Exploring the Factors Affecting in the Adoption of E-Learning Systems in COVID-19 Pandemic: The Higher Education Students Perspectives

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Abstract

The Coronavirus disease (COVID19) has disrupted the daily activities including the teaching and learning activities in education sector. This research explored the factors affecting the adoption of the e-learning system during the pandemic from the perspective of higher education students based on the framework of Technology Acceptance Model (TAM) with two primary factors that influence the intention to use e-leaning system: perceived usefulness and perceived ease of use. This was a quantitative research with non-probability sampling techniques of 135 respondents measured by 5 Point Likert scale and used the method of Structural Equation Model Smart Partial Least Square (SEMPLS) software version 3.2.9 analyzed the data obtained. The findings indicated that prior e-learning experience and system quality were positively significant to perceived ease of use, however, prior e-learning experience did not significantly affect to perceived usefulness. System quality was positively significant to perceived usefulness. Perceived ease of use and perceived usefulness were positively significant to attitude towards e-learning system. Attitude was the most prominent construct to affect the intention to use E-leaning system during the Covid19 Pandemic positively significant.

Keywords

E-Learning System, Intention to Use, Technology Acceptance Model, Pandemic, COVID19

1. Introduction

The global pandemic COVID-19 disrupted many business and companies, changed from offline to online activities and become trendier during pandemic (AL-Hawari et al. 2021; Anita et al. 2021; Bhatti et al. 2020) from contact to noncontact consumerism (Moon et al. 2021), including the teaching-learning activities in the university. The impact and rapid spread of the COVID-19 pandemic that has hit the world had a major impact on society at large, especially in the education, employment, business, and government sectors. This is huge and unprecedented to worldwide

(Papapicco 2020). The closure of educational institutions is considered as one of the necessary preventive measures to contain the spread of the pandemic (Viner et al. 2020).

As the current closure of educational and teaching institutions that rely heavily on distance learning, the real practice will lead to innovative teaching and learning methods to support student learning in the midst of a pandemic crisis. The government in dealing with educational institutions provides the necessary facilities for distance learning. Like research from the University of the United Arab Emirates (UAE), some of the infrastructure for distance learning was built before the pandemic; Even before the pandemic, there were many sophisticated educational platforms and resources in the Ministry of Education and higher education institutions, indicating that student satisfaction and attitudes towards eLearning and virtual classrooms are generally strong with variable degrees between variables (Malkawi et al. 2021).

The impact of the COVID-19 pandemic has forced all universities to carry out the teaching and learning by distance education or e-learning, all activities are carried out online during the semester. All students stay at home and learn by e-learning. In online lectures, lecturers can record what they have learned so that students can see it again. In addition, online exams, online assignments and online quizzes are completely online for each course (Malkawi et al. 2021). In addition, the teaching and learning platform needs to be continuously to be updated to continue to development and training for lecturers and students. The support from the university's current to meet all educational needs through elearning and virtual classrooms, such as adequate infrastructure and technical support (Malkawi et al. 2021).
With the emergent change and shift to e-learning and the virtual classroom environment during the pandemic can affect the students' behavior. In the transition period students have to learn a lot of new things through virtual classes. Some previous research highlights some of the challenges faced during the e-learning system adoption such as: internet access (Wi-Fi), financial problems, and the implementation of online learning with a survey conducted on the perception of international students in China during pandemic (Demuyakor, 2020). There were six various of online learning in the survey that conducted in previous research: (1) live broadcast courses; (2) MOOCs; (3) SPOCs; (4) recorded broadcast courses; (5) online education platforms (example the Blackboard) and (6) blended learning, which combines online and offline learning (e.g., flipped classroom) (Wang et al. 2020).

This research formulates the problems that need to explore from the data obtained such as to explore the effect of System Quality, E-learning prior experience, Perceived Usefulness, Perceived Ease Of Use, Attitude Towards Using, Behavioural Intention to Use on E-Learning systems during the COVID-19 pandemic.

This research continue the previous research conducted by Mailizar et al. (2021). In this study, the main focus is higher education students in JABODETABEK during adoption for e-learning that more than a year. The researchers are interested to further study about the systems quality and prior experiences as antecedents' factors in adopting the elearning systems during pandemic.

