The Effect of Augmented Reality Acceptance on E-Commerce on Cosmetic Purchase Decisions Using Combination TPB and TAM

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ABSTRACT

The fact that the sales of cosmetic products in Indonesia are increasing causes competition between brands to be unavoidable. One of the strategies the company prepared is to expand its marketing reach with e-commerce. But when selling cosmetic products by online new problem arises, scilicet the absence of a tester causes a lack of information about the product and how the technology is accepted. A lack of understanding about the product will affect consumer buying interest. Shopee answers this problem by providing a markerless augmented reality-based beauty cam feature. Based on this description, this study will analyze the effect of acceptance of the use of augmented reality on product purchase decisions using a combination of the Technology Acceptance Model and Theory of Planned Behavior. Data in his study was collected by distributing online questionnaires to Shopee users who have used this feature. The results of this study indicate that behavioral control variables do not affect a person's behavioral intention to use the beauty cam feature or the intention to buy cosmetic products. In addition to these correlations, all proposed correlations have a significant effect. The results of this study can stimulate future research and become a consideration for feature developers and business owners in other fields.

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1 Introduction

Along with population growth in Indonesia, there is an increased demand for necessities. One of them is the increasing demand for cosmetic products. These requests not only come from women, but requests also come from men. This evidenced by a specific increase in men seeking skincare and cosmetic needs over the past decade (Sikora et al., 2021). In addition, according to calculations carried out by the Association of Indonesian Cosmetics Companies and Associations (PPAK Indonesia), from 2015 to 2021, cosmetic sales in Indonesia grew by 0.235%. Seeing the opportunity to sell cosmetics, cosmetic companies in Indonesia are also mushrooming. According to data from the Ministry of Industry of the Republic of Indonesia, in 2020 there were 749 cosmetic companies. This figure has increased compared to the number of cosmetic companies in 2017, which were 607 companies. This fact confirms the intense competition between cosmetic brands in Indonesia, which causes every company to prepare a strategy to attract more consumers.

Expanding marketing reach is one of the strategies used by business owners to increase their sales (Malesev & Cherry, 2021). One way to expand marketing reach is to market products through e-commerce. This method can be one of the right strategies, considering that in 2021 there will be 87.3% of all internet users in Indonesia visiting retail sites or online stores (Tukino et al., 2021). However, online product marketing has a weakness, that is the unavailability of a tester. This problem needs to be considered considering that the unavailability of a tester causes a lack of information that customers have about the product. This ignorance causes doubts in purchasing decisions (Wang et al., 2021). With these obstacles emerged the innovations offered by e-commerce in marketing

cosmetic products, namely applying augmented reality technology that allows consumers to try these products virtually.

Augmented reality is a technology in multimedia and image processing that presents a perception of objects in the real world by adding information on the actual appearance of the user (Siriwardhana et al., 2021; Rachmanto, 2018). The application of augmented reality itself is divided into two types: image-based augmented reality and location-based augmented reality (Jin & Zheng, 2022). Aggarwal and Singhal (2019) also stated that image-based augmented reality is still divided into two categories, that is marker-based and marker less-based. One of the e-commerce that has implemented augmented reality is Shopee. The type of augmented reality used in the Shopee application is marker less based, so it is not necessary to scan a certain code when using it. At Shopee itself, this feature is called "Beautycam". Technology is certainly a new thing for some people.

Based on this description, it can be seen that many factors influence the intention of purchasing decisions by using augmented reality as a substitute for cosmetic product testers. According to the Theory of Planned Behavior (TPB) proposed by Ajzen (2020), self-intention is described in order to obtain the motivational factors that influence behavior, which is a sign of how much a person wants to try and how much effort a person is prepared to do. The variable in this theory is subjective norms, perceived behavior control, and attitude. In addition to using the TPB model, this research also uses the Technology Acceptance Model (TAM). This approach describes users' acceptance of the information technology they use (Marangunić & Granić, 2015). TAM has two variables, that perceived usefulness and perceived easy of use. By combining the two model approaches, researchers can see the extent of acceptance of the technology as well as the influence of the technology on buying interest. The statement is in line with the statement that the advantages of combining these two models provide an overview of the acceptance of technology and the influence of social factors simultaneously (Troise et al., 2020).

