIB; and 17.00 WIB. The measurement aims to determine the fluctuation of water quality.

3 Result

The time needed to reach a size of 300 g/individual of a size of 100 g/individual is usually between 3-4 months. The larger the seedlings stocked, the faster the lobster harvest will be. Survival rate (SR) is less than 90%, meaning that in one pond with 60 stocking densities that survive were 54.

The results of measurements of water temperature at 07.00 WIB have a range of 26°C-28.9°C; at 12.00 WIB it had a range between 27.9°C to 29.9°C; at 17.00 WIB it had a range of 27.4°C-29.5°C (Table 1). The temperature range is still in normal conditions. The changes are also not too significant.

The results of dissolved oxygen (DO) measurements in the morning at 07.00 WIB have a range of values between 5.5-7.9 ppm; at noon at 12.00 WIB has a range between 5.5-8.4 ppm; and in the afternoon at 5:00 p.m. WIB has a range of 6.0-7.6 ppm (Table 1). The range of dissolved oxygen values (DO) is still in normal conditions.

Salinity measurement results in the morning at 07.00 WIB have a range of values between 30-36 ppt; at noon at 12.00 WIB has a range of values between 27 to 36 ppt; and in the afternoon at 17.00 WIB has a range of values between 29 to 35 ppt (Table 1). The salinity range is suitable for spiny lobster cultivation.

PH measurement results in the morning at 07.00 WIB; noon at 12.00 WIB; and in the afternoon at 17.00 WIB has the same value range between 6–8 (Table 1). The pH value for sea lobster tends to be alkaline and the value is suitable for live media of spiny lobster. In this study no lobster was found to be affected by the disease. This can be known by the absence of mass deaths in the rearing cycle.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>07.00</th>
<th>12.00</th>
<th>17.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>26°C-28.9°C</td>
<td>27.9°C-29.9°C</td>
<td>27.4°C-29.5°C</td>
</tr>
</tbody>
</table>

Table 1. Water Quality In Rearing Pond Of The Spiny Lobster (Panulirus Ornatus)
4 Discussion

The high survival rates due to the low levels of stress experienced by lobsters when kept in concrete ponds rather than maintained in floating net cages. The stress response in the lobster can be caused by several things including environmental factors, handling and bacterial infections [11]. Stocking density is closely related to growth and survival rates. The height of lobster stocking is a factor that determines the success of cultivation. Lobster with low stocking density has a great opportunity to get the part of food that is around it, besides that there are also fewer competitors around it. This will provide more space for lobsters to move and grow and develop [12].

According to [13] that Feed from spiny lobster (*P. ornatus*) is usually in the form of shellfish or can also use trash fish cut into small pieces. Food is given regularly every day. Feeding should pay attention to the nocturnal nature of lobster. The best feed should be given at night to be more effective. According to [14] that cannibal is a trait that likes to prey on its own type. High mortality rates in lobsters are usually due to cannibalism. Cannibalism is at its peak when other lobsters experience moulting and also lack of feed. Cannibalism in spiny lobsters often occurs at night. The main prey is lobster, which is new. The new lobster is hard-pressed, for the hardened carapace it takes quite a long time to make it easy to attack because the meat is still soft. Efforts made to prevent cannibalism are by sending lobsters which will be difficult. In addition, high feeding frequency can also prevent predation on lobster seizures.

The quality of water in open fisheries fluctuates more frequently than in concrete ponds so that the water quality in the maintenance pond looks stable and is in the normal range. According to Subani (1981) in [2] stated that rock and sand lobsters are a type of crayfish (*Panulirus* spp.) found in Indonesian waters because of the presence of good habitat in the form of coral reefs that thrive because of their tropical climate and have an average temperature of 28°C. In accordance with [15] statement that the temperature range which tends to be stable will not make lobsters experience interference in adaptation to environmental changes so that it is beneficial in utilizing energy for metabolism and growth.

Ahmad et al., (1991) in [16] stated that dissolved oxygen is the most critical parameter in fish farming. Solubility of oxygen in the water is affected by temperature, salinity and air pressure. Increased temperature, salinity and pressure cause a decrease in oxygen, and vice versa. For the benefit of fish farming, optimal dissolved oxygen ranges from 5-8 mg/l.

Reference [17] stated that salinity are an important factor to support the rearing of spiny lobster. Growth was highest in 35 ppt salinity and progressively reduced at lower salinities [18]. Water salinity usually ranges from 30-35 ppt, but this contrasts with research conducted by [19] that at a salinity of 35 ppt, the survival of lobster will decrease due to high cannibalism in that salinity.
Ahmad (1991) in [7] said that explained that to be able to live and grow well, aquatic organisms (fish and shrimp) require a medium with a pH range between 6.8-8.5. According to [20] that pH value within the range of 7.07-7.86 was still supported the life of *P. homarus* juvenile.

In addition, lobster rearing activities have also just been pioneered so there have been no pest or disease problems. It was just that the level of cannibalism makes lobsters die, but not how much. There were no symptoms of disease found on the lobster which were raised because the learning was done by selecting seeds using a salinity test and well-scheduled feed management, namely the largest percentage is given at night to avoid cannibalism. Normally cannibalism occurs because less feed and also lobsters that have just been molting will be the main target for other lobsters.

5 Conclusion

Maintenance of spiny lobsters which carried out using concrete ponds can produce a high survival rate of 90%. High life support is supported by good feed management and proper water quality control.

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References


Mobile Application Tutorial Hajj and Umroh on Android Smartphone

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Abstract. KBIH as government partners in order to realize and Umrah pilgrims are independent and have coaching institute rituals of Hajj are very attractive to pilgrims and Umrah. One of the emerging KBIH is KBIH Al-Manafiyah North Cikarang Bekasi. However, knowledge of media used for training rituals of Hajj in KBIH uses contextual media in the form of guide books and leaflets paper. It is not yet effective and efficient because there is a guide book that is sometimes difficult to understand and the limited time to study it more deeply. Based on the problems, We wants to build a mobile application on the Android platform. It hoped able to provide guidance information Hajj and Umrah. It are not only comprehensive but also practical. Methodology application development using Rapid Application Development, which consists of three phases: planning, design and implementation workshop to design the UML (Unified Models Language) and developed using Android Framework SDK, the Java programming language, PHP is a server side programming language, MySQL as database, Google Maps. Based on these results with the application of the congregation can easily obtain information about the Hajj and Umrah guide practical.

Keywords: Hajj, Umrah, KBIH, Android Smartphone, Mobile Application, Java

1 Introduction

Technological developments are progressing very rapidly one of which is a mobile telecommunications device or a mobile phone that is marked by the birth of Smartphone technology. Smartphone (Smart Phones) is a new class of mobile phone technology that can facilitate the access and processing of data with significant computing power. Currently, there are several Smartphone technology base that has been popular among people such as Blackberry, iPhone, Symbian, and Android. Features available on the android Smartphone is capable of running a variety of applications making it easier for users to perform various activities of life one of them presenting your information Hajj and Umrah.

Hajj is the fifth pillar of Islam after the creed, prayer, almsgiving and fasting. The pilgrimage is a visit to the House (Ka'bah) to do some good deeds such as tawaf, sa'i, before staying in Arafat, mabit and several other practice period, in order to meet the call of Allah and His pleasure expecting. In accordance with the word of God which means: " Indeed, the first House [of worship] established for mankind was that at Makkah - blessed and a guidance for the worlds." (QS. Ali 'Imran [3] : 96). [¹] Travel Hajj and Umrah requires mental and
physical readiness is good, if not pilgrims and Umrah will feel there is no time, stress and always short of time and information. For that, they need KBIH. [2]

KBIH existence as government partners in order to realize the pilgrims / Umrah independent and has become very popular institution or Umrah pilgrims. One of the emerging KBIH is KBIH Al-Manafiyah North Cikarang Bekasi. However, knowledge of media used for training rituals of Hajj are currently using contextual media in the form of guide books and leaflets paper. It turned out to be ineffective and inefficient because there are guidebooks that are sometimes difficult to understand and the limited time to study it more deeply. Based on the background that has been presented, the authors compiled research entitled: Mobile Application Tutorial Hajj and Umrah on Android Smartphone.

2 Theoretical

2.1 Smartphone

Smartphone are cellular phones with unlimited capabilities for communication via telephone and text messaging, but also to perform functions as well as computers. Smartphone terminology was first used in 1997 by the manufacturer Ericson to distinguish one of their products in the form of Penelope GS88 with a feature phone that was commonly marketed at the time. One significant thing that distinguishes Smartphone from feature phones is the use of application programming interfaces (APIs) that support the development and installation of applications from third parties that are integrated with the operating system and hardware. [7]

2.2 Android

Android is an operating system for Linux-based mobile devices that includes operating systems, middleware, and applications. Android provides an open platform for developers to create their applications. [5]

2.3 Rapid Application Development (RAD)

Rapid Application Development (RAD) is an incremental software development model, especially for short work times.[6] RAD (Rapid Application Development) is an object-oriented approach to the development of a system that includes a method development and softwares.[4]

There are 3 phases in RAD involving analysts and users in the assessment phase, design, and implementation of the following:

1. Requirements Planning Phase
   In this phase, users and analysts meet to identify objectives of the application or system and to identify the information requirements arising from these goals.

2. Design Workshop RAD
   This phase consists of the user's design phase and construction phase. Workshop design here is to work with users to design the system and after that build the system.

3. Implementation phase
   In this phase built, approved and filtered new systems or parts of systems tested and then introduced to the organization.

2.4 Unified Modelling Language (UML)
UML is a "Language" which has become the industry standard for visualization, designing and documenting software systems. UML offers a standard for designing a system model. Using UML can create models for all types of software applications, where the application can run on any hardware, operating system and network, and is written in any programming language.

2.5 Java

Java is an open source, so the following program source code used for free software development is downloaded and freely modified. In other words, Java can be used on various platforms (multiplatform). Java supports the latest software development features such as object oriented programming (OOP). Java has a better level of security than most other programming languages.

3 Methods

3.1 Smartphone

1. Library Studies
2. Field Study
   a. Observations (Observation)
   b. Interview (Interview)
   c. questionnaires
3. Similar Literature.

3.2 Smartphone

The method of developing a Hajj and Umrah guidance system uses Rapid Application Development (RAD), which has the following stages:

1. Requirements Planning Phase
2. Design Workshop Implementation phase

4 Result and Discussion

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

4.1 Requirements Planning Phase

The planning phase the conditions that need to be considered are as follows:

- Identification of running system analysis
  The author identifies the current system analysis in KBIH Al-Manafiyah, namely the media used in conveying the Hajj manasik learning today using contextual media.
- Determine the purpose of system development
  In this case the author determines the goals that must be met from the system that is made so that it can satisfy the user
Determine the system features that will be created

4.2 Design Workshop RAD

The design workshops have two. They are:

a. Phase designing user

This stage is the design stage of the proposed system in order to run well and is expected to address the problems that exist. Steps being taken are as follows:

1. Design process

The process design stage used the UML (Unified Modeling) diagrams as tools. However, not all diagrams provided by UML are used to designing this system. We used only a few UML diagrams are used can support the design of this application. The diagram used as follows:

Creating Use Case Diagrams, the author describes the functional needs of the system

![Diagram](image)

**Figure 1.** Use case Administrator
Creating Activity Diagrams, we describe the flow of what the user activities and systems, and also in view of how objects work. Here is an example diagram Activity Log. Here is a sample Activity Diagram Use case Menu Hajj.
Figure 3. Activity diagram Login

Figure 4. Activity diagram Haji Menu
- Creating Sequence Diagrams, We explain in detail the time sequence of messages process carried out by the system.

Here is an example of a sequence diagram login and logout.

Figure 5. Sequence login and logout

Here is an example of a Sequence diagram Menu Hajj and Umrah
Creating Class Diagrams, We visualize the structure of classes of a system and show the relationship between classes.
2. Database Design
The Database Design phase, we defined entities associated with information Hajj and Umrah guide and conduct of the entity database design has been obtained. Database to be designed is composed of table’s duhaura news and admin tables.