2. Literature Review

2.1 E-Learning and Virtual Class

The E-learning and virtual class is defined as the teaching and learning activities fully delivered by online with using learning management system that able to be accessed by teachers and students in anytime and at anywhere including access to the learning material and the assessment as well as forum group discussion. The E-learning also defined as a learning process with internet based and make the students more independent (Schworm and Gruber 2012).

2.2 Technology Acceptance Model (TAM)

The TAM is defines as a person's act, emotional feeling, positive or negative, behavioral intention towards adopting a technology and predicted by 2 primary factors of TAM such as perceived usefulness and perceived ease of use (Davis 1989a). From original theory of TAM, the perceived ease of use able to be the predictor to perceived usefulness. In this research will use the approach of TAM such as perceived usefulness and perceived ease of use will be examined towards attitudes and intention to use e-learning system for higher education students.

2.3 Theory Planned Behavior (TPB)

The Theory Planned Behavior (TPB) is the theory with the most used frameworks to examine about individual behavior. Currently, many researchers use this framework to do research and considered one of the most effective models to predict about behavioral intention (Ajzen 1991; Yuriev et al. 2020).

2.4 System Quality

In fact, the use of e-learning is considered as one of the most advanced and significant web-based systems in the education sector (Almarashdeh 2016). E-learning can also refer to the delivery of educational resources and services through digital technology in order to become an indispensable and necessary tool to improve the quality of teaching and learning in the classroom so that universities around the world invest large sums of money and resources to improving the quality of their e-learning system (Almaiah 2018). System Quality has been used as variable in the previous research as one of the external factors to determine the behavior intention and as technical factors such as system reliability, response time, ease of access, and speed (Lin 2007; Pituch and Lee 2006). Thus, H1a and H1b in this research as follow:

H1a: System Quality has a positive relationship with perceived usefulness
H1b: System Quality has a positive relationship with perceived ease of use

2.5 E-Learning Prior Experience

The e-learning prior experience meaning as the familiarity with experience in online learning and teaching in the past. This variable has been used in the previous research to examine the perceived usefulness and perceived ease of use towards intention to use (Wang et al. 2020). Thus, H2a and H2b in this research as follow: H2a: E-learning Prior Experience has a positive relationship with perceived usefulness
H2b: E-learning Prior Experience has a positive relationship with perceived ease of use

2.6 Perceived Usefulness

The perceived usefulness defines as a user's believe that using a specific technology will create values for the users (Olaleye et al. 2018). In summary if the users find that using the technology will create benefit and will satisfy them, meaning there is positive attitude towards using the technology (Lee 2018; Olaleye et al. 2018). The previous study found that perceived usefulness had positive relationship with attitude and intention to adopt e-learning system during the COVID-19 pandemic (Sukendro et al. 2020). Thus, H3 in this research as follow:
H3: Perceived usefulness has a positive relationship with Attitude towards the E-Learning System

2.7 Perceived Ease of Use

Perceived ease of use is one of the necessary attribute for perception (Burton-Jones and Hubona 2005) and refers to extent to users' perceive about particular technology, accessing websites, internet function and web-interface is easy to use (Davis 1989b). The previous study found the perceive ease of use has significant and positive relationship in predicting the attitude and intention to use (Buabeng-Andoh et al 2019; Sukendro et al. 2020). The user with positive perceived ease of use have positive intention to use technology (Mortazavi et al 2014). This construct also found a positive relationship and significant effect on perceived usefulness (Chen and Aklikokou 2020). Thus, H4 in this research as follow:

H4: Perceived Ease of Use has a positive relationship with attitude towards the E-Learning System

2.8 Attitude Towards the E-learning System

Attitude is multidimensional variable with cognitive, emotional, and behavioral attributes. The cognitive attribute is about a person's understanding of an object. While the emotional attribute is about a person's like or dislike to an object. The behavioral attribute is related to a person's behavioral intention to an object (Fishbein and Ajzen 1975). Attitude towards the E-learning system defines as a level of a person's feeling about using the e-learning system. The users with positive attitude are likely to use the technology (Hsu et al. 2014). In summary, attitude is the primary predictor to the behavior intention (Ajzen 1991). There is a parallel relationship between attitude and intention to use the technology. The previous research was hypothesized the attitude had positive and significant relationship with behavioral intention to use e-learning system (Sukendro et al. 2020). This research is to examine the relationship between attitude towards the e-learning system and intention to use the e-learning system, thus H5 as follows: H5: Attitude towards the E-Learning System has a positive relationship to Intention to Use the E-Learning System

2.9 Intention to use the E-learning System

Intention to use is a complex process when user is deciding to use technology. Intention is related to user's behaviors, attitudes, and their perceptions (Yeo et al. 2020). The behavior intention determined with two primary key components such as perceived usefulness and perceived ease of use (Venkatesh and Morris 2003).