2 Theoritical Basis

2.1 Augmented Reality

Boeing researcher Tom Caudell proposed the word first augmented reality (AR). Augmented reality word comes from the 'augment' word which means to increase or optimize (Troise et al., 2020). An addition here means someone's understanding for something. According to Chen et al. (2019), Augmented reality is a technology that applies computer-generated virtual information, such as text, images, 3D models, music, videos, and various other media to the real world after being simulated. The application of augmented reality itself is divided into two types, that is image-based augmented reality, and location-based augmented reality (Jin & Zheng, 2022). Aggarwal and Singhal (2019) also stated that image-based augmented reality is still divided into two categories, that is marker-based, and marker less-based. Currently, marker less-based augmented reality is used often as product marketing media. Previous research stated that the current development of augmented reality shows that in the future, it will be necessary to use augmented reality for consumption or marketing (van Esch et al., 2019).

2.2 Combined Technology Acceptance Model – Theory of Planned Behavior

The combined Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) is a combination of decision-making theory and user acceptance theory of information technology proposed by Taylor and Tod in (Sulistiyarini, 2012). TAM is a theory that user acceptance of a technology they use is (Ajzen, 2020). The Technology Acceptance Model generally involves an attitude factor in each user's behavior with two variables, namely usefulness and ease of use, as an instrument to explain user intentions.

While TPB is used to analyze the difference between attitude and intention as well as intention and behavior. Previous research has also suggested that behavioral intention is the most crucial in predicting actual behavior, whereas intention is the desire to act specifically (Simanjuntak & Putra, 2021). Previous research conducted by Ajzen (2020) stated that TPB has three independent variables, that is attitudes, subjective norms, and antecedents of intention, or what is often known as perceived behavior control. The framework of combination TAM – TPB in Figure 1.

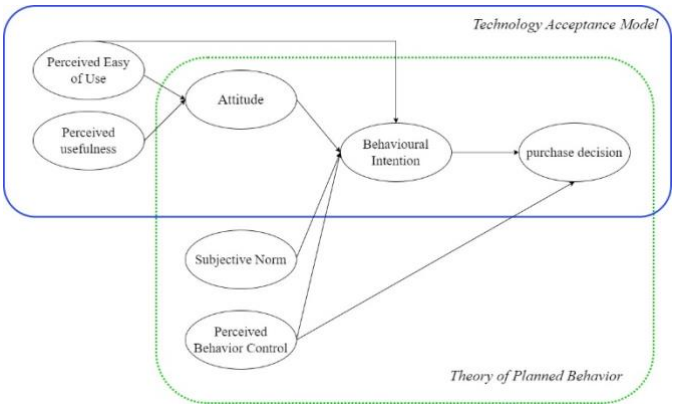

Figure 1. Combination technology acceptance model – theory of planned behavior framework

TPB and TAM several variables will be able to describe how the acceptance of technology and its influence on purchasing decisions. The first variable is perceived easy of use. This variable represents a person belief that technology is free from effort (Taherdoost, 2018). Developers can make several efforts to create a system that is easier to understand by using familiar icons, text, or application instructions for new users. Previous research stated that ease of use affects user trust in the attitude (Cheng, 2019; Majid & Budiman, 2021). In addition to influencing the attitude of this variable, it also affects the perceived usefulness and behavior intention (Cheng, 2019; Troise et al., 2020). Based on this description, the following hypotheses are generated:

H1: Perceived easy of use variable has a significant effect on the attitude to use augmented reality on Shopee.

H2: Perceived easy of use variable has a significant effect on the perceived usefulness to use augmented reality on Shopee.

H3: Perceived easy of use variable has a significant effect on the behavioral intention to use augmented reality on Shopee.

The next variable is perceived usefulness. This variable describes how sure a person is that the technology they use provides benefits or benefits for him (Kamal et al., 2020). Usefulness can tell the extent to which technology can improve the performance of a job. Previous research explained that perceived usefulness affects attitude (Cheng, 2019). However, several studies also found that the perceived usefulness variable did not affect attitude (Kusuma & Susilowati, 2007). Based on the results of previous studies that have been described, the researcher proposes a hypothesis:

H4: Perceived usefulness variable has a significant effect on the attitude to use augmented reality on Shopee.