3. Design Interface
The design phase interface, we designed the user interface to suit the user's needs so that this information can be used optimally by the users. Here is an example of the design interface pilgrim menu tab.
b. Construction phase

Figure 8. GUI Menu

Figure 9. Hajj and Umrah Application
At this stage a presentation of the results of the design into the program. In this stage, the authors use the Java programming language using Eclipse Indigo platform and the Android Emulator for hajj guide feature, then using the programming language PHP to connect to a MySQL database for Hajj news features [3].

4.3 Implementation Phase
At this stage, the authors conducted several phases of implementation are:

a. Application server hosting the Internet
   We install the application server API, backend system (dashboard) hosted the www.000webhost.com to be accessible online for news features pilgrimage.

b. Installing the android handset
   We install the Smartphone or Android handset.

c. Testing or application testing Blackbox testing
   The Blackbox Testing is input / output testing. It is testing conducted to demonstrate that each of these functions fully operational, at the same time looking for errors in each function.

5 Conclusion
The Conclusions are:
1. This mobile application can facilitate the Muslims especially the travelers in obtaining your information Hajj and Umrah rituals in order to be able to perform well, smoothly, and it is valid according to Islamic guidelines so as to obtain a Mabrur pilgrimage, ameen.
2. That mobile applications as a tool capable of becoming one of the alternative solutions to problems that exist and can be useful to provide guidance information Hajj and Umrah. They are practical and can be understood easily by the Muslims, especially the pilgrims who can be used via the android smartphone.

6 Suggestion
The Suggestions are:
1. The development of similar systems in the form of other mobile platforms, (Symbian, J2me, Blackberry, iPhone and Windows Mobile).
2. Synchronization feature development to application server so that the content can be updated automatically via the Internet so that the form of dynamic data.
3. Development discussion of applications in all sorts of Hajj as Hajj pilgrimage Ifrad and Qiran.
4. Multilingual development to be used more widely

References
Development of Database of The Abu Lais’ Thought Regarding Hadith

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Abstract. As a Moslem, there is no doubt that the Quran and Hadith are the highest references in Islam. Contextualization of Hadith of Abu Lais contributed significantly to the dynamics of Islamic law. With the contextualization of Hadith of Abu Lais is effective in making Hadiths relevant to the development of context so that the Islamic law it contains becomes dynamic and relevant. Along with the development of this era required electronic media that can store data and accurate information about his thought. Information Communication and Technology (ICT) innovation can be developed an online database that can provide information with accurate, fast and relevant and efficient use of storage space to be accessible from anywhere and anytime, access by using a Personal Computer and also mobile devices. Thus the documentation and dissemination of Abu Lais thought will be stored online and can be known by many people around the world.

Keywords: Abu Lais; Contextualization of Hadith; database; information; ICT

1 Introduction

In Islam, the hadith is mashdar al-hukm (source of legal decision). The hadith, which is what was reported from the Prophet, in the form of words, deeds, stipulations of physical nature or moral character, travel after being appointed as a Prophet and sometimes also before, so that the meaning of the hadith here is as mean as the Sunnah. The Hadith of the Prophet believed by Muslims as the most tangible form of doctrine and a realization of the Islamic teachings contained in the Quran As a Muslim, there is no doubt that the Quran and hadith are the highest references in Islam. All aspects of Islamic teachings such as' aqidah, worship, muamalah, politics, economy, law and so on should refer to these two main sources. This is because Allah Almighty has explained that the Quran is a guide book for human beings containing various explanations that make people able to distinguish between good and bad. The legitimacy of the legitimacy of hadith or sunnah as the basis of religion is based on many words of Allah Swt and is a logical consequence given that the Messenger of Allah was the bearer of revelation so it is certain that he who most understand the verses revealed to him. Nevertheless, it can not be denied that the distance between the Messenger of Allah and us. Which is far adrift over 1400 years has led to the various order and condition of today's society has characteristics different from the community faced by the Messenger of Allah on both customs and habits of society and the conditions experienced by society today. Therefore, it may be the context or circumstances that exist at that time into consideration why a law
established by Prophet Muhammad Saw no longer found or there have been changes that are even very drastic in the current of. Thus the question arises as to whether a hadith can be contextualized or can be presented with a different understanding because it has a different context between the time of the birth of a hadith with the context of society at this time or precisely that context difference is not the reason for the change of the provisions contained in hadiths of Prophet Muhammad Saw. If it is assumed that the context difference is not the reason for the change of provisions contained in the hadiths of the Prophet Muhammad, it is very hard to negate the negative impact of that where such a viewpoint will actually narrow the thinking space of Muslims from one side and on the other hand will complicate the life of Muslims itself. For example, for example the case that occurred at the time of the Messenger of Allah. Where there has been a very high price spike in the market. This causes the purchasing power of the people to weaken and many of the materials that are the basic needs of society can not afford to buy. Finally, the Companions came to the Messenger of Allah. (as the Prophet and the leader) To ask the Messenger of Allah to set the price of the goods. Therefore, if it is assumed that the hadiths of the Prophet Muhammad may be reinterpreted through the method of contextualizing the hadith especially in the field of Islamic law, does the contextualization not have the potential to crash established provisions in the study of ushul fiqh or the rules contained in the study of the sciences of Sharia as described above. Thus, it is very important to discuss deeply about the concept of contextualization of hadith which aims to bridge between the hadith text and socio-cultural context of society that develops in the sense of studying the necessity of contextualization of the hadith itself and how the procedure must be passed in contextualizing a hadith. Abu Lais is a scholar of hadith who has consistently studied Hadith since bachelor graduate from University of Madinah, Magister from umm Al-Qura University, Mecca and Doctoral at Umm Al-Qura University, Mecca. He gives a very interesting view of the study of hadith in his book 'Ulum Al-Hadith: Asiluha wa Mu'asiruha. This book contains the theory of contextualization and its application in understanding the legal traditions and to see how far the theory can respond to the dynamics of Islamic law. Along with the development of Information Communication and Technology (ICT), can be developed a database that contains about complete information about the thinking of Abu Lais. Thus, the use of database technology will be useful to save time and cost because with a computerized database can stores a lot of information such as printing, loading, displaying accurate data, facilitating data access, isolating data to be standardized, reducing data redundancy and data inconsistency. In this case the selection of appropriate database technology is necessary so that Abu Lais's thoughts can be known by many people and can be accessed easily, more quickly and cheaply.

2 The Abu Lais’ Thought Regarding Hadith

Abu Lais is a scholar of hadith who has consistently studied Hadith from undergraduate to PhD. His full name is Abu Lais Al-Khair Al-Aba in. Born in India precisely in the City of Khairabad in 1953. Abu Lais's intelligence has been seen since young and proven by his appointment as a teacher and mufti at the age of 17 years in India. From 2000 to 2009, he was appointed Professor of Quran and Sunnah at the International Islamic University of Malaysia and regular teaching of Hadith to all undergraduate, Master and PhD students. Achievements and services of Abu Lais in the world of hadith is very much and well known among scientists hadith today, so it is not surprising if he was given the honor to occupy some important
position in the world of contemporary Islamic education, especially in the study of the hadith. Among them are: 1). Members of the Secretariat General of International Hadith Symposium at College of Islamic and Arabic Studies, Dubai (2011 - 2013), 2). General Council of Islamic Journal Institute of the University of Sultan Sharif Ali, Brunei Darussalam (2011 - present), 3). An Academic Advisor for the Evaluation Doctoral in Hadis project at the Faculty of Shariah, Kuwait University in 2013. Among his most important works in the study of the science of hadith are: 1). The principle of An-Nizam Al-Mal Wa Al-Iqtisad in Fil Quran, 2). Tririj Al-Hadith, 3). 'Ulum Al-Hadith: Asiluha wa Mu'asiruha, 4). Mu'jam Al-Mustalahat Al-Hadis | iyyah, 5). Ittijahat Fi Dirasatisunnah: Qadimih Wa Hadisha, and many more of his works including articles and papers. Book of 'Ulum Al-Hadith; Asiluha wa Mu'asiruha by Abu Lais is a unique book when compared to Hadith books written by scientists of today's tradition. On one side of the book is a must-have book hadith that describes the study related to the discipline of hadith as the must be hadith. But on the other hand, Abu lais prepared a chapter in his book in the last chapter on how to interact (ta'amul) with the traditions that had been present more than 1400 years ago without denying or negating the facts and contemporary reality on this day that is happening around the Moslems that have differences even contrary to the situation and conditions that occurred in the early Islamic generation. According to Abu Lais, the correct view of the sunnah is to believe that there are some sunnah that are eternal and do not accept any change and on the other there is sunnah that is adaptive to certain contexts and circumstances so that it can accept the change with the occurrence of changing circumstances or context in the middle - in the Islamic community.

Even according to Abu Lais, there are many stories that support that the contextualization of the hadith is a necessity. Among them are the words of the Messenger of Allah. :

لا يصلَئنَ أهْدِم النَّاسَ إلاّ فِي بَيْتِ قَرِينَة

Meaning:
“Let not one of you perform the prayer ashur but in the village of Bani Quraizhah.”
(HR.Bukhari and Muslim)

Hearing these traditions, the friends who were sent by the Prophet Muhammad to the Bani Quraizah have a different attitude. Some of them are delaying the ashur prayer even when the ashur time is up because it is based on the text of the hadith. But some friends that others keep working Asr prayer at the time though not arrived at the destination due to some friends, the tradition is spoken by the Prophet is not intended to set a time limit Asr prayer but an order to hasten toward the destination and ultimately Prophet Muhammad justify both attitudes taken by the Companions. Based on that history can be concluded that the method of understanding the meaning of the hadith is the purpose behind these traditions have occurred since the time of the Prophet Muhammad so that contextualization is new in the study of that attempts to the contextually is a must and this assessment is very helpful in that speak about the law. A genius at the same thoroughness Abu Lais in integrating the study of hadith and Sharia sciences so as to generate a theory or rules of a new, independent outside of the rules contained in the disciplines of hadith and ushul fiqh itself.

3 Database Technology
A database is a collection of information stored in the computer systematically so it can be checked using a computer program to obtain information from the database. The software used to manage and call the database is called the database management system (database management system). The database system can be learned in information science. A database is a complete set of operational data records of an organization or company, organized and stored in an integrated manner using a particular method so as to meet the optimal information required by users. The term database refers to a collection of interconnected data, and the software should refer to a database management system so that many administrators and programmers use database terms for both meanings. Database technology is naturally very flexible and accompanied by high capabilities to be configured/tailored to company needs and simplicity to make modifications/changes and give full confidence in the implementation and continuity of handling the company's operational system can be achieved easily and effectively. A functional device provided by database technology will also make administrative tasks very minimal. Database technology continues to evolve in line with the research of experts. Juan Loaiza has been pounding away at Oracle Database for more than 27 years, helping refine the technology as it exists today. With that perspective, Loaiza thinks the careers of developers, architects, and IT implementers will depend on how well they prepare for the "big waves sweeping through the database industry." So here are 10 transformational database technologies that Loaiza thinks developers, architects, and other IT pros need to track. [3]

3.1 Engineered Database Systems

Building a database from scratch is a simple idea, where Oracle with its hardware can maximize the software to run the Oracle database. For example, the system moves query processing directly to storage so analytics can run quickly. Loaiza - and Oracle - are people who truly believe in this approach, but many still don't know whether this will be successful in the industry as is the case with some of the trends below. Oracle has thousands of customers in production, but no other industry has followed in its footsteps.

3.2 In-Memory Database

There isn't much about this, where each database vendor adds memory to its line. Use of data structures and algorithms on data in memory, where databases can run analytics 10.20 or can reach 100 times faster than physicalbased databases. Where speed makes people ask, because analysts can repeat "what if" questions where they will get answers in seconds, not hours.

Loaiza said that in offering Oracle this "dual format architecture" is unique - where there is a single database that uses an approach depending on the user: line analysis for OLTP, and column-in-memory analysis for analytics. In-memory is part of the Oracle Database 12c architecture, it can be said that companies have not changed the applications running on Oracle Database, and the features they expect to get, such as high availability and scalability. From the on-disk format to the memory database, "the entire industry will be there," Loaiza said.

