Design and Development of Vocational Learning Management Information System

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Abstract. The Vocational Learning Management Information System is a research that aims to design and develop an effective management information system in the governance of vocational learning activities at SMK Negeri 2 Sampang. Based on the results of interviews conducted with teachers at SMK Negeri 2 Sampang, there are several functional needs in the management of vocational learning activities for taking attendance and filling in class journals. Functional needs in vocational learning management relate to access to vocational learning history by teachers, both productive teachers, normative teachers and adaptive teachers, as well as monitoring the implementation of vocational learning activities by heads of expertise programs, curriculum assistants and school principals.This research aims to design and develop a vocational learning management information system to improve the quality of education in Madura by managing vocational learning, including through attendance, filling in class journals, and monitoring the implementation of vocational learning activities. The method in this research is Research and Development using the waterfall model which consists of five stages, namely needs analysis, system design, implementation and unit testing, system testing, and maintenance.

Keywords: madurese education, management information systems, vocational learning.

1 Introduction

Learning management information systems in schools is one of the fields that is developing very rapidly in the era of the industrial revolution [1]. Vocational learning is a mandatory activity that must be undertaken by students studying at Vocational High Schools in facing the era of the industrial revolution 4.0. Vocational education is education that equips students with competencies to have abilities aimed at producing graduates who can easily enter the industrial world and are capable of entrepreneurship [2]. Madura has now entered the era of industrial revolution 4.0 where the development of information technology has developed rapidly so that it requires quality human resources to be able to keep up with developments in industry. Education in Madura needs to improve the capabilities and skills of human resources, and must be able to complement the abilities of students who can contribute directly to society,

direct and form students who are ready to face the era of industrial revolution 4.0 to produce graduates who are able to compete in the global era [3].

The Vocational Learning Management Information System is a research that aims to design and develop an effective management information system in the governance of vocational learning activities at SMK Negeri 2 Sampang. Based on the results of interviews conducted with teachers at SMK Negeri 2 Sampang, there are several functional needs in the management of vocational learning activities for taking attendance and filling in class journals. Functional needs in vocational learning management relate to access to vocational learning history by teachers, both productive teachers, normative teachers and adaptive teachers, as well as monitoring the implementation of vocational learning activities by heads of expertise programs, curriculum assistants and school principals [4].

Several studies have been carried out developing learning management information systems. Research conducted by Pongajow, Rianto, and Kaparang entitled "Learning Management Information System for Teachers at SMK Negeri 2 Tondano" concluded that vocational learning management information system can provide progress for teachers in improving the teacher's daily journal management system and can also improve the quality learning in schools [4].
In 2019, Andrian, Wicaksono, and Rokhmawati conducted research by developing "Development of Management Information System for Administration of Learning Tools and Teacher Supervision at Vocational High Schools (SMK) (Studies at SMK Negeri 5 Malang)" with the aim of helping teachers in preparing learning tools and making it easier teacher supervision process [5]. Agarina, Sutedi, and Karim conducted research in 2024 with the title "Digital Administration Management System in Vocational Schools in Lampung Province" [6].

It is necessary to develop ICT innovation in Madura in the form of a "Design and Development of Vocational Learning Management Information System". This research aims to design and develop a vocational learning management information system for SMKN 2 Sampang to carry out vocational learning management, including through attendance, filling in class journals, and monitoring the implementation of vocational learning activities.

2 Research Method

This research uses a waterfall model which is often analogous to a waterfall. Waterfall model is a reference in the development research model which is usually used to develop products. In order for a product to function well, the product created must have effective value. The same thing has been explained that the R & D method is a research method used to develop products and test the effectiveness or ineffectiveness of the products that have been developed [7]. According to Ian Sommerville (in [8]), the stages that can be carried out include five stages, namely: requirements definition, system and software design, implementation and unit testing, Integration and System Testing, and Operation and Maintenance. The stages of the waterfall model [9] are showed in Figure 1.
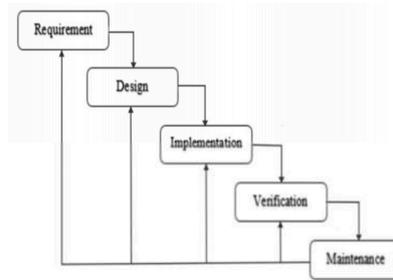
Fig. 1. Stages of waterfall model development.