Attitude is the next variable. Attitude itself is a person's readiness to take specific actions against something (Taherdoost, 2018). Attitudes can be addressed negatively by criticizing or hating. In contrast, a positive attitude is shown by liking and tending to expect objects. Research by Cheng (2019), states that attitudes affect the behavior intention variable. Based on this description, the researcher proposes a hypothesis:

H5: Attitude variable has a significant effect on the behavior intention variable to use augmented reality on Shopee.

The next is the subjective norm variable. This variable is assumed to be the belief that the individual agrees explicitly or does not display a behavior (Hsu & Huang, 2012). Several previous studies found that the subjective norm variable influenced the behavior intention variable (Sulistiyarini 2012; Cheng 2019). However, the opposite was found in Nadlifatin et al. (2020), which found that the subjective norm variable did not affect the behavior intention variable. With these differences, the researcher decided on a hypothesis alternative:

H6: Subjective norm influences user's behavioral intention to purchase cosmetic using augmented reality technology at Shopee.

The following variable is behavior control which explains past actions, events, or circumstances that shape a person's behavior in the present (Ajzen, 2020). Previous research stated that the greater the behavioral control, the stronger the user's interest in carrying out the attitude they are considering (Cheng, 2019). However, the opposite result is shown in the research conducted by Sulistiyarini

(2012) and Nadlifatin et al. (2020) which shows that behavioral control does not affect behavioral interest. In addition to having a relationship with the behavioral intention variable, previous research shows that the behavioral control perception variable significantly influences purchasing decisions (Wildan et al., 2018). However, the opposite was found in research conducted by Imtihanah (2022) which stated that the perceived behavioral control variable did not have a positive and significant effect on the purchasing decision variable. Based on the differences in the results of previous studies, the researcher proposes an alternative hypothesis as follows:

H7: Behavior control variable has a significant effect on the behavior intention to purchase cosmetic using augmented reality technology at Shopee.

H8: Behavior control variable has a significant effect on the purchasing decision to purchase Cosmetic using augmented reality technology at Shopee.

Behavior Intention can be interpreted as how much a person wants or intends to use information technology on an ongoing basis, assuming that the person has access to information (Marangunić & Granić, 2015). Previous research stated that behavioral intention positively influences purchasing decisions (Sitohang & Adhi, 2021). However, the opposite result is shown in research conducted by Nulufi and Murwartiningsih (2015) which shows that behavioral intention does not affect purchasing decisions. With the differences in research results, the following are the hypotheses proposed by the researchers:

H9: Behavior Intention variable has a significant effect on the purchasing decision to purchase cosmetic using augmented reality technology at Shopee.

3 Method

This research was conducted with a quantitative approach. In other words, data will be processed and analysed to obtain research results. The data in this study were obtained by distributing online questionnaires on several social media platforms. The questionnaires distributed included the variables contained in TAM and TPB with a scale of 1 to 4. According to a statement Hair et al. (2012), the number of respondents used was 100 to 200. Furthermore, if the required data has been collected, the data will go through a data screening process through the excel tools created by James Gaskin. This process is used to delete data that has the potential to make data invalid. After screening data, the data will be processed and analysed using SmartPLS 3. The calculation process on SmartPLS is divided into 2 steps, that is outer model and inner model.

3.1 Outer Model

The outer model is often known as the data validation process. There are two tests on the outer model, that is validity test and reliability test. Validity test is needed to measure the ability of research instruments to measure what should be measured (Sugiyono, 2013). Validity test is still divided into convergent validity and discriminant validity. Convergent validity aims to determine the validity of each relationship between the indicator and its latent construct or variable (Darma, 2021). We can see this test through the results of the outer loading of each item contained in the study with a minimum value that must be met 0.7 (Sürücü & Maslakçi, 2020). In addition to outer loading, convergent validity can also be seen through average variance extraction (AVE) with a minimum value of 0.5. Then the discriminant validity test aims to ensure that each item's relationship with the original variable is stronger than the other variables (Sürücü & Maslakçi, 2020). This test can be seen by looking at the Fornell-Lacker value or the square root value of the AVE, provided that the correlation value of each item is greater than the other variables. The next stage is the calculation of the reliability test. This test aims to test the consistency of the variables in performing calculations. This test is passed by looking at the Cronbach alpha, and composite reliability values, with a minimum value of 0.5.