3.3 Software in Silicon

"This is not just a product feature. It's really a computer science advance," Loaiza says. Oracle calls the approach "software in silicon"—embedding algorithms directly onto microprocessors. The idea is that processors can't just keep adding ever-more cores and threads, so speed and performance will come from putting algorithms to accelerate core tasks
such as encryption and compression directly onto the chip. Loaiza cites three aspects of this advance. First, SQL in silicon accelerates database in-memory performance. Second, capacity in silicon can get a lot more data into memory using on-processor tactics such as real-time decompression. Third, encryption support in silicon can help improve security as workloads move to in-memory, because without such protection in-memory could be less secure than data on disk. “It’s an advance for the whole industry on how database processing works, and how chips are designed,” Loaiza says. “You’ll see more of these products appear as other vendors start copying this technology.”

3.4 Big Data Linked to Existing Data

Many companies use Big Data in strategies such as the Internet of Things, or clickstream web tracking data. But more knowledge about Big Data comes from combining new Big Data with pre-existing data companies. Questions will come to the pre database: “How can existing Big Data with operational data be integrated?” Loaiza said. He put forward two Oracle technologies as examples that can help. First, Oracle Big Data Appliance is a system that runs Apache Hadoop and Spark, allowing IT teams to build large data systems much faster and at a much lower cost than building it themselves. Two, Oracle Big Data SQL allows analysts to run massively parallel, full SQL queries across relational, Hadoop, and NoSQL data. Oracle SQL is more sophisticated than what is generally run on this large data set, Loaiza said. The aim is to “make it simple and efficient to integrate all this big data together.”

3.5 Sharding for Easier Global-Scale OLTP

We have said from the start that large web companies with users reaching hundreds of millions to billions are very dependent on wasted databases; to manage one billion users they not only have large databases, they make the database broken so that it becomes a more manageable element, but the company can still question all the fractions. Sharding technology was developed several years ago and is easy to use using NoSQL. “This is one reason many web companies like NoSQL,” Loaiza said. Oracle plans to offer “genuine sharding” in Oracle Database, Loaiza said, because in the past users had to take manual steps to simulate sharding in Oracle Database. Genuine sharding will allow IT to manage fractions, while getting the usual benefits from Oracle Database, such as high availability and security features.

3.6 Complete Data Protection

When disk-based database backups came on the scene about a decade ago, they brought two big advances over tape: more accessibility to data and deduplication that reduced the volume of data. “And that’s where it stopped in the last decade,” Loaiza says. Increasingly, the expectation will be that data backups happen constantly, in real time, so that data never gets lost. With batch-oriented, disk-based backups, data can be lost between backups. That doesn’t cut it in today’s digital business models. “Nobody wants to lose data.” Loaiza says. “It’s pretty much impossible to go to financial users and say ‘I’ve lost your data.’ No one wants to lose their seat on an airplane, or their day’s worth of shopping.” Oracle meets this need with an approach similar to its engineered systems, using specialized algorithms on custom hardware called Zero Data Loss Recovery Appliance. In addition to preventing data loss, the appliance has minimum impact on production servers because it backs up only the changes to the database, rather than copying a whole database. It has database-aware recovery that validates data as it backs up, and it offers cloud-scale protection, so a single appliance can back up a whole data center.
3.7 JSON is currently integrated with SQL

According to Loaiza, JSON is very well known in the field of developers who can represent data and can replace XML that is used to format data with complex structures, for example user profiles or web pages. The NoSQL database project invites JSON because JSON is widely used by developers in making their applications. Currently JSON data can be stored natively as a column on the Oracle database. Thus, JSON data can be accessed via SQL very easily and the database pro can use that data to work on various relational database tasks. “If you look at NoSQL databases, they kind of had two technologies that were really interesting—one was sharding, the other was JSON,” Loaiza says. “We’ve now introduced those into relational databases.”

3.8 Container Databases

More than two decades Virtualization has been widely used, and has given way to lighter and heavier container-based virtualization. With Oracle Database multitenancy, container technology directly goes into the relational database, not visualizing at the operating system level. With container databases, one container manages many "pluggable" databases. Each database that has been installed with container technology considers having its own personal resources, but actually shares it as part of one container, which makes managing and scaling easier. The container database is useful for consolidating many databases in a company to reduce costs, Loaiza said. Another function is that it can help reduce software administration costs, because there is less software to manage than OS-based virtualization. OS-based virtualization reduces hardware requirements by increasing server utilization rates, but increases the administrative burden of software, because each virtual machine has copies of all software.

3.9 Cloud-Based Databases

The testing team and the development team want to have a database environment that can run fast without having to wait for IT to manage it. The company wants its database to be upgraded immediately if the application is popular because if it fails, the company will close and move on to the next idea. They want the new performance and security features in a database to be used and will pay the technology team to be able to build new applications and be able to analyze new data, rather than having to fix the servers in the company's data center. This is because of the increase in cloud-based databases. The existence of a system such as Oracle's Exadata Cloud Service Database that provides Oracle Database performance that can run on Oracle Exadate, cloud-based databases can be easily obtained and with various benefits, such as fast provisioning, continuous updates, availability and subscription pricing. “It’s moving to the cloud but taking with you all the advantages that we’ve built during the past 40 years instead of going to some primitive database in the cloud,” Loaiza says.

3.10 Coexistence of Cloud and On-Premises Databases

With the cloud, the pro database can run on a local system. Often a company rules to be able to store data on its data center and also often make special applications to do this task. This makes IT use modern applications. Oracle can overcome this by creating a system, called Oracle Cloud Machines, which can run the database exactly as it does on the Oracle Cloud, but which is located in the company's own data center. IT pays for Oracle Cloud Machine as a subscription, Oracle pro can manage remotely, and capacity can be increased up and down depending on needs; the only difference is that the device is behind your firewall.
4 Abu Lais’ Thought Cloud-Based Databases

There are several advantages of Cloud Storage, namely (1). Usability: There is a desktop folder for Mac and PC on all cloud storage services that can be used by users to drop files between local storage and the cloud, (2). Bandwidth: Sending e-mails to individuals can be avoided and sending web messages to recipients via e-mail is replaced, (3). Accessibility: Can access files stored from anywhere using an Internet connection; (4). Disaster Recovery: Companies are expected to have an emergency backup plan that can be used in an emergency and for backup plans that can store copies of important files can use Cloud storage that can be accessed using an internet connection; (5). Cost Savings: Using cloud storage can reduce annual operating costs because to store data internally requires only about 3 cents per gigabyte. because internal power is no longer needed, users can find out about additional cost savings.

Figure 1. Abu Lais’ Thought Cloud-Based Databases

From the advantages of cloud computing and e-collaboration is more suitable for

Database of The Abu Lais’ Thought Regarding Hadith. Cloud databases are also known as database as a service (DBaaS), since they are often offered as a managed service. As shown in Figure 1, database containing information about Abu Lais’ Though is placed on the cloud so that it can be accessed from anywhere. Devices for access to the database can be used from a wide range of Personal computers to smartphones.

5 Conclusion

The Abu Lais’ Thought Regarding Hadith is using cloud-based databases will be easy to develop and more to increase to share all the information over the world everywhere. Devices for access to the database can be used from a wide range of Personal Computers to any other mobile devices like smartphones.
Acknowledgements. This paper in conjunction with the 2nd International Conference on Quran-Hadith, Information Technology and Media: Challenges and Opportunities (ICONQUHAS 2018).

References


Identification of Letters Hijaiyah Pronunciation Using Neural Network (Backpropagation) and Pre-Processing of Mel-Frequency Cepstral Coefficient

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Abstract. To avoid mistakes in pronouncing hijaiyah letters, the writer applies mel-frequency cepstral coefficient to extract and will yield characteristic value of voice signal. Implementation of Artificial Neural Networks (Backpropagation) is used for classification on the identification of 8 letters of hijaiyah using MatLab. 8 selected hijaiyah letters are س ص ض ذ ذ ز ق ع take fathah. The feature extraction process produces several different parameter values, including pre-emphasis, windowing, fast fourier transform, discrete cosine transform, coefficient cepstrum and the duration. The backpropagation experiment using the maximum number of epoch and training functions varies as much as 15 times from each scenario capable of producing training regression 0.91019, test 0.93486, validation 0.99772 and MSE 0.2048. The test of hijaiyah pronunciation using trainlm with the number of hidden layer 10, obtained accuracy of 25%.

Keywords: Signal processing; Mel-Frequency Cepstral Coefficient; Artificial Neural Network (Backpropagation); Simulation;

1 Introduction

Sound is a major part of language. Oral communication will not be carried out if there is no sound spoken and heard. If this sound element is not considered, the spoken language will not be well understood, or it may be understood with a meaning that is far different from the speakers’ intention [1]. It’s the same as reading or reciting the Qur’an. For the sake of smoothness and goodness in reciting Arabic reading, each letter must be sounded according to its articulation. Errors in articulation can lead to differences in meaning or error in the reading being read [2].

Ifnani Ifka [3], in her research, found 53 words that experienced sound changes in the Saradan Village community. The details are as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>Number of Letter Changes</th>
<th>That Should be Pronounced</th>
<th>Pronounced Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>سَ ص  ض  ذ  ذ  ز  ق  ع</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>سَ ص  ض  ذ  ذ  ز  ق  ع</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>سَ ص  ض  ذ  ذ  ز  ق  ع</td>
</tr>
</tbody>
</table>

Tabel 1. Changes in pronunciation
From this case, by implementing a signal processing system, the author tries to identify the letters hijaiyah. Haby Bagus Prasetyo, Adiwijaya, and Untari Novia Wisesty [4] revealed that, in order to do voice recognition, the feature extraction and classifier methods are needed. The sound signal that has been extracted character then produces information that can be analyzed for each variation of the existing sound signal.

Therefore, to avoid mistakes that might occur when reciting Arabic reading, reading the Qur'an, praying and communicating, the author tries to identify hijaiyah letter pronunciation using MFCC (Mel frequency Cepstral Coefficient and Artificial Neural Network for classification).

The objectives of this study include:
1. Identifying 8-letter hijaiyah pronunciation using mel-frequency cepstral coefficient as a feature extraction by applying pre-emphasis, frame blocking and windowing stages, fast fourier transform, filter bank, discrete cosine transform, and cepstrum filters and artificial neural networks backpropagation as a classifier.
2. Knowing the effect of learning rate, the number of neurons in the hidden layer, maximum epoch, and training function on backpropagation neural networks against extraction values features mel-frequency cepstral coefficient which uses pre-emphasis, frame blocking and windowing stages, fast fourier transform, filter bank, discrete cosine transform, and cepstrum filter.

### 2 Study of Literature

The author conducts a literature study that has relevance to the topics discussed, namely the discussion of voice identification and the method of backpropagation and mel-frequency neural network coefficients. The literature study used can be in the form of journals, theses or other publications. The following are some similar studies as ingredients.

<table>
<thead>
<tr>
<th>Title, Author, Year</th>
<th>Method</th>
<th>Advantages</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algoritma Pengenalan Ucapan Huruf Hijaiyah Bertanda Baca</td>
<td>Linear Predictive Coding (LPC) as feature extraction, and</td>
<td>After several test scenarios obtained the best accuracy for training is</td>
<td>The best accuracy for testing is 58.93%</td>
</tr>
<tr>
<td>Citation</td>
<td>Methodology</td>
<td>Result</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Haby Bagus Prasety, Adiwijaya, and Untari Novia Wisesty, 2016</td>
<td>Hidden Markov Model (HMM) as a classification.</td>
<td>99.60% with 28 data classes.</td>
<td></td>
</tr>
<tr>
<td>Speech Quality based on Arabic Pronunciation using Mel-Frequency Cepstral Coefficient and LDA N.S.Zainon, Z.A. Ahmad, M.A. Romli, and S. Yaacob, 2012</td>
<td>Mel-Frequency Cepstral Coefficient (MFCC) as feature extraction and Linear Discriminant Analysis (LDA) as a classification.</td>
<td>Accuracy for (Saad), (Taa), (Zaa) and (Qaaf) is above 80% with different test data and values. The highest level of accuracy achieved is 92.5% for (Taa “) when training is 80% and using 35 coefficients.</td>
<td></td>
</tr>
<tr>
<td>Identifikasi dan Aplikasi Pengenalan Spektrum Bunyi Gamelan Menggunakan Jaringan Syaraf Tiruan Pada Matlab Eko Ariyanto and Farid Samsu H, 2014</td>
<td>Artificial Neural Networks as a classification</td>
<td>In testing using training data, the success rate reached 99% in the number of neurons 110 and obtained an MSE value of 0.0001233 on the epoch to 1000. The number of neurons used in hidden layers is not limited to the input provided.</td>
<td></td>
</tr>
<tr>
<td>Penggunaan Algoritma Learning Vector Quantization dalam Mengenali Suara</td>
<td>Mel-Frequency Cepstral Coefficient (MFCC) as feature extraction and Learning Vector Quantization</td>
<td>During the testing process with the presence of fan noise with 20 attempts, it produces 15. If there are many noise disorders, from 20 trials, only 2 are recognized.</td>
<td></td>
</tr>
</tbody>
</table>
Based on the research in the table above, there are several things that are different from previous studies, including:

- Use of other methods in feature extraction process. That is using mel-frequency coefficients and cepstral processes using artificial neural networks.
- Artificial neural network which is backpropagation as an algorithm. Writing of hijaiyah letters that have been pronounced.
- Random changes in the learning rate value, maximum epoch and training functions such as occurring converging faster.
- Using the mel-frequency cepstral coefficients method consists of only a few parameters, namely pre-emphasis, frame-blocking windowing, fast fourier transform, mel frequency wrapping, discrete cosine transform, and cepstrum lifter.
- The preprocessing stage on the cepstral mel-frequency coefficient which in this study only uses a pre-emphasis process without using noise canceling and Voice Activation Detection (VAD).
- In the extraction feature of the cepstral mel-frequency coefficient does not use the postprocessing stage.
- The sound used as the object of research is the sound or pronunciation of a hijaiyah letter which is only called 8 hijaiyah letters, the which is a fathah community which is read for one lawless beat without using mad (long reading).