3. Methods

The research was a quantitative research and used non-probability purposive sampling. The online questionnaires were distributed to 250 respondents of higher education students in JABODETABEK on September 2021. The unit analysis in this research was the higher education students who use the e-learning system during the COVID-19 pandemic. Only 135 respondents returned the online questionnaires and were usable. All items measured using 5-point Likert type scale range on 1 = strongly disagree, and 5 = strongly agree. There were twenty-one questionnaires such as system quality, e-learning prior experience, perceived usefulness, perceived ease of use, attitude towards the e-learning system, and intention to use the e-learning system (Mailizar, Mailizar; Burg, Damon; Maulina, 2021).

Recently, the most method of measurement that many researchers are using is the partial least structural Equation Model (PLS-SEM) in various social science subjects study such as human resource management (Nisar et al. 2021), management information systems (Joseph and Marnewick, 2021; Bayaga and Kyobe, 2021), education management (Boubker et al. 2021; Kasilingam 2020; Purwanto and Tannady 2020), marketing management (Low et al. 2021), hospitality management (Nisar et al. 2021), and in supply chain management (Chatterjee and Chaudhuri 2021). The method of PLS-SEM was used to test the hypothesis in this research with data analyze used Smart-PLS version 3. The SEM-PLS technique involved two assessments: the evaluation of the measurement model and structural model. The evaluation of measurement model examined the research model's reliability and validity while for the evaluation of structural model evaluated the significance relationship of the proposed research model (Hair et al. 2013). The reliability test used composite reliability (CR) and Cronbach Alpha (CA). The convergent validity of the measurement model is assessed based on the correlation between the estimated item value in the loading factor (Hair Jr, J. F. et al. 2021). While the test for convergent validity analysis results provides about information of the reflection the indicators that are most related to the research variables. After the evaluation of the outer model measurement, the inner model to be tested the hypothesis built based on the estimated value of the standardized regression coefficient. Follow to analysed the value of R-square (R^2), the predictive relevance (Q^2), and the f-square effect size (f^2) (Hair et al. 2019). The Figure 1 was the research model in this research.

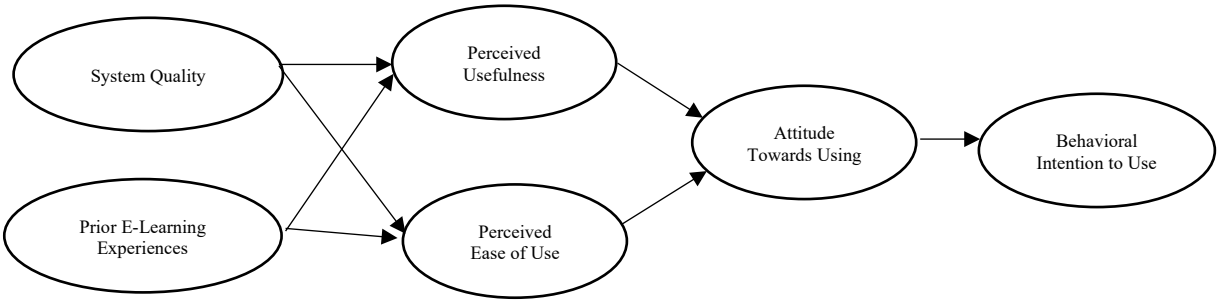

Figure 1. Research Model

From the research model in the Figure 1, the hypotheses as follow:
H1a: System Quality has a positive relationship with perceived usefulness
H1b: System Quality has a positive relationship with perceived ease of use
H2a: E-learning Prior Experience has a positive relationship with perceived usefulness
H2b: E-learning Prior Experience has a positive relationship with perceived ease of use
H3: Perceived usefulness has a positive relationship with Attitude towards the E-Learning System
H4: Perceived Ease of Use has a positive relationship with attitude towards the E-Learning System
H5: Attitude towards the E-Learning System has a positive relationship to Intention to Use the E-Learning System

4. Data Collection

The measurement scale used for operational variables in this research was ordinal scale design. The scale of the instrument used to measure operational variables in this study was the 5-likert scale. In this study, the respondent was the higher education students in JABODETABEK (Jakarta Bogor Depok Tangerang Bekasi) areas. In this study, the sampling technique was nonprobability sampling with incidental sampling type. Due to the unknown number of higher education students, the researchers used Roscoe theory to determine the number of respondents in this study questionnaire. The online questionnaire distributed on September 2021.