3.2 Inner Model

The results of calculations at this stage will outline the relationship between variables. There are several tests, and the first is path coefficient test. This test measures the effect of the independent variable on the dependent variable with a minimum value of 0.1 (Sugiyono, 2013). The next test is coefficient of determination (r-square) which is used to predict how significant the contribution of the independent variables in this study (Darma, 2021). The calculation results will be divided into 3 levels, namely 0.25 (weak), 0.5 (middle), 0.75 (strong). Furthermore, the t-test was carried out to see the influence of a correlation and significant value by looking at the t-statistic and p values (Darma, 2021). A correlation is significant if the t-statistic value is more than 1.96 and the p-value is not more

than 0.1. The next test on the inner model is the effect size (f^2), which aims to see how much influence there is between the correlations in the study (Sugiyono, 2013). The results of this calculation are grouped into 3 groups, namely 0.02 (small effect), 0.15 (medium effect), and 0.35 (large effect). The last test is the relative impact (Q^2) which is useful for knowing that the variables used in a model have predictive relationships with other variables (Darma, 2021). The results of this calculation become three, namely 0.02 (small effect), 0.15 (medium effect), and 0.35 (large effect).

4 Results and Discussion

This section will describe the results of calculating the data obtained from the distribution of online questionnaires. The analysis is carried out based on the hypothesis compiled in the previous section. That way, based on the data that has been processed, the researcher will find out more about whether the hypothesis is accepted or rejected. The first step is data screening. Data that can cause invalidity will be deleted at this stage. The deleted data include decreasing, increasing, high-low, and consistent data. Of the 200 data obtained, 11 data did not meet the requirements, and 29 data were deleted, leaving 160 data as listed in Table 1.

Table 1. Screening data result

Description	Data
Total data	200
Not eligible data	11
Data error	29
Total	160

After the data is ready, proceed to the process of testing the validity of the data. The first data validity test is convergent validity by looking at the outer loading value and the AVE value. Each must have a minimum value of 0.7 for outer loading and 0.5 for AVE (Sürücü & Maslakçi, 2020). At this stage, an item with an outer loading value below 0.7 will be deleted. The following is the result of the outer loading calculation listed in Figure 2.

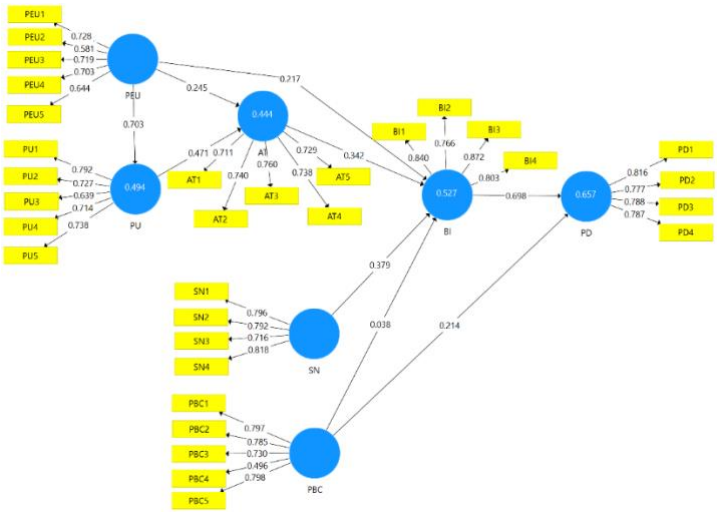

Figure 2. Outer loading result

At the outer loading calculation stage, there are several indicators that do not meet the minimum value, which is 0.7 according to the opinion of previous researchers. The invalid indicators include PBC4, PEU2, PEU5, and PU3. Indicators that do not meet the requirements at this stage will be deleted, leaving valid indicators. The following is the result of the outer loading calculation after deleting the indicators that do not match the ones listed in Figure 3.