### 3 Basic steps for letters hijaiyah pronunciation

So the writer uses the mel-frequency cepstral coefficient method as a feature extraction method from the 8 letter hijaiyah pronunciation as for the purpose of this stage, which is to answer the question of the problems that have been defined previously. The steps are as follows:
Figure 1. Conceptual flow of the hijaiyah letter pronunciation identification model

The picture above is a conceptual model flow in detail. Which starts from the feature extraction stage, the training process and the identification process.

Feature extraction aims to make the signal easily recognizable during the voice recognition process by the system. The main steps of feature extraction include preprocessing, frame blocking and windowing, and feature extraction [5]. The extraction feature here is broken down into several processes including fast fourier transform, mel-frequency wrapping, cosine transform and mel cepstrum.

The following data has been recorded using a smartphone and has been converted in *.wav format.

Table 3. Respondent data
3.1 Pre-processing

In pre-emphasis, which gives emphasis to the sound signal by applying a high pass filter to increase the frequency. In fact, when it spreads via air, the amount of the speech signal decreases when the frequency rises. To compensate for the attenuated speech signal, it is passed through a high-pass filter (limited impulse filter) to recover the signal using a limited impulses filter \((1, -0.97)\) [6] then:

\[
Sp(n) = s(n) - 0.97 s(n-1) \quad (2.1)
\]

Information:

- \(Sp(n)\) = signal of the nth pre-emphasis filter result
- \(s(n)\) = signal before the pre-emphasis filter
- \(n\) = signal length

3.2 Frame Blocking and Windowing

The voice signal is divided into several frames and overlapping each other. The overlapping area tested is 25%, 50%, and 75% so that a certain number of frames are obtained. To calculate the number of frames used is the following formula:

\[
((I - N) / M) + 1 \quad (2.2)
\]

With,

- \(I\) = Sample rate
- \(N\) = Frame size (Sample rate * time framing (s))
- \(M\) = \(N/2\)

The next thing to do is windowing each frame in order to reduce signal discontinuity at both ends of the block. Windowing commonly used is the Hamming Window which is calculated as follows [5]:

\[
w(k)=0.54-0.46\cos((2\pi k/(K-1)) \quad (2.3)
\]

Information:

- \(w(k)\) = window function
- \(k\) = frame length
3.3 Fast Fourier Transform (FFT)

An analysis based on Fourier transform is synonymous with a spectrum analyzer, as Fourier transform to change the digital signal from the time domain to the frequency domain. Fast fourier transform is discrete fourier transform using fast calculation techniques that utilize the periodical properties of fourier transforms. As the following formula:

\[ F(k) = \sum_{n=0}^{N-1} f(n) \cos \left( \frac{2\pi nk}{N} \right) - j \sum_{n=0}^{N-1} f(n) \sin \left( \frac{2\pi nk}{N} \right) \]  

(2.4)

Because \( x(n) = x_r(n) + jx_i(n) \) can be complex, then:

\[ X(k) = X_R(k) + jX_I(k) \]

\[ X_R(k) = \sum_{n=0}^{N-1} [x_r(n) \cos \frac{2\pi kn}{N} + x_i(n) \sin \frac{2\pi kn}{N}] \]

\[ X_I(k) = \sum_{n=0}^{N-1} [x_r(n) \cos \frac{2\pi kn}{N} - x_i(n) \sin \frac{2\pi kn}{N}] \]  

(2.5)

Information:

\( N \) = Number of input sample
\( F_k \) = the order of k fast fourier transform component output (x (0), x (1), ... , x (n-1))
\( K \) = output index of fast fourier transform in the frequency domain (0, 1, ... , N-1)
\( n \) = index sample of input sample in the time domain (0, 1, ... , N/2-1)
\( j \) = constanta of imaginary numbers (√(-1))
\( \pi \) = (180°) degree

3.4 Mel Frequency Wrapping (Filterbank)

This section is one of the most important parts, which is to get relevant information from the greeting block. Many methods are used at this stage [5]. This stage is also called the triangular filter with the following formula:

\[ H_i = \frac{2.595 \log(1 + \frac{f}{700})}{\pi} \]  

(2.6)

\( H_i \) = Filterbank
\( F \) = linear frequency
\( S_i \) = Signal from fast fourier transform

3.5 Discrete cosine transform (DCT)

At this stage the spectrum will be converted into the time domain. D iscrete cosine transform is the same as fast fourier transform or inverse of fast fourier transform [5].

\[ \tau_n = \sum_{k=1}^{K} (\log S_k) \cos \left( \frac{(k-\frac{1}{2})\pi n}{L} \right) \]  

(2.7)

\( S_k \) = Result of filterbank on index k
\( K \) = Number of coefficients with moder n

3.6 Cepstral Liftering

To improve the quality of recognition, the result of discrete cosine transform cepstrum must pass through the cepstral liftering process first [6] as cepstral liftering formula:

\[ w[n] = \{ N \frac{L}{2} \sin \frac{n\pi}{L-1} \} \]  

(2.9)

\( L \) = Number of cepstral coefficients
\( N \) = Index of cepstral coefficients

3.7 Artificial Neural Networks
Sutojo et al. [7] explained that "artificial neural networks have an extraordinary ability to obtain information from complex or incorrect data, are able to solve unstructured and difficult to define problems, can create a pattern of knowledge through self-regulation or learning ability (self-organizing), able to choose an input data into certain categories that have been defined (classification), able to describe an object as a whole even though only given some data from the data object (association), has the ability to process input data without having to have target, and able to find the best answer so as to minimize the cost function".

3.8 Backpropagation

Backpropagation is a type of nonlinear gradient reduction procedure. This can be used for multi-category classification. The aim is to minimize error criteria [8] Gradient drop method to minimize output error. There are three stages that must be carried out in network training, namely the stage of forward propagation, reverse-propagation stage, and weight and bias stages. This network architecture consists of output layer [7].

In this study, the problem that must be solved is how to identify the pronunciation of hijaiyah letters using an envy extraction algorithm, namely mel-frequency cepstral coefficients and backpropagation artificial neural networks as a classification method. By simulating the system that has been made using the parameters of the effect of the classification, learning rate, maximal epoch to the accuracy of the identification of the pronunciation.

4 Result and Discussion

After going through the stages of feature extraction using mel-frequency cepstral coefficient, out the results of the tests using 10 neurons in the hidden layer 1 and 5 neurons in the hidden layer 2 using logsig activation function and learning function trainlm, maximum epoch of 5000 and 0.01 as the learning rate shown in fig. 3.

![Figure 3. Block diagram for mel-frequency cepstral coefficient test result interface](image)

Figure 2 shows the results of testing the file named "a (1) .wav" which produces the output of the letter "Za". Accuracy obtained is 16.67%, using 14 iterations (epoch), and MSE is 4.4465. Because the results are still not in accordance with the target that should be issued that is worth 7, then it takes repeated experiments so as to produce the same output as the target.
Table 4. Result of 19 tests files "a (1) .wav"

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Target Value</th>
<th>Results</th>
<th>Epoch</th>
<th>MSE</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Z</td>
<td>14</td>
<td>4.447</td>
<td>16.67%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Z</td>
<td>116</td>
<td>12.95</td>
<td>20.83%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Z</td>
<td>49</td>
<td>4.67</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Z</td>
<td>21</td>
<td>2.797</td>
<td>29.17%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Z</td>
<td>15</td>
<td>5.239</td>
<td>16.67%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Z</td>
<td>35</td>
<td>9.393</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Qo</td>
<td>90</td>
<td>4.694</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Z</td>
<td>46</td>
<td>4.005</td>
<td>16.67%</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Z</td>
<td>25</td>
<td>0.648</td>
<td>41.7%</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Qo</td>
<td>26</td>
<td>1.786</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Z</td>
<td>16</td>
<td>4.45</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Z</td>
<td>40</td>
<td>2.494</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Z</td>
<td>19</td>
<td>5.14</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Z</td>
<td>153</td>
<td>3.114</td>
<td>58.35%</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sho</td>
<td>16</td>
<td>7.57</td>
<td>16.67%</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>A</td>
<td>29</td>
<td>7.55</td>
<td>54.17%</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Sa</td>
<td>30</td>
<td>15.708</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>A</td>
<td>51</td>
<td>2.346</td>
<td>16.67%</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>A</td>
<td>123</td>
<td>1.05</td>
<td>41.67%</td>
<td></td>
</tr>
</tbody>
</table>

Value: The learning rate used in these 12 experimental sections is 0.01, 10 neurons in the hidden layer, using the Logig or binary sigmoid activation function and changing the maximum Epoch value and the type of training function that produces MSE values, regressions from training, validation, and tests. Using maximum epoch values of 3000, 4000, and 5000 in each experiment using various training functions.

Table 5. Results of training using artificial neural networks by different training functions

The greatest accuracy obtained is 70.83% while the letter sound of the letter "sa" produced by a sound signal called "sa (2) .wav" is most easily recognized even though using a variety of training functions. Of the 12 scenarios, only 2 scenarios cannot recognize.

In the hijaiyah letter pronunciation test using trainlm with the number of hidden layer 10, an accuracy of 25% was obtained which resulted in the same 4 outputs with the target of the 16 data tested. So, to get the MSE value that reaches the minimum level, a random experiment is needed by changing some artificial neural network parameters.
5 Conclusion

This study uses 5 letter pronunciation sound samples and the fathah community is then identified using Mel-Frequency Cepstral as feature extraction and backpropagation Artificial Neural Network as classifier. Training uses trainlm using the number of hidden layer 10, learning rate 0.01, maximum epoch of 4000 which is done 15 times the experiment produces regression training of 0.91019, test of 0.93486, validation of 0.99772 and MSE value of 0.2048. Produces 7 letters that do not match the target so that the accuracy of the truth obtained is 70.83%. Testing of hijaiyah letters using trainlm with the number of hidden layer 10, obtained an accuracy of 25% which resulted in the same 4 outputs with the target of the 16 data tested.

Therefore, to get the MSE value that reaches the minimum level, a random experiment is needed by changing the number of neurons, maximum epoch, learning rate or training function and increasing training data so that the network can recognize the training process.

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References

Problem Based Learning Model using Exe-Learning for Mechanical Waves

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Abstract. Mechanical Wave is considered as an abstract materials in physics, thereby requires support from learning media for contextual problems presentation. The present research applies the exe-learning in the model of problem based learning. Such eXe shall encourages to troubleshooted, analyzed and finding the solution for authentic problem as well as scientific attitude that expected to emerge as a result of their learning process. The research method used was a quasi- experiment design with nonequivalent control group. The results showed that using problem based learning model-assisted exe-learning able to improve student’s learning outcomes as well as promoting the scientific attitude of medium and higher level. Therefore, this research may serve as an alternative for learning physics thus becoming more effective and efficient.

