Technology Acceptance and Customer Perception of Augmented Reality (AR) in Indonesian Beauty Industry

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Abstract. AR utilization in Indonesia is still infancy while the Indonesian beauty industry growth is currently appealing. This research aims to determine AR attributes that influence AR acceptance in the Indonesian beauty industry and how it shaped the customer perception. Through an experiment of three AR platforms (website, e-commerce, and social media) on 413 customers, the research also aims to discover which platform that gives the best experience. The experiment result is obtained by utilizing a questionnaire and be analyzed using PLS-SEM while the platform comparison is done by deploying Kruskall-Wallis. Interviews are also conducted before experimenting. Open coding and triangulation will be used to analyze the interview result. The findings indicate that all attributes of AR influence indicators of technology acceptance but vividness is found not influencing perceived ease of use. The research also shows that the good performance of interactivity, vividness, and novelty of AR will positively influence customer perception. Moreover, customer perception had the biggest effect on influencing enjoyment. The platform comparison reveals that e-commerce gives the best customer experience which may be caused by its good performance of interactivity and vividness and the familiarity of Indonesian females with the platform. In conclusion, if AR performs a good quality of interactivity, vividness, and novelty, customers will have a good perception towards the platform and accept the AR technology where they perceive the technology as easy to use, useful, and enjoyable.

Keywords: Augmented Reality, Technology Acceptance, Customer Perception, Beauty Industry, PLS-SEM.

1 Introduction

AR has emerged as an invention in technology that can improve the marketing environment [1]. Azuma [2] identifies AR as an interactive virtual object superimposed with the real world in real-time interaction. Mclean and Wilson [3] proposed three attributes of AR which are interactivity, vividness, and novelty.

Sephora found that women buy the wrong base of color about seven times before they find the right shade which appears to be the issue with purchasing make-up offline and online. By using AR, consumers can see the visualization of how a product would look like on them [4]. AR helps consumers to see whether the makeup is a perfect fit for them before purchasing it. In the beauty industry, some brands have been implementing AR on several platforms.

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Giorgio Armani and Maybelline use websites as their virtual try-on tool, MAC and NARS use YouTube. While L'Oréal Paris and Maybelline utilize both website and Shopee.

The growth of the Indonesian beauty industry is currently appealing whilst it is also placed as the main sector that contributes to national exports [5]. The Indonesian Ministry of Industry mentioned that the cosmetics industry needs to improve its marketing strategy to compete with imported products. He suggested utilizing "Industry 4.0" to create new added values. AR could be the answer to his suggestion. But, a thorough search of the relevant literature yielded no related literature on the implications of AR implementation on the Indonesian beauty industry. Furthermore, Mclean and Wilson [3] stated that AR application in consumer markets is still in its infancy so the study regarding AR is still lacking. Since the use of AR is still lacking in Indonesia, this research aims to determine AR attributes that influence technology acceptance and how it shaped the customer perception. The research will also assess 3 AR platforms which are Maybelline's website, e-commerce, and social media to discover which platform gives the best experience.

2 Literature Review

2.1 Technology Acceptance

2.1.1 Perceived Ease of Use

Perceived ease of use refers to the degree in which individuals perceive the use of technology as easy or effortless which results in increased productivity, efficiency, control, and performance [6]. Yim et al. [7] assert that perceived ease of use has been regarded as an influential variable in the adoption and the use of new technology.

2.1.2 Perceived Usefulness

Perceived usefulness is the individual's perception that using a technological system or function will increase their performance [3]. Yim et al. [7] assert that perceived usefulness has been regarded as an influential variable in the adoption and the use of new technology.

2.1.3 Enjoyment

Enjoyment is the degree to which the action of using technology is being enjoyable aside from any consequences of performance that may be predicted [8]. Enjoyment is a major attribute besides perceived usefulness and perceived ease of use to affect the attitude and intention to adopt and use a system [8].

2.2 AR Attributes

2.2.1 Interactivity

Interactivity is the AR capacity to manipulate the things that the user sees while the real and virtual world integrates [2]. Interactivity in AR increases the customer acceptance of the technological system [4] since it is easy for customers to interact and be involved with the content provided [9]. Moreover, interactivity will yield a positive influence on the perceived ease of use [3].