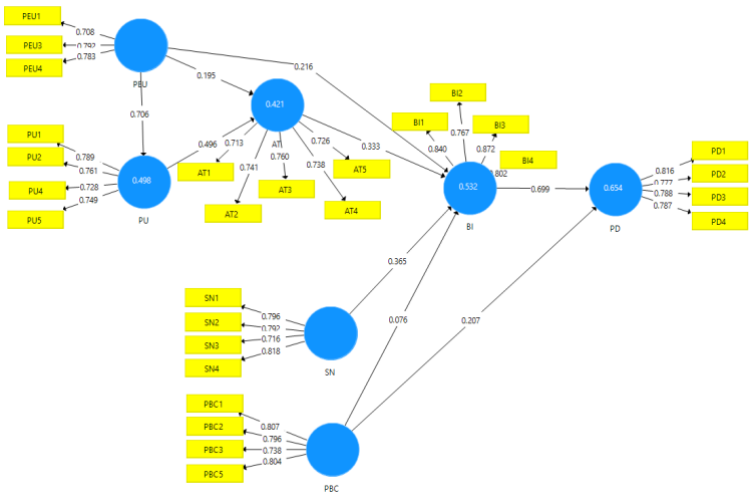

Figure 3. Revised outer loading result

After deleting indicators that do not match, the following calculation is carried out that is average variance extracted (AVE). This calculation describes the magnitude of the variable variance contained in the latent construct. In this calculation, all variables meet the minimum value of 0.5. The results of the AVE calculation are shown in Table 2.

Table 2. AVE result

	AVE
AT	0.541
BI	0.675
PBC	0.619
PD	0.628
PEU	0.581
PU	0.573
SN	0.611

The next calculation is the calculation of discriminant validity by looking at the value of the square root of AVE or Fornell-Lacker. After calculation, all correlations between variables have a greater Fornell-Lacker value than correlations with other variables. The results of these calculations are listed in Table 3.

Table 3. Discriminant validity result

	AT	BI	PBC	PD	PEU	PU	SN
AT	0.736						
BI	0.573	0.821					
PBC	0.509	0.424	0.787				
PD	0.515	0.787	0.504	0.792			
PEU	0.545	0.540	0.417	0.565	0.762		
PU	0.634	0.709	0.515	0.708	0.706	0.757	
SN	0.227	0.525	0.240	0.453	0.302	0.363	0.781

Based on the data in Table 3, it can be seen that the correlation value between perceived easy of use variables is more significant, 0.762. When compared, the correlation between PEU and PU is 0.706, and the correlation between PEU and SN is 0.302. Based on this description, it can be concluded that the perceived easy of use variable has a good level of discriminant validity and is said to be valid. The following calculation is the reliability test by looking at the value of Cronbach's alpha and composite reliability with a minimum value of 0.6 each. The results of these calculations are listed in Table 4.

Table 4. Value of Cronbach's Alpha dan Composite Reability

	Cronbach's Alpha	Reliabilitas Komposit
AT	0.789	0.855
BI	0.838	0.892
PBC	0.803	0.867
PD	0.802	0.871
PEU	0.637	0.805
PU	0.752	0.843
SN	0.789	0.862

The next stage is calculating the inner model, in which there are several calculations. The first calculation is the path coefficient used to determine the effect of the previously proposed correlation. The minimum value that must be met is 0.1. The calculation results of the path coefficient are in Table 5 and Figure 4.

Table 5. Path coefficient result

	AT	BI	PBC	PD	PEU	PU	SN
AT		0,333					
BI				0,699			
PBC		0,076		0,207			
PD							
PEU	0,195	0,216			0,706		
PU	0,496						
SN		0,365					