The development research procedure can be interpreted as the stages in conducting research on the design and development of vocational learning management information system in accordance with the selected development model, namely the waterfall development model. The waterfall model was the first model that appeared around 1970, so this model is often considered an old model, but is most widely used in software development [10]. The waterfall model is a model that is often used in developing information systems or software. This model is analogous to a waterfall that flows continuously downwards and explanation of each stage is described in Table 1.

Table 1. Stages of waterfall model development.

Stages of waterfall	Description
Requirement	At this stage, requirement analysis is carried out through observations at vocational high schools and interviews with teachers. Until you find the need for the system to be built. This research is located at SMKN 2 Sampang. The product developed in this research is a Vocational Learning Management Information System for Improving the Quality of Education in Madura. This system will manage vocational learning, including through attendance, filling in class journals, and monitoring the implementation of vocational learning activities.
Design	After finding the need for the problem to build a system, as a basis for developing software products. The next stage is determining design includes UML, database and prototype of the vocational learning management information system.
Implementation	After carrying out the system design stage, the next stage is implementation and unit testing. In this stage, it takes a very long time and is difficult. When building an application, start by creating the interface and coding the application using a programming language, including PHP for developing web applications.
Verification	The next stage is the system testing stage. After coding the application that has been created, before it is used by other people, the testing stage is carried out first, namely by testing various aspects of the information that has been developed so that later the

	application that has been developed can be ascertained whether the application really has no errors from various conditions.
Maintenance	The final stage is maintenance of the system that has been created. At this stage, it is implemented after a product feasibility test with the aim of reviewing whether this application needs to be repaired or refined. Because the applications created will not always work well. When running it, there may still be small errors found or other features may be added.

Instruments are the key to success in research which aims to be a tool in collecting the required data [11]. The form of instrument in this development research is a questionnaire or questionnaire. The questionnaire was given to obtain suggestions and assessments regarding the products being developed.

Information system testing is made using the black box testing method from system expert. The method functions to test the functional suitability value of information system, by seeing whether the system is running well or not. The black box method research instrument is made according to the number of functionalities contained in the system. This instrument is also in the form of a questionnaire that matches usability and suitability according to user responses. Table 2 displays the grid for the user test.

Table 2. Grid for user test.

Indicator
Usefulness
Ease of Use
Ease of Learning
Satisfaction

The data analysis technique used in this development research is by collect data using research instruments that have been answered by respondents, then carried out with quantitative analysis and qualitative analysis. Quantitative analysis is applied to processing data in the form of numbers. That figure obtained from questionnaires answered by system expert and user respondents. Test results using the black box method are calculated using a scale Gutman. The Gutman scale was chosen to get strong answers, namely "valid" and "invalid" [7]. Calculation of system expert testing scores using equation 1.

$$percentage = \frac{total\ scores\ from\ respondents}{maximum\ total\ score} \times 100\%$$
(1)

The distribution of value categories from the functional test results can be seen in Table 3.

Table 3. Conversion rate achievement and system qualification.

Criteria	Interpretation
0%--20%	Very less high
21%--40%	Less high
41%--60%	Quite
61%--80%	High-worth
81%--100%	Very high

The results of user testing are by testing the usability system. Research instrument questionnaire answers can be calculated using a Likert scale which has five components in the details of the answer. Strongly agree (SS) is given 5 points, Agree (S) is given 4 points, Undecided (RG) is given 3 points, Disagree (TS) is given points 2, and Strongly Disagree (STS) is given point 1. Calculation of user trial scores using equation 2.

$$Totalscore = (Jss \times 5) + (Js \times 4) + (Jr \times 3) + (Jts \times 2) + (Jsts \times 1) \qquad (2)$$

Keterangan :

Jss = The number of respondents answered strongly agree
Js = The number of respondents answered agree
Jr = The number of respondents answered undecided
Jts = The number of respondents answered disagree
Jss = The number of respondents answered strongly disagree

Then the total score is calculated to obtain the criteria for interpreting the usability test results score using equation 1. Then the scores are converted into 5 scale scores on a Likert scale. Convert percentages to statements as in Table 3.