H_1: The interactivity of AR technology will positively influence the perceived ease of use.

Increased interactivity will enable customers to effectively gather more information Because it can stimulate cognitive information processing thus enhancing the usefulness of information in the customer's mind [10]. Additionally, interactivity provided in the AR content will yield a positive influence on the perceived usefulness [3].

H_2: The interactivity of AR technology will positively influence perceived usefulness.

Individuals who experience more interactive operation will tend to feel a higher sense of enjoyment. Interactivity in AR through media features can develop an enjoyable experience through the new product visualization [3].

H_3: The interactivity of AR technology will positively influence enjoyment.

2.2.2 Vividness

Vividness is defined as the clear, detailed representation of an image in the combination of the real and virtual world [3]. Jiang and Benbasat [5] assert that more vivid content can lead to an increased positive perception of customer experience in online shopping, which in turn affects customer perception of its ease of use. Vivid presentation of the real and virtual world will influence the perception of ease of use [3].

H_4: The vividness of AR technology will positively influence the perceived ease of use.

Increased vividness enables customers to collect product information more effectively by providing a realistic examination of virtual products which increases perceived usefulness [7]. Vividness encourages more active participation during product searching with more efficient and detailed data processing thereby enhancing perceived usefulness [11].

H_5: The vividness of AR technology will positively influence perceived usefulness.

By experiencing the new and real-like product in AR, customers will undergo a positive evaluation such as enjoyment [12]. The 3D virtual object in the online platform that provides a try-on product feature can encourage enjoyment in the customers' experience. Customers who experience more vivid pictures will result in a higher level of enjoyment [7].

H_6: The vividness of AR technology will positively influence enjoyment.

2.2.3 Novelty

The novelty is defined as the new, unique, and user-specific information combining the real world and virtual world each time an individual uses the feature which provides a unique experience [2][3]. Ease of use will increase productivity, efficiency, control, and efficiency [6] so the unique contents of the novelty will enhance the AR perceived ease of use [3].

H_7: The novelty of AR technology will positively influence the perceived ease of use.

The novelty of AR allows customers to personalize AR content to be matched with their interests and preferences [13]. The novelty will enhance the customer's shopping performance yielding increased shopping efficiency, making it easier to shop, complete a task, and visualize the product [3].

H_8: The novelty of AR technology will positively influence perceived usefulness.

Individual likes to interconnect with novel stimuli. Hoffman [9] has outlined that human psychological states lead to enjoyment and immersion since the strange stimuli provided by novel effects will stimulate the sharing and discussion about novel objects or situations.

H_9: The novelty of AR technology will positively influence enjoyment.

2.3 Customer Perception

Customer perception defined as how customers perceive a product or service and how customers assess the thing they have experienced [14]. Evaluation is common with perception. AR generated product visualization will commonly result in significantly greater values of customer evaluation [7]. Moreover, interactivity and vividness will promote positive customer evaluation when AR is running. Mclean & Wilson [3] suggest that the customer's perception can be influenced by the components of AR interactivity.

H_{10a}: The interactivity of AR technology will positively influence customer perception.
H_{10b}: The vividness of AR technology will positively influence customer perception.

AR is directly correlated with novelty effects. However, the customer's perception of AR uniqueness and newness which produces a prominent novelty effect will bring benefits from AR [7]. Therefore, it can be hypothesized that the novelty effect of AR will create a customer perception.

H_{10c}: The novelty of AR technology will positively influence customer perception.

Jihyun Kim [15] affirm that there is a positive relationship between perception and enjoyment which means that the customer's perception of the online environment will exhibit a beneficial impact on enjoyment. They also found that the customer's perception had the strongest effect to influence enjoyment.

H_{11}: Customer perception of AR technology will positively influence enjoyment.