Keywords: Problem Based Learning Model, Exe-Learning, Mechanical Waves

1 Introduction

Mechanical Waves is one of the abstract concepts of physics [1] which is considered difficult by students in term of cognitive aspects [2], which lead to poor comprehension of such concept by the student [3]. The problems experienced by the students i.e. difficulty in understanding the basic concept of mechanical waves. For example, students are frequently having misconception about the direction and the wave speed [4]. The equation to determine the waves speed is as follows:

\[ v = \lambda f. \]

Where \( f \) is the wave frequency and \( \lambda \) is the wavelength [5]. To determine the refraction index, \( n \) is a relative index of two medium inter alia as shown in the following equation:

\[ n = \frac{|U_1|}{|U_t|} \]

Where \( |U_1| \) is the initial speed in medium 1, and \( U_t \) is the final speed (2 medium). This shows that \( n \) is the refraction index of the two mediums (bending) of the coming wave [6]. Interference is a fusion of coherent two waves. To determine the wave interference using the formula of the Pythagorean theorem:

\[ \Delta D = d \sin \theta \]
Where $\Delta D$ is the distance between two sources coherented with the site where the interference pattern is observed, $d$ is the distance between two coherent sources and $\theta$ is the angle. Compare wave diffraction by a slit width of wavelength $\lambda$.

As mentioned previously regarding poor conceptual comprehension rooting from less suitable model and learning method applied for the intended topic [8]. The student’s misconception is that the wave transfers the material while in fact the wave only transfers energy [4]. One of the learning models able to minimize misconception of the mechanical wave is a model of problem based learning (PBL) [9] [10]. PBL model is a learning model which involves the contextual issues, generating students with the ability to apply the skills of problem solving in real life, and provide an opportunity to engage students in an exploration of problem solving [11]. PBL model may improve communication between students from interaction with the rest of the Group [12], enhance cooperation in group activities, student understanding of the concepts, engage in working independently, and participate in the discussion [13]. Discussions with classmates to build communication between mates in problem solving [14], by applying the knowledge [15].

Problem based learning model is composed of five stages of learning consisting; students focus on the issue, organized the students learning, individual and group investigations, developing and presenting the work, analyzing and evaluating the process of problem solving [16]. The model of problem based learning encourages students to be able to interpret, collect new information, identify solutions and methods, solve problems, collaborate, discuss, and compare the idea to produce a conclusion [17] [18], as well developing a scientific attitude in physics [19]. In addition to improve the learning outcomes, the psychomotoric also improve [20]. The scientific attitude is the attitude toward science of how the students feel and think about science [21]. Scientific attitude is related to student learning outcomes. Kaptan and Korkmaz have conducted research on the influence of PBL effect on the scientific attitude of students [22].

PBL model encourage students to understand concepts through discussion, students collaboration, social interaction supported by computer device [23]. Computer devices is one of the tools to support the student’s learning process [24], and try to understand some concepts that are abstract [25]. Learning media used is the exe learning media [23]. It’s easy to use without extensive programming language [26].

Based on the above explanation, the study objective is to apply PBL model by using the eXe-Learning in learning the characteristics of mechanical wave, and to determine its effect to the learning outcomes and scientific attitude of the students. The attitude observed is attitude after learning, by observing the academic ability of students. Academic ability is the individual ability that allows them to give a proper response on stimulus received [27], processing information and improving the ability to complete tasks [28].

2 Methodology

The population in this study is the entire students of XI MAN 3 Tangerang. The sample in the study is grade XI IPA 2 as a experimental group and Class of XI IPA 3 as the control group. Academic ability of the students is grouped into 3 groups including students who possess higher academic ability as much as 7 students, There are 20 students who have middle academic ability, and 8 students who have poor capability either in experimental or
control group. Experimental group were taught with the model of problem based learning assisted exe-learning, while the control group is taught using the conventional model.

The research method used was quasi experiment method with the nonequivalent control group design research design [29][30]. Sampling techniques is the purposive sampling techniques [31][32].

Data sampling in this study was conducted using the test and non-test. Testing method was utilized to measure learning outcomes in the form of pre-test and post-test. The instruments utilized are learning outcomes test and scientific attitude questionnaire. Test results obtained subsequently analyzed using a test N-Gain equation 1 [33].

\[
N \text{-} Gain = \frac{\text{posttest} - \text{pretest}}{100 - \text{pretest}}
\]

Determination of N-Gain value criteria is \(0 < G < 0.3\) low Category, \(0.3 \leq G < 0.7\) medium Category, dan \(0.7 < G\) High Category [34]. Prerequisite test utilized the test of normality (Kolmogorov-Smornov test) and homogeneity test (test Levene). Test hypotheses utilized the parametric tests was Test T with significance level 5% (\(\alpha = 0.05\)).

The scientific attitude data were calculated using formula as follows: [35]

\[
\text{Percentage} = \frac{\text{score}}{\text{maximum score}} \times 100\%
\]

Determination of scientific attitude criteria is very good (86%-100%), good (76%-85%), sufficient (60%-75%), poor (55%-59%) and very poor (\(\leq 54\%\)) [36].

3 Result and discussion

3.1 Learning Outcomes

Before treatment, we firstly conducted the pre-test to define the experiment and controls. Pre-test result was analyzed with Normality test of Kolmogorov-Shapiro Wilk as summarized in Table I below:

<table>
<thead>
<tr>
<th>Academic Ability Group</th>
<th>Experiment Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signification</td>
<td>Description</td>
</tr>
<tr>
<td>Low</td>
<td>0.200</td>
<td>Normal</td>
</tr>
<tr>
<td>Middle</td>
<td>0.117</td>
<td>Normal</td>
</tr>
<tr>
<td>High</td>
<td>0.030</td>
<td>Not Normal</td>
</tr>
</tbody>
</table>

Table I shows the results of normality test in pre-test. In, experimental group of poor and middle academic ability the data are normal, while the higher academic ability group has abnormal data. The academic control group which has normal data: poor and high academic ability.

Post-test results in analysis with test Kolmogorov-Shapiro Wilk normality on table II:
Table 2. Posttest normality test

<table>
<thead>
<tr>
<th>Academic Ability Group</th>
<th>Experiment Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Significance</td>
<td>Description</td>
</tr>
<tr>
<td>Low</td>
<td>0.200</td>
<td>Normal</td>
</tr>
<tr>
<td>Middle</td>
<td>0.026</td>
<td>Not Normal</td>
</tr>
<tr>
<td>High</td>
<td>0.200</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Table II shows the results of the post-test normality test in the experimental group and the control group. In the normality data, experimental group has normal data for low and high academic skill. Meanwhile all the data in control group is normal. The pre-test and post-test data were subsequently tested for their homogeneity to determine whether data is homogenous or heterogeneous. Homogeneity was tested using the Levene test using SPSS 21 and the result is summarized in the following Table III:

Table 3. Pre-test and post-test homogeneity test

<table>
<thead>
<tr>
<th>Academic Ability Group</th>
<th>Experiment Group and Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
</tr>
<tr>
<td></td>
<td>Significance</td>
</tr>
<tr>
<td>Low</td>
<td>0.114</td>
</tr>
<tr>
<td>Middle</td>
<td>0.547</td>
</tr>
<tr>
<td>High</td>
<td>0.155</td>
</tr>
</tbody>
</table>

Table III shows the results homogeneity test upon pre-test and post-test. It is shown that the experiment group and the control group obtained a homogeneous data in every level of academic ability of students. Pre-test and post-test data are re-tested with hypothesis test to determine the effects of the treatments. Hypothesis test results is summarized in the table IV below:

Table 4. Pre-test and post-test hypothesis test

<table>
<thead>
<tr>
<th>KKA</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signification</td>
<td>Description</td>
</tr>
<tr>
<td>Low</td>
<td>0.468</td>
<td>H1 rejected</td>
</tr>
<tr>
<td>Middle</td>
<td>0.494</td>
<td>H1 rejected</td>
</tr>
<tr>
<td>High</td>
<td>0.115</td>
<td>H1 rejected</td>
</tr>
</tbody>
</table>

Table IV above shows that the use of the model of problem-based learning assisted exe learning may improve learning outcomes of students on academic ability groups, and higher academic ability. Students who learn to use the problem-based learning model is expected to connect the personal understanding of any of the information with previous experience, self-reliant and able to make decision on subject of learning to cultivate the motivation [37]. Exe learning media creates more flexible learning structure, easy, and can be updated. Exe learning media may have an effect on students' cognitive ability and the ability of the creative thinking
Model of problem-based learning assisted exe-learning may improve student learning outcomes [38]. This is in accordance with the results of N-Gain of the learning outcomes. The results of the value N-Gain student learning results is shown in table V below:

<table>
<thead>
<tr>
<th>Academic Ability Group</th>
<th>Experiment N-Gain</th>
<th>Category</th>
<th>Control N-Gain</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0.55</td>
<td>Middle</td>
<td>0.43</td>
<td>Middle</td>
</tr>
<tr>
<td>Middle</td>
<td>0.65</td>
<td>Middle</td>
<td>0.52</td>
<td>Middle</td>
</tr>
<tr>
<td>High</td>
<td>0.73</td>
<td>High</td>
<td>0.54</td>
<td>Middle</td>
</tr>
</tbody>
</table>

Table V above indicates that the experimental group has a value of N-Gains higher than that of control group, in both of the student’s academic ability group, poor, middle academic ability, as well as a group of high academic ability. Problem-based learning may improve student learning outcomes [37]. Problem-based learning is developed to assist students to improve the student’s thinking ability, problem-solving ability, and intellectual skills; connecting experience acquired through various situations, real or simulated situations; and become an independent learner [23].

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific attitude of Students</th>
<th>Low Academic Ability</th>
<th>Middle Academic Ability</th>
<th>High Academic Ability</th>
<th>%</th>
<th>Conclusion</th>
<th>%</th>
<th>Conclusion</th>
<th>%</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inquisitive</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
<td>Conclusion</td>
<td>77.68</td>
<td>Good</td>
<td>85.31</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>respect to data</td>
<td>81.25</td>
<td>Good</td>
<td>85</td>
<td></td>
<td>Good</td>
<td>86.61</td>
<td>Very Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>critical thinking</td>
<td>80.36</td>
<td>Good</td>
<td>83.33</td>
<td></td>
<td>Good</td>
<td>89.28</td>
<td>Very Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>attitude of discoveries and creativity</td>
<td>80.36</td>
<td>Good</td>
<td>80</td>
<td></td>
<td>Good</td>
<td>85.71</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>open thinking and cooperation</td>
<td>84.53</td>
<td>Good</td>
<td>83.54</td>
<td></td>
<td>Good</td>
<td>83.93</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Persistence</td>
<td>83.33</td>
<td>Good</td>
<td>80.83</td>
<td></td>
<td>Good</td>
<td>86.31</td>
<td>Very Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>sensitive to the surrounding environment</td>
<td>84.82</td>
<td>Good</td>
<td>82.19</td>
<td></td>
<td>Good</td>
<td>83.93</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>81.76</td>
<td>Good</td>
<td>82.89</td>
<td></td>
<td>Good</td>
<td>86.44</td>
<td>Very Good</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 Conclusion

The use of models of problem-based learning assisted exe-learning may enhance the learning outcome of students in the groups of middle and high academic ability related to comprehension of the concept and characteristics of wave mechanics, as well as improving the student’s scientific attitude.
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References


Learning Instructional Strategies as Determinants of Senior Secondary School Students’ Achievement in Algebra. To cite this article: Blended Learning and Problem-Based Learning Instructional Strategies as Determinants of Senior Secondary School Students’ Achievement in Algebra. 2018.