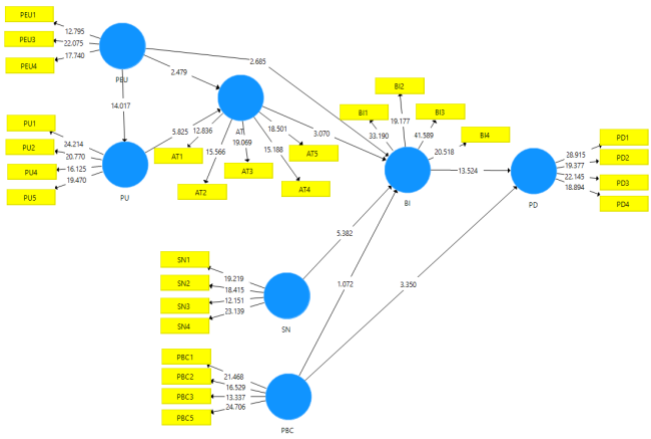

Figure 4. Inner model

Based on the results of the calculations in Table 5, one correlation has a value below 0.1, namely the correlation between BI and PBC. The following calculation is the r-square, where the results of the calculation are divided into 3 groups, namely 0.25 (weak effect), 0.5 (moderate effect), and 0.75 (strong influence). The following are the results of the r-square calculation listed in Table 6.

Table 6. R-square result

	R Square
AT	0.421

BI	0.532
PD	0.654
PU	0.498

Based on the results in Table 6, the attitude and perceived usefulness variables have a weak influence with values of 0.421 and 0.498, respectively. Furthermore, the behavior intention and purchase decision variables have a moderate effect with values of 0.532 and 0.654, respectively. The following calculation is the effect size test (f^2), whose results will be grouped into three, namely 0.02 (small effect), 0.15 (medium effect), and 0.35 (large effect). The following is the result of calculating the effect size in Table 7.

Table 7. Effect size result

	AT	BI	PBC	PD	PEU	PU	SN
AT		0,143					
BI				1,160			
PBC		0,009		0,102			
PD							
PEU	0,034	0,064				0,991	
PU	0,217						
SN		0,255					

Based on the results of the calculations described in Table 7, it can be seen that there is one hypothesis or correlation that is not supported. The correlation that is not supported is PBC with BI with a value below 0.02, which is the minimum limit. Next is the relative impact test (Q2) with the blindfolding method. The results of this calculation will be grouped into three groups, namely 0.02 (small effect), 0.15 (medium effect), and 0.35 (large effect). The results of the calculation of the relative impact test are described in Table 8.

Table 8. Relative impact value

	Q^2 (=1-SSE/SSO)
AT	0.216
BI	0.344
PBC	
PD	0.399
PEU	
PU	0.277
SN	

Variables AT, BI and PU have a moderate influence. In comparison, the PD variable has a strong influence. Based on the results of these calculations indicate that the model has a relevant predictive. In other words, the independent variable can predict every change in the dependent variable. The last test is to test the hypothesis by looking at the t-statistic and p-values. A hypothesis will be rejected if the t-statistic value is below 1.96 and the p-value is more than 0.1 (Darma, 2021). The following are the results of the calculation of the hypothesis test listed in Table 9.

Table 9. Path coefficient and hypothesis test

Hypothesis		Original sample	T-statistic	P Values	Conclusion
H1	*Perceived easy of use → Attitude*	0.198	2.587	0.005	Accepted
H2	*Perceived easy of use → Perceived usefulness*	0.706	14.169	0.000	Accepted
H3	*Perceived easy of use → Behavior Intention*	0.215	2.759	0.003	Accepted
H4	*Perceived usefulness → Attitude*	0.497	6.558	0.000	Accepted

H5	*Attitude → Behavior Intention*	0.333	3.070	0.002	Accepted
H6	*Subjective Norm → Behavior Intention*	0.366	5.382	0.000	Accepted
H7	*Behavior Control → Behavior Intention*	0.076	1.072	0.284	Reject
H8	*Behavior Control → Purchase Decission*	0.207	3.350	0.001	Accepted
H9	*Behavior Intention → Purchase Decission*	0.699	13.524	0.000	Accepted

Based on the calculations listed in Table 9, it can be seen whether the previously proposed hypothesis is accepted or not. The first hypothesis is that perceived easy of use affects attitude. The correlation obtained a coefficient value of 0.198, a t-statistic value of 2.587, and a p-value of 0.005. Based on the translation of the calculation results, perceived easy to use influences attitude toward using augmented reality at Shopee. When users find it easy to use the augmented reality feature on Shopee, the user will show a positive attitude towards the augmented reality feature.