2.4 Conceptual Framework

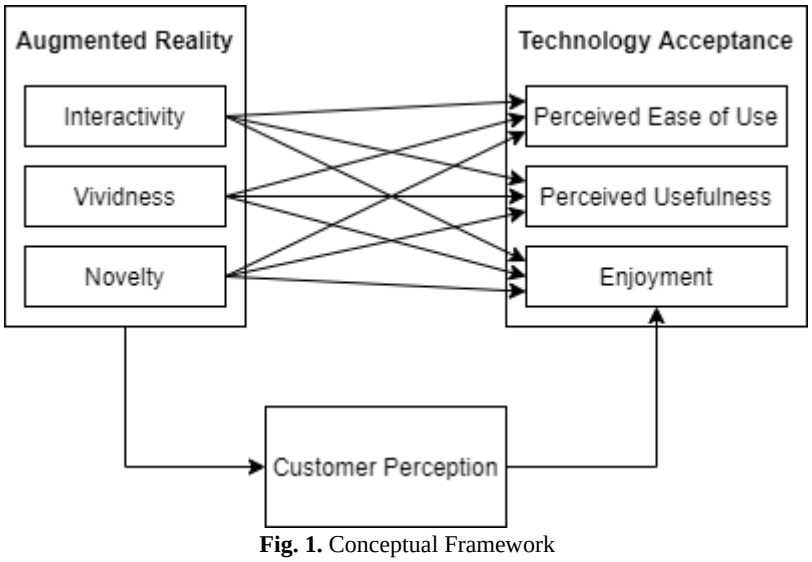

Fig. 1. Conceptual Framework

The framework is adopted from previous research by Mclean and Wilson [3] with some modifications from Yim [7] and Kim [15].

3 Research Methods

3.1 Qualitative Method

To validate whether the variables are worth being assessed, structured interviews with 10 respondents was conducted. The respondents are females whose ages ranged from 17 to 39 years old, domiciled in Indonesia, wear makeup from Maybelline/L'Oréal Paris/MAC, have used the AR virtual try-on feature (Maybelline's website/Shopee/YouTube). Open coding and triangulation will be used to analyze and verify the result.

3.2 Quantitative Method

The respondent characteristics of quantitative are the same with the qualitative but they should have not tried makeup try-on feature before. Pre-experimental design (one-shot case study) will be employed. To process the data obtained, PLS-SEM will be used. After the respondents have done the experiment step, they should fulfill the questionnaire. All questions are provided with a 7 Likert-scale. The minimum sample size of the test-marketing study is 200 [16]. Then, the platforms will be examined using the Kruskal-Wallis test.

4 Result and Discussion

4.1 Qualitative Method

4.1.1 Interactivity

Interactivity is a very important aspect of AR since it will provide a good experience for the customers. Shoppers will engage more with their shopping experience if they are provided with a highly interactive system [17]. The slow performance of AR in responding to customers will give a perception of an error system that makes customers lose interest and decide not to continue accessing the feature.

> *"This is important because when I do online shopping, I want it to be easy and fast", Rani.*

4.1.2 Vividness

Vividness is a very important aspect of AR because customers want the color shades in virtual makeup to look like the original one since it is the actual purpose of AR. It will help customers to compare and make decisions to buy the product which fits their face the most. The actual role of AR is to help the decision making of customers by visualizing how the products will look on the customer's face [3]. If the AR platform fails to do so, it will still create the gap between expectation and reality which is the main problem that AR wants to solve.

> *"It is the "actual purpose" of the AR platform. If it doesn't provide an original makeup look, customers will feel dissatisfied when they buy the product that doesn't have the exact color or look as expected", Chyntia.*

4.1.3 Novelty

The novelty aspect of AR is quite important. AR features do not have to always provide something new or unique to its users because AR is already a new and unique thing today. But

adding something new would be better to stimulate the interest of customers so it can give them a new customer experience and prevent them from feeling bored with the old features and product options. People perceive AR as a new technology [7].

"Not really important [...] But adding something new will make a better impression", Riwie.

4.1.4 Perceived Ease of Use

The perceived ease of use of an AR feature is very important because customers will tend to choose a system that is practical or easy to operate. The main function of AR is to help customers to shop easier so the absence of this aspect will make customers think it is a waste of time and simultaneously lose their interest and stop using the feature. In line with who said that shoppers will feel annoyed and abandon their transaction if they perceive the system is not beneficial [18]. Perceived ease of use has been regarded as an influential variable in the adoption and the use of new technology [7].