The sample size for multivariate research (including multiple linear analysis) is 10x greater than the number of variables or indicators in the study (Sekaran and Bougie 2016). The number of variables in this study was 6 variables therefore the minimum number of respondents that must be achieved is 60 respondents. In this study, the number of respondents collected was 135 students. To support the analysis in this study, the data used in the study is primary data in the form of the dissemination of questionnaires and secondary data of books, literature, journals, scientific works or previous researches.

5. Results and Discussion

5.1 Demographic Respondents

In total the research distributed 250 online questionnaires by google form. The valid respondents were 135 respondents to be analyzed in this research. Table 1 presents the demographic of respondents. The majority of the respondents are female 63.7% and male 36.3%. The majority respondents aged between 21 – 25 years old (57.8%), aged ≥ 31 years old (17.8%), followed by aged ≤ 20 years old (14.1%), and aged 26 - 30 years old (10.4%). The majority of the respondents accessed the e-learning system by handphone/ IPAD (66.7%) and by laptop/ desktop (33.3%). For the internet connection, majority respondents use the mobile data plan (51.9%) and use the Wi-Fi connection (48.1%).

Table 1. Demographic Respondents

Measurement Items	Frequency	%
Gender		
Male	86	63.7%
Female	49	36.3%
Age		
≤ 20 years old	78	14.1%
21 – 25 years old	24	57.8%
26 – 30 years old	19	10.4%
≥ 31 years old	14	17.8%
Device to use for e-learning system		
Handphone/ Ipad	90	66.7%
Laptop/ Desktop	45	33.3%
Internet Connection		
Mobile Data Wi-	70	51.9%
Fi	65	48.1%

Source: Primary Data, 2021

5.2 Outer and Inner Model

The first step was evaluated the outer model or measurement model. The evaluation was confirmed by the convergent validity, discriminant validity, and internal reliability such as the Cronbach Alpha and the Composite Reliability. The Convergent validity is satisfied if the loading factor value of each indicator is more than 0.7 and the Average Variance Extracted (AVE) value is more than 0.5, and the Cronbach Alpha and Composite Reliability values should be 0.7 or higher (Hair et al. 2019). Table 2 presents the loading factor (LF) value for each indicator more than 0.7 and the AVE value for each construct are more than 0.5. This condition confirmed that each construct has good and valid. In addition, the Cronbach Alpha and Composite Reliability values are more than 0.7. It stated that each construct in the research model has satisfactory internal reliability.

Table 2. Descriptive Statistic and Outer Model

Variable	Item	Mean	LF	AVE	CR	CA
System Quality (SQ)	SQ1	4.030	0.842	0.685	0.867	0.771
	SQ2	3.904	0.815			
	SQ3	3.815	0.827			
Prior E-Learning Experience	PEX1	4.141	0.845	0.770	0.910	0.852
	PEX2	4.244	0.912			
	PEX3	4.311	0.875			
Variable	**Item**	**Mean**	**LF**	**AVE**	**CR**	**CA**
Perceived Usefulness	PU1	4.222	0.887	0.753	0.924	0.891
	PU2	4.119	0.847			
	PU3	3.748	0.843			
	PU4	4.141	0.894			
Perceived Ease of Use	PEOU1	3.941	0.886	0.771	0.931	0.901
	PEOU2	3.978	0.851			
	PEOU3	4.126	0.881			
	PEOU4	3.963	0.894			
Attitude Toward ELearning System	ATT1	3.963	0.859	0.754	0.924	0.890
	ATT2	4.259	0.908			
	ATT3	4.178	0.900			
	ATT4	4.222	0.801			
Intention to Use E-Learning	ITU1	3.556	0.843	0.795	0.921	0.870
	ITU2	3.578	0.932			
	ITU3	3.741	0.898			