The next hypothesis is that perceived easy of use affects perceived usefulness. The calculation results show that this correlation has a coefficient value of 0.706, a t-statistic value of 14,169, and a p-value of 0.000. Based on the results of these calculations, it can be seen that the perceived easy of use variable influences the perceived usefulness variable. That way, it can be interpreted that the easier information technology is used, the value of its usefulness will increase in the eyes of the user.

The third hypothesis is that perceived easy of use affects behavior intention. Calculations on the correlation obtained the parameter coefficient value of 0.215, the value of t-statistics is 14.169, and the p-value obtained for this effect correlation is 0.003. Based on the calculation results, the perception of easy of use influences interest in purchasing technology products. In other words, when users feel the convenience of the augmented reality feature on Shopee when shopping for cosmetic products, it will give them an interest in buying cosmetic products using augmented reality.

Next, perceived usefulness affects attitude. Based on the data in Table 9, this correlation has a coefficient value of 0.497, a t-statistic value of 6.558, and a p-value of 0.00. If the user feels the benefits or usefulness of using the augmented reality feature on Shopee, the user will have a positive attitude toward the feature.

The following hypothesis is that attitude affects behavior intention. The parameter coefficient value obtained is 0.333, the t-statistic value is 3.070, and the p-value obtained for this correlation is 0.002. Based on the translation of the results of these calculations, it can be seen that if every user feels confident in the augmented reality feature, the user will show buying interest in buying cosmetic products. Put, the higher the user's trust in the feature, the higher the user's interest in buying the product. Trust in the feature here also includes trust in the information contained in the feature.

Hipotesis The sixth hypothesis proposed is that subjective norms affect behavior intention. The value of the parameter coefficient in this correlation is 0.365. Then, the t-statistic value obtained is greater than the minimum limit of 1.96, which is 5.382. The correlation of the effect of this variable also obtained its p-values of 0.00. Based on these results, subjective norms influence behavior intention in using augmented reality in shopping for cosmetic products. These results indicate that the study of people around influences a person's behavioral interest in doing something.

The next hypothesis is the only hypothesis rejected in this study, that behavior control affects behavior intention. This correlation has t-statistics and p-values that do not meet the requirements, where each value is 1.702 and 0.284. Thus, it can be concluded that perceived behavior control does not affect behavior intention in buying cosmetic products using augmented reality at Shopee.

Next is the hypothesis that behavior control affects purchase decisions. This correlation obtained a coefficient value of 0.207. Then, the t-statistic value obtained is 3.350, where the value already meets the minimum standard of 1.96. The p-values obtained do not exceed the maximum value of 0.1, which is 0.001. Based on the calculation results obtained, perceived behavior control significantly influences the user's perception of purchasing decisions in using augmented reality at Shopee. If the environment around a person, many suggest making a purchase, then the user will buy the product.

The last hypothesis proposed in this study is that behavior intention affects purchase decisions. This correlation has a coefficient value of 0.699. Then, this correlation obtains a t-statistic value of 13.524, where the value exceeds the minimum value of 1.96. The p-value obtained by this correlation

is 0.00, which is still below the maximum value of 0.1. These calculations indicate that the more someone intends to buy cosmetic products, the more confident that person will decide to buy the product. In other words, the intention positively and significantly influences purchasing decisions.

5 Conclusion

The use of augmented reality as a substitute for cosmetic product testers in e-commerce is a new thing. With the availability of these features, buyers can buy and try products anywhere and anytime. However, because technology is a new thing, it is not yet known how the acceptance of the technology and how affects purchasing decisions. This study aims to analyze the factors that influence the acceptance of augmented reality technology and the effect of using this technology on the purchasing decisions of cosmetic products. The approaching model used in this study is a combination of the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). The study results show that all the variables in TAM and TPB affect the decision to purchase cosmetic products using augmented reality, except for the correlation between behavior control and behavior intention. In connection with perceived easy of use which has a very high influence on perceived usefulness, feature providers can provide directions on how to use these features directly on the Shopee application. This is because not all users immediately understand how to use these features. The directions can be in the form of step-by-step navigation on how to use the feature. With the availability of step-by-step navigation on how to use it directly on Shopee, users can learn directly through the Shopee application. That way, the convenience felt by the user will increase and other variables will also increase. Including usage intentions and purchase decisions.

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