"If it's not easy to use than it's just a waste of time", Ara.

4.1.5 Perceived Usefulness

Perceived usefulness refers to how customers perceive the usefulness of AR and how it can enhance shopping time efficiency. This aspect is the main purpose of why customers use AR so they can use the AR on their mobile phones as a quicker and practical way to compare and buy makeup products so AR will enhance their shopping time efficiency. The benefits that contribute to the usefulness of AR are how it can enhance shopping productivity and how it can enable customers to shop more efficiently [3].

"If the AR platform provides good results or examples from the brand, it will increase our shopping time the make us more satisfied", Sherina.

4.1.6 Enjoyment

The enjoyment of AR can be obtained if the platform is easy to use and performs a quick response. People who are exposed to a higher level of interactivity will result in a higher level of shopping enjoyment [19]. If users enjoy their time while using AR, they will have the intention to use the platform again. Shoppers who gain positive experiences from the system will likely have a positive attitude and behavioral intention toward the system [18]. Meanwhile, AR platforms will give a bad impression to customers and make them immediately leave the platform. Shoppers who gain a bad experience from the system will likely abort the online transaction that was intended [18].

"Must be enjoyable to make us enjoy while using the platform. If it's not enjoyable, I can immediately exit", Anin.

4.1.7 Customer Perception of AR

An AR platform needs to get a good customer perception because it will create a good brand image. Brand image is a set of customer perception that increase the value of the products or services [19]. Customers will have the intention to try and use the platform again if they have a positive perception of the AR platform. Moreover, good customer perception of an AR platform will increase the possibility of the users to recommend the platform to their friends. Customers who engage with a brand who makes its users perceive the brand positively will recommend the brand to others [20].

"Obviously important. To make the users amazed and keeping the good brand image", Aliya.

4.1.8 Feedback for AR

The three platforms have similar problems regarding interactivity and vividness. The Maybelline's website already provides a complete set of makeup while the other platforms still provide a few options for makeup products. Specifically, for Shopee, some people perceive the platform as interactive and vivid but some people think the other way around. YouTube gives the novel effect since customers feel a new and unique experience by trying on makeup on YouTube where the platform is usually only used to upload or watch videos.

4.2 Quantitative Method

The survey was filled with 413 respondents in total. 134 respondents tried the website, 150 respondents tried Shopee, and 129 respondents tried YouTube. Respondents profile can be seen in table 1.

Table 1. Respondents Profile

Respondents Profile		
Age	17-20 years old	61.7%
	21-25 years old	32%
	26-30 years old	2.2%
	31-35 years old	1.9%
	36-39 years old	2.2%
Educational Level	Senior High School	17.9%
	D1	0.7%
	D2	0.2%
	D3	4.1%
	D4	0.7%
	Bachelor	71.4%
	Master	3.6%
	Others	0.7%
Domicile	DKI Jakarta	16.9%
	Bandung	46.2%
	Samarinda	0.5%
	Surabaya	2.4%
	Medan	1.2%
	Papua	0.2%
	Yogyakarta	1.9%
	Makassar	0.7%
	Others	29.8%
Spending per month	< Rp1.000.000	32.7%
	Rp1.000.000-Rp4.999.999	59.8%
	Rp5.000.000-Rp9.999.999	5.1%
	Rp10.000.000-Rp19.999.999	1.2%
	>Rp20.000.000	1.2%

4.2.1 Validity and Reliability

All variables are valid since all AVE scores are greater than 0.5 and reliable since all other indicators have scores greater than 0.7. All variables do not have any collinearity problems since VIF values are lower than 5. Result of validity and reliability can be seen in table 2.