Source: Primary Data, 2021

Table 3. Heterotrait-Monotrait Ration (HTMT)

	ATT	ITU	PEOU	PU	PEX	SQ
ATT						
ITU	0.736					
PEOU	0.838	0.763				
PU	0.908	0.791	0.823			
PEX	0.570	0.338	0.585	0.410		
SQ	0.564	0.727	0.786	0.564	0.529	

Source: Primary Data, 2021

For the discriminant validity in Table 3 presents discriminant validity values using the Heterotrait - Monotrait ratio of correlations (HTMT) method, and the results are less than 0.9 according to (Henseler et al., 2015) that the HTMT value is satisfied if the correlation value between the two reflective constructs is less than 0.9. The result PU toward Attitude is not satisfied the research model.

The second step is to evaluate the structural model (inner model). At this step, purpose of the evaluation is to prove the research hypothesis (*p value* less than 0.05), the contribution of exogenous constructs to endogenous constructs (R^2), predictive relevance (Q^2) and the measure of the impact of each construct (f^2) (Hair et al. 2014).

In Figure 2, the value of R^2 for perceived usefulness is 0.254 or 25.4 percent, Perceived ease of use is 0.503 or 50.3 percent, Attitude towards the e-learning is 0.713 or 71.3 percent and intention to use e-learning system are 0.431 or 43.1 percent. It means that the variables of system quality and prior e-learning experience explains 25.4 percent in building perceived usefulness. Then, system quality and prior e-learning experience explains 50.3 percent in building perceived ease of use. Perceived usefulness and Perceived ease of use explain 71.3 percent of attitude towards the

elearning system and 43.1 percent of intention to use e-learning system. The result R^2 for all the variables under weak, moderate, and high level of predictive accuracy (Hair et al. 2014).

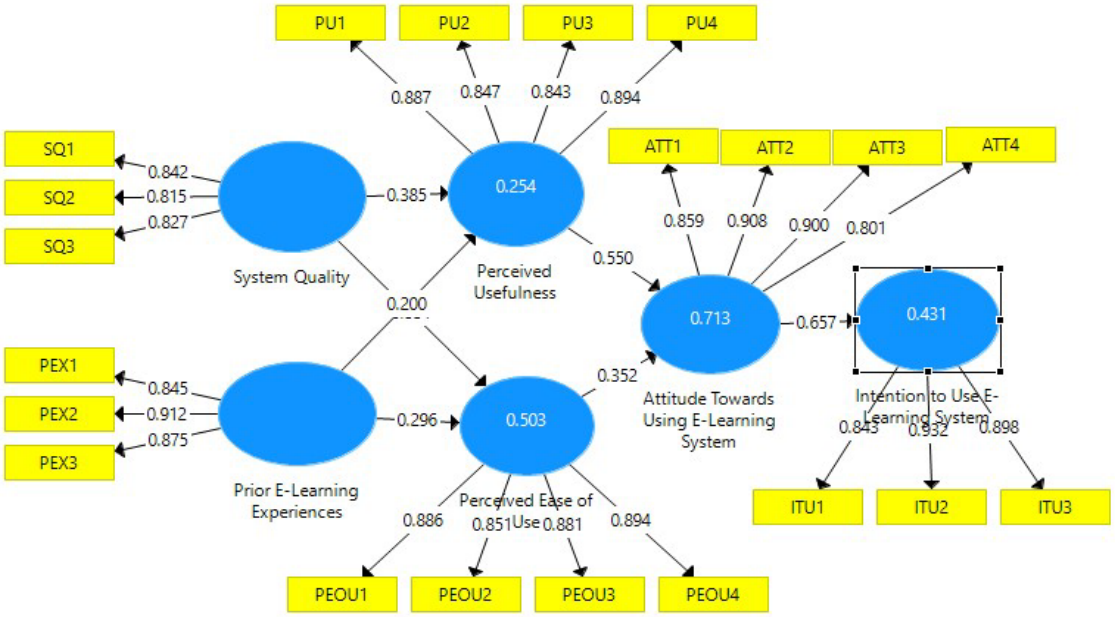

Figure 2. Structural Model

In Table 4 presents the effect size on each path. When referring to the predictive relevance (Q^2), the model has a good predictive relevance value because the Q^2 value of 0.519 is greater than 0.50.