[37] T. H. E. Effect, O. F. Health, E. On, P. Hygiene, B. In, and P. Vaginal, “Leadership and


Dashboard of Quantitative Data for Accreditation of Undergraduate Level Study Program using Application Programming Interface (Case Study on University in Indonesia)

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Abstract. Higher education accreditation held by the National Accreditation Board (BAN-PT) is one of the parameters in determining the quality of higher education institution in Indonesia. The quality of study-program or department in higher education institution are based on the assessment of various evidence and documents that are in accordance with the standards provided by BAN-PT; namely self-evaluation and accreditation forms. For the accreditation process, study-program or department in university need to prepare the accreditation forms and reports on their performance over the past 3 to 5 years. Mostly, all data is spread in other information system and different physical documents that require more time and effort to integrate until they are tried. Dashboard of Quantitative Data for Higher Education Accreditation is an application system that is able to automatically retrieve and display the reports and visual results of a study-programs evaluation with more time and effort to save. The development of this dashboard uses an Application Programming Interface (API), which is integrated and connected with Academic Information System in university simultaneously. It is an executive information system that facilitates and supports information and decision making for academic executives (like leaders of study-program, faculty or university). With this system, they can periodically evaluate the internal state of the study program, faculty or university in accordance with the assessment based on BAN PT standards, and then able to improve it in the future.

Keywords: Quantitative Dashboard; Executive Information System; Academic Accreditation; Application Programming Language; API; National Accreditation Board

1 Introduction

One of the ways to assessing universities in Indonesia is through an accreditation system. The assessment is used as a quality benchmark in all study programs and higher education institutions, both public and private, to hold professional and academic programs. The better the value of accreditation will have an impact on the views of outsiders regarding the quality of the study program and higher education institutions. Decisions regarding quality are based
on an assessment of various evidence and documents prepared by higher education institutions in accordance with the standards provided by BAN-PT, including self-evaluation and accreditation forms, which are used as a basis for assessing a criterion [1].

The corporate world is currently facing problems, namely the swelling of data (big data) due to the successful implementation of various computerized systems [2]. This is also felt by the world of education, especially universities. To prepare accreditation documents / reports for most study programs or colleges, all data is spread on different information systems and physical documents so that it requires more time and effort to integrate until they are assessed. The problem that arises is how to organize all of the scattered and disorganized study program data well so that it is easier to evaluate itself before the assessment period by the national accreditation institution.

Therefore we need a system that is able to automatically retrieve and display visual evaluation results with more time and effort savings, namely the Academic Executive Information System (EIS) that is able to visualize the current state of the study program data that has been collected, processed and simplified. The study is intended to develop an Executive Information System application for academic executives of undergraduate level education, which is in accordance with the BAN-PT accreditation assessment matrix.

This dashboard of quantitative data for accreditation of undergraduate level study program is an executive information system that helps provide data for filling in the instrument for accreditation of study programs in universities and at the same time verification during the visitation process. This application is integrated with the Academic Information System (AIS), case study on The State Islamic University (UIN) Syarif Hidayatullah Jakarta.

2 Literature Review

The Executive Information System is a well-visualized form of report for decision making. There are several types of Executive Information Systems [3] suggest 3 types of Dashboard types, 1) Strategic Dashboards, used to support strategic level management to provide information in making business decisions, predicting opportunities, and providing direction for achieving strategic goals; 2) Tactical Dashboard, focuses on the analysis process to determine the cause of a particular condition or event; 3) Operational Dashboard, which functions as a support for monitoring of specific business process activities. Focus on monitoring activities and events that don't change constantly.

The Higher Education National Accreditation Board is one of the accreditation assessment bodies in accordance with Law number 20 of 2010 which specifically deals with the assessment of tertiary education accreditation. Higher education accreditation is carried out by experts, experts, or experts and those who understand how to assess the management of study programs / tertiary institutions as a Team or Assessment / Assesor Group [1].

Assessment of the quality of higher education is based on some evidence such as documents related to standards agreed upon by a team of experts who master the quality of higher education. Some things that become BAN-PT's assessment standards in assessing the quality of a study program / higher education institution are [4] :

1. Standards 1. Vision, Mission, Goals and Objectives, and Achievement Strategies
4. Standards 4. Human Resources
The API stands for Application Programming Interface, and allows developers to integrate two parts of an application or with different applications simultaneously. API consists of various elements such as functions, protocols, and other tools that allow developers to create applications. The purpose of using API is to accelerate the development process by providing a separate function so that developers do not need to create similar features. The application of the API will be felt if the desired feature is very complex, it certainly takes time to make something similar to it. For example: integration with a payment gateway. There are various types of system APIs that can be used, including operating systems, libraries and web [5]. The API is a technology to facilitate the exchange of information or data between two or more software applications [6].

3 Research Method

This research begins with conducting a preliminary study with literature studies, reviewing the results of prior research, and reading group discussion forums in this field. For system development methods, researchers use Rapid Application Development Method (RAD). RAD is an object-oriented approach to system development that includes a method of software development [7]. The research framework is shown in Figure 2.

This research begins with the preliminary study stage which consists of 3 stages, namely, literature study, review of the results of previous research and reading a forum group discussion related to the research topic. In the literature study stage, researchers collected literature that discussed executive information systems, dashboards and academic information systems. the stage carried out after conducting a literature study was reviewing the results of previous research, at this stage researchers collected the results of previous studies to be able to find out the development and comparison of each study. Then at the stage of forum group discussion, researchers obtained information related to the research topic in depth then collected the data needed in the study.

In the first RAD phase, namely requirements planning, researchers identify and analyze the system and sort out the data and information needed to develop the system. After that, planning regarding the requirements of the system needs is done, this planning includes how
the development will be carried out on the system, what kind of system will be made, and also how to apply the appropriate system. This phase produces an analysis of system development and determine the system requirements obtained from the results of studying the academic information system that runs at university and reviewing the forms of study programs from National Accreditation Board.

Then in the RAD Design Workshop phase, researchers designed the appearance of the dashboard and the design of the application menu and user interface.

And last in the implementation phase, coding was carried out and using Application Programming Interface (API) for the development of a dashboard system in which the system was integrated with the academic information system.

4 Result

![Figure 2. Research Framework](image-url)
4.1 Generated Data from API Link

Figure 3 is an example of data generated from the API link with certain parameters, about lecturer data from the Information study program at the university. In this example, at the end of the URL, there is code 51 which explains the Information System study program code on the API link:

https://api.uinjkt.ac.id/ais/resources/akreditasi/dosen_tetap_sesuai_bidang/51.

The API is created with code by retrieving data from a database and then it is generated in the XML or JSON format. The API is made in the aim of applications can be integrated directly with the database, and application development can be done in any programming language.

![Figure 3. The data sample that generated from API](image)

In Figure 4, there is a curl_data function which is useful for translating data from the API link so that it can be made into a view, which will be displayed in the view of application form of the study program.
4.2 Data Retrieval from The API Link

The following is an example function of the code to retrieve data from the API link. Data is taken from the API link that corresponds to its needs. The data taken is lecturer data. The code function can be seen in figure 5.
4.3 Application Interface Result

The following is the result of the application display. Not all functions are displayed, only a few functions. As in Figure 5 which is the main page interface, where the user is required to choose the desired faculty and study program then the system will provide a notification when it has successfully entered the dashboard system.

After successfully entering the dashboard system, then the welcome page interface will appear. In this interface, there is a menu on the left and content on the right, content includes existing standards accredited by the study program form, starting from standard 1 to standard 7. The menu has several other sub-menus. The welcome page interface can be seen in Figure 6.

Then, in the Figure 7 we can see the permanent lecture whose expertise is in accordance with the study program in University page interface. The data contained on this page are included in standard 4 in the study program form.
5 Conclusion

1. Dashboard of Quantitative Data for Academic Accreditation of Undergraduate Level Study Program is an Application of Executive Information System that automatically provide quantitative data for filling in instruments for accreditation of study programs in universities and at the same time verification during the visitation process. The dashboard generated from this study can facilitate and accelerate users to obtain data related to the accreditation of study programs needed.

2. This dashboard was developed using an Application Programming Interface (API) that has been integrated with academic information systems in university.

3. The data contained in the dashboard system has been adjusted to the requirement taken from the Study Program Form of the National Accreditation Board.

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References


Game Based Learning Platform as a Tool for Assessment in Chemistry Education: Students’ Experiences and Perspectives

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Abstract. This study aims to explore student’ experiences and perspective on using Kahoot!, a game based learning platform as an assessment tools in chemistry education. A descriptive qualitative approach utilised for this research. The study carried out at two analytical chemistry classrooms at Syarif Hidayatullah State Islamic University Jakarta. The researchers used Kahoot! every two weeks during the period of four month as a tool for formative assessment. Three students form each classroom were interviewed to explore their experiences and perception on using this game-based learning platform. The data from interviews were analysed using thematic analysis. The finding indicates that the students felt nervous when they were assessed using game-based learning platform since they knew their scores straight away and they were timed to do the assessment. However, they felt motivated to be a top scorer student. Moreover, they see beneficial of Kahoot and want to employ this platform in their classroom when they become a teacher.

Keywords: Kahoot!, formative assessment, game-based learning,

1 Introduction

Assessment is an important and inseparable part of educational process. It is a systematic and continuous activity to collect, analyze, and interpret information about teaching and learning processes and results in achieving learning goals. As a systematic process, assessment must be carried out in a planned and gradual manner in order to obtain an overview of student development. Meanwhile as a continuous process, assessment must be carried out continuously throughout the learning period [1].

Generally, there are two type of assessment in learning processed, called summative and formative assessment. Summative assessment is a usually done after all the subject matter has been taught. This assessment will be in the form of numbers or letters that are used as decisions on student performances. Summative assessment is designed to record students' overall achievement systematically. The purpose of summative assessment is to measure students' abilities and understanding, as a means of providing feedback to students at the conclusion of an instructional period like a unit, term and program [2][3].

Formative assessment is an assessment carried out to monitor student performances during the learning process. This assessment will provide feedback for the improvement of the learning process. Teachers are able to identify misconceptions and learning gaps along the learning process by implementing formative assessment [4]. The purpose of formative
assessment is not only to determine the level of student ability but also to improve the learning process. In addition, Formative assessment aims to obtain information about how the learning process takes place in the classroom. This information will then be useful for teachers to improve, change or modify learning to be more effective in improving student competencies [5].

Nowadays, in the midst of the rapid development of information technology, teachers are beginning to authorize the use of technology as a tool for formative assessment. One of technologies integrated in the classroom as a formative assessment tool is a games based learning platform such as Kahoot!. This study aims to explore student experiences and perception on using Kahoot! as assessment tools.

2 Game Based Learning Platform as Assessment Tool

Students reply positively to mastering activities that allow them to interact with their teacher and others and get hold of immediately feedback. Various studies investigated that the usage of technology, along with computers, tablets, and smartphones, is positive in improving students’ engagement and lively participation in classrooms. The use of personal devices and systems can enhance teachers’ competencies to solicit participation from all students in their lessons. Using technology can be an exquisite way to interact students in today’s classrooms. Computer lab and computer system in the classroom can be used in a similar manner if students do not have get entry to personal devices [6].

Game-based learning is considered as one of best practice in teaching and learning process. Previous studies have reported that games-based learning as an effective tool for educators to use in the classroom. The tool engages students in critical thinking, problem solving and review of content knowledge. It can be used to engage students in reviewing the content that they have learned in meaningful and fun way. With the rapid grow of technology, teachers should consider all of the possibilities and benefits that can be gained through using technology during the lessons. Researchers suggested that students should be enticed by the competitive nature of the game if it is going to be a valuable learning experience for the students. It would be a great beneficial for students using digital games in the classroom, It will support students to handle success and failure as well as how to use critical thinking and problem-solving skills. Thus, Kahoot! one of digital games platform can be used in higher education course to engage students with the knowledge content in a fun way [7].

Kahoot!

Kahoot! is a free game-based learning platform that engage students through game in the form of quizzes create by teachers. Students do not need this platform account to access quizzes that created by their teacher. To access the quiz, they only need to launch their kahoot!apps or kahoot.it and the PIN code which is displayed on the screen.

Meanwhile, to be able to employ Kahoot! in the classroom, teacher need to register or have a Kahoot! account. Soon after they have an account they can create a new quiz. It is realy easy and quick job to create a quiz [7]. The steps of creating the quiz is available through video tutorial and easy to follow.