Table 2. Validity and Reliability

Variable	Indicator	Label	AVE	Cronbach's Alpha	Composite Reliability	Outer Loadings	VIF
Augmented Reality	Interactivity	IR1	0.711	0.796	0.881	0.858	2.151
		IR2				0.884	2.312
		IR3				0.785	1.385
	Vividness	VV1	0.699	0.856	0.903	0.864	2.403
		VV2				0.870	2.522
		VV3				0.813	1.862
		VV4				0.795	1.750
	Novelty	NV1	0.827	0.896	0.935	0.892	2.588
		NV2				0.912	2.610
		NV3				0.925	3.137
Technology Acceptance	Perceived Ease of Use	PE1	0.838	0.903	0.939	0.904	2.921
		PE2				0.935	3.673
		PE3				0.907	2.588
	Perceived Usefulness	PU1	0.821	0.891	0.932	0.910	3.334
		PU2				0.928	3.711
		PU3				0.880	2.058
	Enjoyment	EY1	0.836	0.902	0.938	0.904	2.721
		EY2				0.932	3.460
		EY3				0.907	2.683
Customer Perception		CP1	0.735	0.820	0.893	0.879	1.972
		CP2				0.869	1.938
		CP3				0.823	1.670

4.2.2 Hypothesis Testing

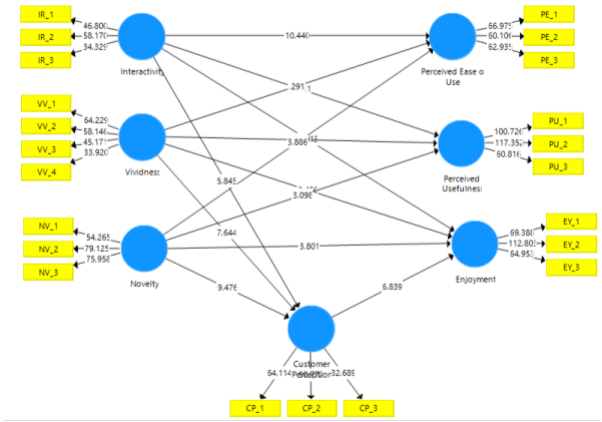

Fig. 2. Hypothesis Testing

To accept a hypothesis by using a two-tailed t-test of a 5% significant level, the T-statistics must be greater than 1.96 and the p-value must be lower than 0.05.

Table 3. Hypothesis Testing

Hypothesis	Structural Path	T-statistics	P Values	Result
H_1	IR→ PE	10.440	0.000	Accepted
H_2	VV → PE	0.291	0.772	Rejected
H_3	NV → PE	3.886	0.000	Accepted
H_4	IR → PU	3.911	0.000	Accepted
H_5	VV → PU	8.694	0.000	Accepted
H_6	NV → PU	3.098	0.002	Accepted
H_7	IR → EY	2.143	0.033	Accepted
H_8	VV → EY	2.450	0.015	Accepted
H_9	NV → EY	3.801	0.000	Accepted
H_{10a}	IR → CP	5.845	0.000	Accepted
H_{10b}	VV → CP	7.644	0.000	Accepted
H_{10c}	NV → CP	9.476	0.000	Accepted
H_{11}	CP → EY	6.839	0.000	Accepted

H_1: The interactivity of AR technology will positively influence perceived ease of use

The hypothesis is accepted. The quick response and control of users to navigate the AR feature makes people perceive that the technology is easy to use. In line with the interview result, it is better to perform a real-time response because customers want something easy and fast when it comes to the online environment.

H_2: The vividness of AR technology will positively influence perceived ease of use

The hypothesis is rejected. The study shows that the vividness of AR technology will not positively influence the perceived ease of use. This may be caused by the poor vividness quality of the AR platforms that are being assessed in this study.

H_3: The novelty of AR technology will positively influence perceived ease of use

The hypothesis is accepted. The unique contents of the novelty will enhance the perceived ease of use of AR. In line with Mclean [13], the unique contents of the novelty will enhance the perceived ease of use and perceived usefulness of AR.

H_4: The interactivity of AR technology will positively influence perceived usefulness

The hypothesis is accepted. The slow performance of AR in responding to customers will give a perception of an error system that makes customers lose interest and decide not to continue accessing the feature. The platform will not be useful for its target users.

H_5: The vividness of AR technology will positively influence perceived usefulness

The hypothesis is accepted. Providing color shades in virtual makeup to look like the original one is the actual purpose of the AR feature. It will help customers to compare and make decisions to buy the product which fits their face the most. Therefore, the AR is perceived to be useful.