Table 4. F-Square

	f^2	Criterion
Attitude > Intention to use the E-learning system	0.758	Large
Perceived Ease of Use > Attitude towards e-learning system	0.196	Small
Perceived Usefulness > Attitude towards e-learning system	0.480	Large
Prior e-learning experience > Perceived Ease of Use	0.144	Small
Prior e-learning experience > Perceived Usefulness	0.044	Small
System Quality > Perceived Ease of Use	0.463	Large
System Quality > Perceived Usefulness	0.163	Small

Source: Primary Data, 2021

Table 5. Hypotheses Testing

Hypotheses	B	T-Value	P-Value	Result
Attitude > Intention to use the Elearning system	0.657	11.541	0.000	Supported
Perceived Ease of Use > Attitude towards e-learning system	0.352	4.131	0.000	Supported
Perceived Usefulness > Attitude towards e-learning system	0.550	6.449	0.000	Supported
Prior e-learning experience > Perceived Ease of Use	0.296	3.220	0.001	Supported

Prior e-learning experience > Perceived Usefulness	0.200	1.773	0.077	Not Supported
System Quality > Perceived Ease of Use	0.531	7.521	0.000	Supported
System Quality > Perceived Usefulness	0.385	4.503	0.000	Supported

Source: Primary Data, 2021

Based on the hypotheses testing in Table 5, T-statistic of variable System Quality against variable Perceived Usefulness of 4.503 > t-table 1.96 shows value of 0.385 which indicates that positive and significance relationship between these variables. The higher system quality of e-learning system will increase the perceived usefulness towards the e-learning system. Variable System Quality against variable perceived ease of use with value 7.521 > t-table 1.96 shows value of 0.531 which indicates that positive and significance relationship between System Quality and Perceived Ease of Use. The higher system quality of e-learning will increase the perceived ease of use towards the elearning system. While variable Prior e-learning experience against variable perceived ease of use of 1.773 < t-table 1.96 shows value of 0.200 which indicates that not significant relationship between these two variables as prior elearning experience that gained by higher education students are not related to the pandemic COVID-19 and the experience obtained totally different than current pandemic condition. Variable prior e-learning experience against perceived ease of use value of 3.220 > t-table 1.96 shows 0.296 which indicates a positive and significance relationship between variable prior e-learning experience and variable perceived ease of use. Students who had prior-experiences in using e-learning system were ease to use the e-learning system during pandemic. Variable perceived usefulness against variable attitude towards e-learning system of 6.449 > t-table 1.96 shows value of 0.550 which indicates positive and significance relationship between these variables. The e-learning system really useful during pandemic as the teaching and learning activities may deliver smoothly with the established of the system therefore students willing to adopt e-learning system. Variable perceived ease of use against variable attitude towards e-learnings system of 4.131 > t-table 1.96 shows 0.352 which indicates positive and significance relationship of theses variables. The elearning system developed with friendly users therefore students willing to adopt the e-learning system. While variable attitude against intention to use the e-learning system of 11.541 > t-table 1.96 shows value of 0.657 which indicates positive and significance relationship of these two variables. With positive attitude towards e-learning system will create positive intention to use the e-learning system as well.

6. Conclusion

The results of this research indicate that System Quality to perceived ease of use and perceived usefulness has positive relationship and significant. This result in line with previous research (Fearnley and Amora 2020; Shah and Attiq 2016). The e-learning system should have reliable system and ensure able to meet and deliver the quality to teacher and student when they use the e-learning system during the pandemic.

The prior e-learning has positive and significant relationship to perceived ease of use and in line with (Wang et al 2020), (Händel et al. 2020). However the prior e-learning has no relationship with perceived usefulness and in contra with previous research (Wang et al. 2020). During the pandemic, students and teacher has no other options for teaching and learning and still need to use e-learning system as the study need to be continued and delivered during on-going pandemic.

The perceived ease of use and perceived usefulness has positive and significant relationship to attitude towards the elearning system and this result is in line with (Islami et al. 2021; Ma et al. 2017). When the e-learning system is userfriendly then the application will be very useful during the pandemic COVID-19 will create positive attitude. The attitude towards e-learning system has positive and significant relationship to intention to use e-learning system and this result is in line with previous research (Kasilingam, 2020; Purwanto and Tannady 2020). The user's positive attitude will create the intention to use the technology.

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