After developing the quiz, teachers log into their account and retrieve their created quiz by clicking the bar “My Kahoot”. Then, by launching the quiz, teachers will receive a pin code. Student should type the pin and submit their name to enter the quiz. Teachers manage
the tempo of the quiz whether or not each student has the full time to answer the question before transferring on to the next available question. Questions are displayed on the screen with four answer options that students can choose. Students have to choose the answer by selecting colour and symbol on their device that matches the colour and symbol on the screen. Once the time allocated for answering each question is finish, the correct answer is displayed along with the graph showing how many people select each of four possible answers. Points are awarded for correct answer as well as how quickly students answer the questions. The fastest student who select correct answer will receive the highest point. The names of the top three students are displayed on the screen, while each student know their ranking on their own device [7,8,9,10]

3 Research Methods

Given the fact that the present study aims to explore students’ experiences and perception on using game-based learning platform as a tool of, a descriptive qualitative is a suitable approach for this study. The researchers carried out this study at two classes of Analytical Chemistry at Chemistry Education Department State Islamic University Jakarta. The researchers selected the classes using a purposive sampling strategy since the researchers has access to these two classes.

The data were gathered using interview. The main purpose of the interview is to gather information from the respondent; to see things from the participant’s perspective [11]. In addition to this primary purpose, interview can be used to identify variables and their relationship and to support findings from other research methods. And for this present study, interviewing was chosen as one method because researchers can generate contextual information on students’ experiences and perception about the usage of Kahoot! as an alternative tool for formative assessment. Researchers interviewed 6 students from the analytical chemistry lesson, 3 form each class at the end of the term.

Beside interviews, researchers employed classroom observation. Observation is an important primary source of data for qualitative research. Scholars suggests that participant observation is the best methods when activities, event and situation can be seen first-hand [11,12]. In order to analyse classroom observation, researchers should write and record their observation. Considering the advantages and disadvantages of recording process of classroom observation, the researchers wrote a field note for each observation and recorded the observation using audio and video recorder. In total, the researchers observed 8 lessons within the period of four months.

Data gathered then analysed by employing thematic analysis approach. Thematic analysis is an approach for identifying, analysing and reporting themes rise from the data in qualitative data [12,13,14,15] The thematic analysis method applied in this study is the one which developed by Braun and Clarke in 2006. Thematic analysis steps applied were familiarisation the data, initial code generation, searching for themes, reviewing themes, defining and naming themes and report writing [13]

4 Findings and Discussion

4.1 Students’ Experience
Analytical chemistry course was the first course that applied Kahoot! as a formative assessment tool. Students had mixed feeling when using this game-based learning platform for the first time, as shown below:

“Nervous yet excited. Initially, I wasn’t sure whether I can answer the question or not and I was afraid the internet would be suddenly disconnected. In overall, Kahoot is really challenging” (student #1)

“I feel so challenged considering each question has time limit. I was also afraid of mistakenly pressing wrong answer button because I got panic” (student #3)

“Panic and uncomfortable at the beginning. Because we race with a little time, and when time runs out we can’t continue.” (student #5)

As describe above, some students felt nervous and uncomfortable at the beginning. This feeling occurs due to the fact that they have to complete a question with a certain period of time and they should have a correct answer. These conditions led them to the under-pressure situation that they had to deal with. Meanwhile, some students felt excited.

“I feel a bit nervous yet excited. I also wanted to be first one who can answer the question” (student #4)

“The test using Kahoot! is fun, because the atmosphere of the test is like the atmosphere of playing games.” (student #2)

Here, the students reveal that they were excited and seen Kahoot! as a fun platform to be implemented in the classroom. This experience was in line with the previous study which describe that Kahoot! is fun and engaging platform that valuable for students [7].

4.2 Advantages and Disadvantages of Using Kahoot!

Kahoot! is one of popular platforms that implemented in the classroom. This game-based learning offers many advantages, as shown below:

“simpler, fun, challenging, paperless and make students more focus” (student #1)

“Kahoot! utilizes technology so that the assessment process becomes more practical, it is also minimize the dishonesty of test participants and the test has been more enjoyable with Kahoot!” (student #2)

“saves paper, saves time because each question has time limit, is more practical because it does not require paper” (student #3)

“The advantages are more practical because the test results can be seen immediately, demanding students to think quickly” (student #5)

As can be seen from above responses, it is clear that Kahoot! has many advantages when implemented in the classroom as a tool of formative assessment. Kahoot! is not only a simpler fun and engaging platform, but also more practical and help educators to save the environment since it is paperless. In addition Kahoot! is also able to help students more focus in learning.
These results seem to be consistent with other research which found that Kahoot! is more effective, able to support educators in creating more engaging and motivating classroom atmosphere, and able to create environment that make students more focus in studying the topic [8].

Moreover, student also identified another advantage of Kahoot!. Kahoot! show the correct answer and score as a form of student feedback.

“After you answer the questions, you know the correct answer as well as your score” (student#3)

“It is good to have the feedback straight away. I mean you know the correct answer and know your score” (student#4)

The above responses shown that Kahoot! can offer direct feedback to student and they need them. It is important to know the feedback and score of formative assessment so then they will able to close the gap between what they know and what they expected to know.

However, students also recognized disadvantages of this promising game-based learning platform.

“kahoot cannot be applied to areas that are constrained by signals. The chance to give a wrong response could be bigger because the participants were in a hurry, compared to working on paper-based tests without a timer” (student#2)

“need a decent internet connection.” (student#4)

Students reveals that Kahoot! has two disadvantages when implementing in the classroom. The first disadvantages is that Kahoot! could not be applied when students or the class has limited internet connection. Sometimes students exit from the apps that make they lost their mark due to lost of internet connection. The second disadvantages according to students is that they need to do the test in a hurry since they are given certain time to answer the questions. As a result they may give the wrong response or answer since they feel under-pressure.

4.3 The Implementation of Kahoot! in the Near Future

Considering the advantages offer by Kahoot!, all of participants were agree to implement Kahoot! in the near future when they carried out teaching internship. Specifically, one student commented that:

“Yes, because the assessment process becomes more practical, fun, and motivating. Especially in the next few years, when I become a teacher, my students will be the ones who are called millennial generation. Kahoot will be very suitable for them”. (student#2)

Even though Kahoot! is a novel formative assessment tool which suitable for 21st century generation, this game-based platform cannot be implemented at all the topic lessons, as some participant response that:

“I will implement Kahoot depend on the topic learned”
(student#5)

“I will be using Kahoot depend on the situation, condition and the subject” (student#4)
“I will use it for certain topics” (student#1)

It is noteworthy that students concern about the implementation Kahoot in relate to the complexity of chemistry lesson. They believe that Kahoot! is a good alternative for formative assessment tool, however it cannot be implemented in all the topics covered in the chemistry classroom. It seems that Kahoot! is not suitable for topics that need more complex calculation and concept. These results are in agreement with previous study which identified that Kahoot! cannot be simplify the complex subject due to the nature of the topic [8].

5 Conclusion

Kahoot! is one of effective tools to promote engagement and motivation in learning. This game-based platform can be benefit for both students and educator. This study found that students felt nervous at the first time, and later on they felt excited and fun doing Kahoot!. Kahoot! offers enjoyable and meaningful learning with few limitation such as it is needed a decent internet connection and push students to work according to time allocate for each question. Considering the advantages, students were agreed to implement this amazing platform during their teaching internship in the near future. Based on this study, the researchers recommend teachers or educators to implement this platform in their classroom and further research is also needed to investigate the effectiveness of Kahoot! at schools and universities.

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References


The Effect of Social Interaction to the Tendency of Food Innovativeness: Evidence from West Java

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Abstract. The strong dependence upon rice staple food and decreasing of paddy land areas in Indonesia will cause the country to face the staple food scarcity. The model of extension to change the eating pattern is inevitable. For such purpose, the research explored social interaction – mutual understanding, partnership, family relationship and communication – between cassava consumers with surrounding community, the effect of social interaction to the food innovativeness. Based on Slovin formula with 5% of error probability and adopting the stratified random sampling technique, the research sample is 182 people. Data collecting was conducted during May-July 2018 by close questionnaire in Likert scale. The multiple regression analysis indicated the strongly significant effect of communication and family relationship as well as the significant effect of partnership to the tendency of food innovativeness.

Keywords: Social interaction, food innovativeness, and cassava eater’s surrounding community, Indonesia

1 Introduction

The existence the custom community in Cirendeu village, district of Cimahi, Bandung, West Java should deeply be considered. Following the ancestor, they have seriously prohibited to consume the paddy-rice. Their daily staple food is cassava-rice which its variety based on the cassava raw material. They are small community consist of 55 family households, and uniquely they live within big community of paddy-rice eater in Citizen Association 10, Sub District of Leuwi Gajah, Cimahi Selatan, Bandung, West Java, Indonesia.

Their unusual eating habit within the paddy-rice eaters has aroused the question of how the level of social interaction between the two different communities; and whether this social interaction bring the effect of food innovativeness and tendency of eating habit change for the surrounding community. The answer of this question is strongly valuable to initiate the model of extension to develop staple food diversification and to reduce the dependence upon paddy-rice. Referring to Jati [7], the paddy-rice consumption for Indonesian people is the highest in the world, average of 139 kg of per capita per year, higher than Philippines who spent 131 kg of rice per year, although the Food Security Agency (FSA), Ministry of Agriculture [6] has emphasized the reducing of rice consumption in Indonesia to the 90.63 kg/capita/year. This amount of rice consumption, however, is still higher than the average of world rice consumption, in which it is merely 60 kg/capita/year [7]. Therefore, the program of rice
consumption decreasing should be continued, and the proper model of extension is completely needed. The social interaction model could probably be enhanced to develop food diversification and change the habit of eating.

The reduction of paddy-field continuously in Indonesia has strengthened the necessity of staple food diversification. The last 1983 agricultural census (AC) indicated, the amount of Indonesian rice wetland was 16 704 272 ha. But, the land area was continuously decreasing to 16 704 272 in 1993 and 14 139 895 ha in 2003. The 2013 AC revealed alarming data that Indonesia had lost almost half of wet paddy field compared to 1983 AC. For more detail, the rest of wet paddy field in Indonesia was 8 685 888 ha based on 2013 AC, or loss of 8,013,384 ha, that means Indonesia has lose 267 279 ha of paddy land per year compared to the data enquired in 1983 AC [9]. Within the shrinkage of paddy-field, the population has constantly and rapidly increases. In 1983 the Indonesian population was 158.1 million. The number has been growing to 161.6 million in 1984, 165.2 million in 1985, 168.7 million in 1986, 172.2 million in 1987, 175.6 million in 1988; and jumped to 255,461,686 people in 2015. At the end of 2016 the number of Indonesian population was 258 704 986 people, and in 2019 the amount will become 268,074,565 [12].

The growing need of rice and the opposite of wet paddy land decreasing caused Indonesia faced probably the problem of food crisis. FAO, IFAD and WFP [5] pointed out the paddy land conversion is the main critical point that would disturb Indonesian food availability. The strong dependence upon rice staple food has also brought out Indonesia to get the lack of staple food availability as well as the affordability. Based on the indicator of food availability, affordability, and food quality, Indonesia has gotten the fluctuating rank within 65 to 75, in which it has attributed Indonesia as the food insecure state [17]. Based on the experience of Cote d’Ivoire in the phase of military conflict between Northern and Southern territory and the disruption of food supply from food surplus zone, Savane, to the food minus southern territory, revealed that the food diversification is the main way to get food self-sufficiency [14]. The food diversification of course benefits for food security, nutrition and health; secure source of income, employment and high value products; and resilience for farming system and environment service [4].

For Indonesia, the implementation of staple food diversification program is strongly possible. Center for Agricultural Data and Information System [1] exposed, Indonesia has 11, 949, 727 ha dry land more than wetland area which is 8,132,345 ha in 2012. In addition, Indonesia has also unused land which is about 14,252,383 ha, in which it is suitable for cassava, sweet potato, and corn. However, the question is how to decrease the acute dependence on rice as a single staple food? The food innovativeness is precondition for food diversification and reducing the strong dependence upon paddy-rice. Therefore, the exploration of social interaction effect to the food innovativeness is strongly valuable to initiate the model of extension to reduce the strong dependence upon of paddy-rice staple food.