H_6: The novelty of AR technology will positively influence perceived usefulness

The hypothesis is accepted. Updating the product options with the newest one might be an option to promote a novelty aspect in AR which also promotes the usefulness of AR since it helps customers to decide whether to buy the newly launched product or not.

H_7: The interactivity of AR technology will positively influence enjoyment

The hypothesis is accepted. Interactivity affects the convenient aspect of using AR features where the convenient aspect is related to enjoyment. In line with the interview result, interactivity affects the convenient aspect of using AR features where the convenient aspect is related to enjoyment.

H_8: The vividness of AR technology will positively influence enjoyment

The hypothesis is accepted. Customers will undergo a positive evaluation such as enjoyment by experiencing the real-like product in AR [12].

H_9: The novelty of AR technology will positively influence enjoyment

The hypothesis is accepted. Adding something new in the feature would stimulate the interest of customers so it can give them a new customer experience and prevent them from feeling bored with the old features and product options.

H_{10a}: The interactivity of AR technology will positively influence customer perception

The hypothesis is accepted. The slow performance of AR in responding to customers will give a perception of an error system that makes customers lose interest and decide not to continue accessing the feature. Meanwhile, a responsive feature will give a perception of a convenient AR platform.

H_{10b}: The vividness of AR technology will positively influence customer perception

The hypothesis is accepted. AR-generated product visualization will result in significantly greater values of customer perception [7].

H_{10c}: The novelty of AR technology will positively influence customer perception

The hypothesis is accepted. Customers perceive AR is already a new and unique thing today. There will be benefits by producing a prominent novelty effect to create the customer's perception of AR uniqueness and newness [7].

H_{11}: Customer perception of AR technology will positively influence enjoyment

The hypothesis is accepted. If the customers get a bad impression from AR, they will immediately leave the platform because they are not enjoying it. Customer perception had the biggest effect to influence enjoyment.

4.2.3 Kruskal-Wallis Test

Asymp. Sig.value must be lower than 0.05 to be accepted. There are significant differences between platforms if Adj. Sig. value is lower than 0.05. The higher mean indicates that the platform is better in influencing the variables.

Table 4. Technology Acceptance

	Technology Acceptance
Kruskal-Wallis H	19.527

Asymp. Sig.	0.000

YouTube and Shopee are the best platforms in influencing Technology Acceptance which may be caused by their good performance of interactivity and vividness. Customers feel YouTube provides a unique experience by enabling AR features in social media. According to Hootsuite (2020), YouTube is the most-used social media platform in Indonesia. This behavior supports the AR technology on YouTube since it can be accessed in a KOL's video.

Table 5. Adj. Sig.

Variable	Platform Comparison	Adj. Sig.
Technology Acceptance	Website - Social Media (YouTube)	0.014
	Website - E-commerce (Shopee)	0.000
	Social Media (YouTube) - E-commerce (Shopee)	0.476

Whereas for Shopee, it may be caused by the familiarity of Indonesian females with Shopee since it is the first top e-commerce site in Indonesia (Statista.com). Shopee is specially designed for Indonesian customers. It provides the makeup price in Rupiah currency and customers can directly buy their orders there. The confidence of the customers correlates monotonically with their level of familiarity.

Table 6. Mean Rank

Variable	Platform	Mean Rank
Technology Acceptance	Website	171.56
	E-commerce (Shopee)	233.35
	Social Media (YouTube)	213.18

5 Conclusion

All attributes of AR influence indicators of technology acceptance but vividness is found not influencing the perceived ease of use. The interactivity, vividness, and novelty of AR technology will positively influence customer perception. YouTube and Shopee are the best platforms in giving the best experience.

The study only assessed the influence of customer perception on enjoyment as one of the technology acceptance indicators. Future research should examine the influence of customer perception on other indicators which are perceived ease of use and perceived usefulness. Given the non-significant influence of vividness to perceived ease of use, future research should reassess these using AR platforms that have a very good quality of interactivity, vividness, and novelty. Moreover, future research should investigate the advantages of AR utilization in other industries.

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