Qualitative analysis was obtained from criticism and suggestions from information system expert test questionnaires and user test questionnaires. From the analysis results obtained, they are used to revise development products [12].

3 Result And Discussion

In the requirement stage, the primary activity involves analysing the requirement for developing vocational learning management information system. Software requirement from system design stage is shown in Table 4.

Table 4. Software requirements.

Software application	Versi	Function
DIA Diagram	v.0.97	ERD, flowchart, and use case diagram modelling

Visual Studio Code	v.1.95.1	Programming
Google Chrome		Web browser to access website
Laragon	v.6.0	Programming tools platform
Sybase Power Desainer	v.16.5	CDM (Conceptual Data Model) and PDM (Physical Data Model) modelling

The language and other platform requirements used are shown in Table 5.

Table 5. Language and platform requirements.

Software application	Function
HTML and PHP	Programming language
MariaDB	DBMS
phpMyAdmin	DBMS Client
Apace	Web server
Windows	Operation system

The following are several examples of the display of vocational learning management information systems that have been produced. The result of login module is shown in Figure 2. The result of administrator dashboard module is shown in Figure 3. The result of presence based on teacher location is shown in Figure 4.
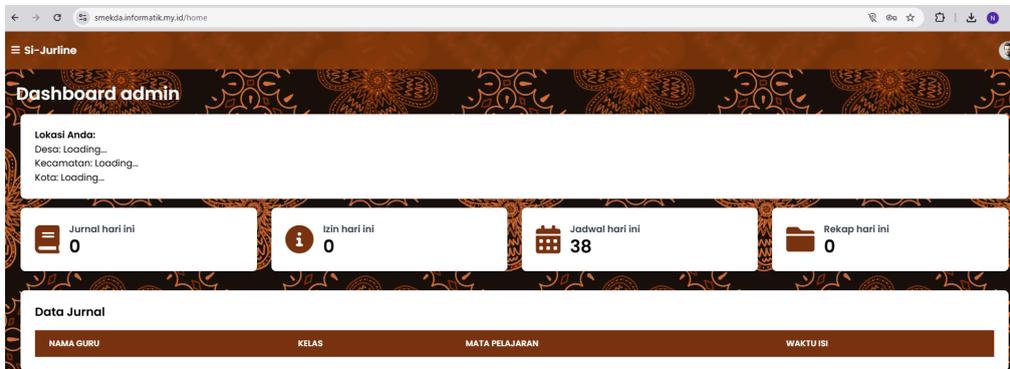

Fig. 2. Login module.

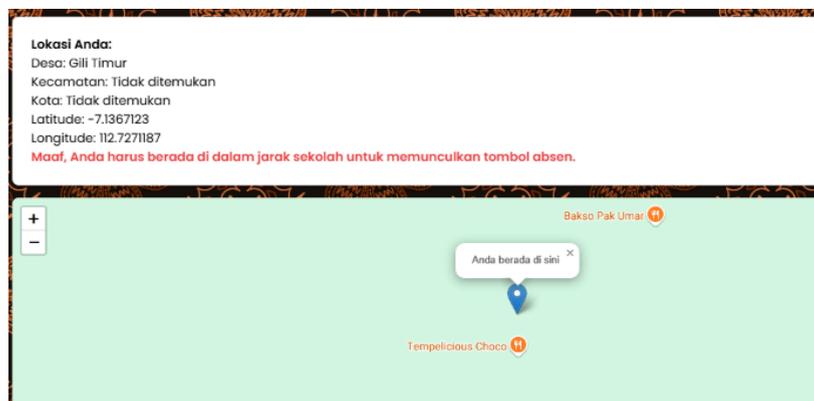**Fig. 3.** Administrator dashboard module.

Fig. 4. Presence based on teacher location.

4 Conclusion

This research generally resulted the vocational learning management information system. The system was developed to make easier process the teacher's daily journal which is carried out during activities learning in each class. The vocational learning management information system can help in managing vocational learning activities at SMKN 2 Sampang due to monitoring carried out by school leaders when subject teachers carry out learning activities and can evaluate learning activities carried out by teachers in class. The vocational learning management information system is also very helpful for subject teachers in filling in daily journals which is more practical and makes it easier for teachers.

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