2 Framework analysis and reasoning

The food innovativeness for the aim of food diversification and the effort to reduce the dependence upon rice is strongly important. The research in five districts of Jakarta indicated that the food innovativeness is the proper steps to get food diversification and to change the habit of eating [16]. In this context, and based also on the research its self, the social
interaction is the main predictor for the tendency of eating pattern change. The research in West Jakarta has found the significant effect of social interaction to the tendency of eating pattern change, while the research in North Jakarta has strengthened the previous finding, in which the effect of social interaction to the eating pattern change is not merely significant, but strongly significant [16]. This research has deeply aroused the hypothesis of social interaction to the food innovativeness.

The question of the effect of social interaction to the food innovativeness has gotten more strength by previous as well as the current research. The research of Hidalgo et al. [11], Thai [15] and Gueguen et al. [10] indicated the strong impact of social interaction to form the certain behavior. The cultural product consumption, in Hidalgo’s research [11], was significantly affected by the information transmission about the observed value of the product, and it was decisively yielded by the high grade of social interaction. Quoting the 1992 prize noble winner, Gary S. Becker, Thai [15] expressed the consumption of the common goods was strongly influenced by social dimensions. In this context, the Thai’s research indicated the “one group feeling” and the “close relationship feeling” are the main predictor for the tendency of similar behavior because of the equal characteristics and institutional environment. The expression of Gueguen et al. [10] has similarity of conclusion, in which the individual has a desire to make affiliation and rapport when the interact each other, and a tendency to make adaptation to the condition [2]. By the fact, hypothetically, the social interaction is strong predictor to get food innovativeness and tendency of eating behavior change.

The social interaction, referring to Sunandar [3], could be categorized into four special aspects, in which it included: the communication, partnership, understanding and family relationship. In this context, Miraningsih [18] emphasized the relationship is commonly occur between individuals and individual with the group, and also the relationship between the groups and the groups. The relationships could also be traced into the aspect of family or relatives and neighbors. The family relationship according to Sigmund Freud are basically formed by the marriage, birth and adoption that aims to create, maintain the culture, and improve physical, mental, emotional, and social from each family member [18].

The others aspect of social interaction is mutual understanding, in which it means a willingness to understand other people, especially in the aspects of feelings, thoughts, and desires. The mutual understanding, according to Sunandar [3], is the placement of self of individual in to the atmosphere of feelings, thoughts, and desires of others as close as possible. If the communicator shows sympathy for the communicant, psychologically it will support the development of a harmonious relationship atmosphere. The understanding could not possibly exist without any communications. Sunandar [3] expresses, the communication -- verbal and non-verbal -- is a channel to convey feelings, ideas, and thoughts; and at the same time it is also a medium to be able to interpret or understand the thoughts or feelings of others. Communication cannot be separated from the lives of individuals as a medium to connect others and to meet the needs. Finally, the high aspects of social interaction is a tendency to get a partnership, in which it is a joint or an effort to cooperate between individuals or groups to achieve certain goals [3].

In the light of the theories and research finding and experiences, the main predictor to the food innovativeness in this research is the social interaction, which elaborated into four sub categories: family relationship, understanding, partnership and communication.

3 Research Methodology
The research population is cassava eater’s surrounding community in Cirendeu, West Java. The sample size based on Slovin formula by 5% of error’s probability is 182 people, taken randomly from the community. The research presented two main variables, social interaction as independent variable and food innovativeness as dependent variable. The operational definition is presented in Table 1.

The two variables were measured in Likert Scale. The research instruments were completely implemented after validity and reliability test of Cronbach’s alpha [8], in which it get score more than 0.6. Therefore, the instrument has met the scientific requirement. The rank of two main variables has adopted the following formula [13]:

\[
\text{Range: The Highest Score of Likert Scale – The lowest Score of Likert Scale}
\]

**The Used Likert Scale**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sub Variable</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Interaction</td>
<td>Family relationship</td>
<td>The existence of filiation with cassava eater, fraternity relationship by marriage, children adoption, and forefather kinship</td>
</tr>
<tr>
<td>Understanding</td>
<td>Respect to cassava eater and mutual understanding</td>
<td></td>
</tr>
<tr>
<td>Partnership</td>
<td>Readiness to assist, reciprocate, and work together</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Frequency of meeting, dialogue, sending and receiving the massage.</td>
<td></td>
</tr>
<tr>
<td>Food Innovativeness</td>
<td>A habit and a pleasure to create a food, process, and try the food’s taste.</td>
<td></td>
</tr>
</tbody>
</table>

By this formula, the social and food innovativeness descriptively were categorized into high (3.2-4.2), moderate (2.1-3.1), and low (1-2). While, to browse the effect of social interaction to the food innovativeness, the research adopted the regression analysis with the following model:

\[
Y = a + b1 X1 + b2 X2 + b3 X3 + b4X4 + e
\]

In which:

- \( Y \) = Food innovativeness
- \( X1 \) = Family relationship
- \( X2 \) = Understanding
- \( X3 \) = Partnership
- \( X4 \) = Communication
- \( a \) = Constant
- \( e \) = Error

### 4 Result and Discussion

#### 4.1 Respondent Characteristics

The characteristic of respondents consist of age, job, education level, and monthly income. The age and job are two important variables represented the modernity and ability to
perform the proper decision and to solve the problem. The young age is commonly more innovative, friendly, and has the strong tendency to adopt new idea and practice which are more valuable for their life. The job also describes the wide relationship, and capacity to catch the information flow.

In this research the majority of respondents are productive age, between 20-40 years. About the job, the research found the various types of worker. However, pleasantly the research found 75 respondents (41.20%) as the housewife and 14 persons (7.6%) as entrepreneurs. The two kinds of job could decisively be predicted as the social capital to support the food innovativeness. The housewife will get probably to try and test many kinds of additional foods. The monthly income, in this context, should seriously be considered. The research has found the majority of respondents (61.52%) have earned monthly less than 1 million. The lower revenue will lead someone to arrange their income to adequate the daily, weekly, and monthly needs. The food innovativeness based on the cheap raw material is a right way to decrease the strong dependence upon paddy-rice.

In the light of this finding, the respondents could strongly be predicted to get high food innovativeness. This assumption is mainly supported by the evidence of relatively high education level within the research respondents. For more clear, the majority of respondents (more than 50%) have gotten experience of junior and senior high school – the common as well as the Islamic junior or senior high school in local context (Table 2). The good education level could probably be a main support to get a right consumption habits based on the monthly income level.4.2. Conducting Testing

In conducting the test, the author uses the keyword in Table 1 for assessment.

4.2 Social Interaction

The social interaction in this research is family relationship, understanding, partnership, and communication between surrounding community of cassava eater with the traditional and custom society of Cirendeu, West Java. The indicators of family relationship – in which it is measured in four stages of Likert Scale are happy feeling to attend the wedding party, comfortable feeling if one of their family members get married with traditional community, good neighborhood feeling, and happy to get a children adoption by or from traditional society, and finally the perception that the member of traditional community has gotten happy feeling if they are invited by surrounding communities to attend the wedding party. The score gotten from such indicators was categorized into high, moderate, and low (Table 3).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Category</th>
<th>Frequency</th>
<th>%</th>
<th>Characteristics</th>
<th>Category</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages</td>
<td>20-40 Years</td>
<td>98</td>
<td>53.84</td>
<td>Education Level</td>
<td>ES/IES</td>
<td>76</td>
<td>41.76</td>
</tr>
<tr>
<td></td>
<td>40-60 Years</td>
<td>71</td>
<td>39.02</td>
<td></td>
<td>JHS/IJHS</td>
<td>60</td>
<td>32.97</td>
</tr>
<tr>
<td></td>
<td>&gt; 60 Years</td>
<td>13</td>
<td>7.14</td>
<td></td>
<td>SHS/HIS</td>
<td>39</td>
<td>21.43</td>
</tr>
<tr>
<td></td>
<td>Amount</td>
<td>182</td>
<td>100</td>
<td>Monthly Income</td>
<td>Diploma</td>
<td>7</td>
<td>3.84</td>
</tr>
</tbody>
</table>

| Job             | Private Worker | 24 | 13.19 | Monthly Income | < IDR 1 million | 112 | 61.52 |

| Tabel 2. The age and job of the research respondent
The mutual understanding was also measured closely by five indicators in Likert Scale, includes: (1) the feeling of respect to the indigenous society when they conduct the custom activities; (2) perception about the custom society’s respect to the religious activity in the surrounding community; (3) the feeling of comfortable to get a cassava’s food entertainment; (4) the feeling of happy to entertain the custom’s society by cassava food; and (5) the perception about the custom society’s respect to the non-cassava food.

The other five indicators were also implemented to explore and measure the partnership between the two groups of custom society and the surrounding communities. The indicators are happy feeling to: (a) help each other, (b) sale and purchase goods and services, (c) conduct mutual assistance; (d) manage the land together; and finally to (e) conduct a business cooperation. While, the five indicators to measure the tendency of warm communication are comfortable feeling to: (a) talk each other, (b) know the habit of traditional society of Cirendeu; (c) get a recommendation about the way of cassava-raw material-food processing; (d) exchange experience of food processing, and (e) send advice about the way of cassava food processing.

In the light of serial five indicators for each sub variable, the respondents got the moderate level for each sub variable of social interaction. The respondents who got the high social interaction level averagely are no more than 34% (Table 3). However, it is very important to note that partnership is one of sub variable, that the high level of it is fulfilled by 33.51% of the respondents. It clearly indicated the existence of warm partnership between the both custom society and its surrounding communities, which sequentially followed by communication, family relationship, and understanding mutually between the both different societies.

### 4.3 Food Innovativeness Level

The food innovativeness in this research is measured exclusively by eight indicators, in which it includes feeling comfortable: (a) to observe food variation made from cassava; (b) to learn the way to create food variation made from cassava; (c) to try the taste of the various
food created from cassava; (d) to try creating the various food made from cassava raw material; (e) to process the various food made from cassavas; (f) to create the rice from cassava’s raw material; (g) to make the cooked rice made from cassava; and (h) try to taste the cooked rice from cassava’s raw material.

In the light of eight indicators, the research has proved that more than 73% of respondents got the moderate level of food innovativeness. The respondents who got high level of food innovativeness is no more than 28%; while, the respondents who got the lower of food innovativeness level were small, merely 2.1% (Table 4). By the majority of respondents who got the moderate level of food innovativeness, it is highly potential to develop staple food diversification and decreasing the strong dependence upon rice staple food. However, of course, it needs the proper model of extension.

4.4 The Effect of Social Interaction to the Food Innovativeness

The social interaction with each sub variable hypothetically has a strong effect to the food innovativeness based on the above mentioned theory and research experience. The hypothesis, fortunately, proved significant and strongly significant based on the multiple regression model analysis. For more detail, the warm communication between the cassava eater communities and their surrounding society as well as the family relationship between the two different group of societies have given the strong effect for food innovativeness. The effect of two sub variables to the food innovativeness could be concluded statistically without any error probabilities. Meanwhile, the partnership within the both neighbourhood communities has merely taken the significant effect to the dependent variable of this research, indicated statistically by the 5% of error probability. The mutual understanding between the mentioned custom and common groups of society proved in contrary has not had significant effect to the food innovativeness, indicated statistically by the high error probability (Table 5).
In the light of the research finding proved by multiple regression analysis, the food innovativeness group of society could be created and replicated in several places. The agent of social change in this case could decisively adopt the field school to let the participant find and make a proper decision in food creation based on the cassava raw material. The agent of social change could kindly facilitate the food innovativeness group to extend the social interaction with the surrounding community, especially by the warm communication -- oral, gesture, as well as the social media; friendly family relationship; and followed by mutually partnership. The process will be the proper way to develop staple diversification and changing the habit of eating.

5 Conclusion

The research exclusively indicated the existence of food innovativeness within the surrounding community of cassava eater, and the moderate social interaction – in which it includes the communication, partnership, understanding, and family relationship – between the traditional and custom society and the surrounding society. The social interaction, especially communication, partnership, and family relationship, has excitedly given the significant and strongly significant effect to the food innovativeness. Based on the research finding, it could be created the social interaction model of extension to develop food diversification and to reduce the high dependence upon paddy-rice staple food.

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References


[16] D. Sunandar, “Pengaruh Interaksi Sosial terhadap Perilaku Konsumsi Pangan Ubi Kayu (Singkong),” Thesis, Faculty of Science and Technology, State Islamic University, Syarif Hidayatullah Jakarta, Indonesia, 2017


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