Factors of using e-learning in higher education and its impact on student learning

Zulherman[1,2], Farah Mohamad Zain[2], Siti Nazuar Sailin[2]
[1]Department of Primary Teacher Education, Faculty of Education, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta, Indonesia
[2]Awang Had Salleh Graduate School of Arts and Sciences (AHSGS), Universiti Utara Malaysia, Sintok, Malaysia

Article Info

Article history:

Received Feb 10, 2022
Revised Nov 1, 2022
Accepted Nov 17, 2022

Keywords:

E-learning
Learning management system
Online learning
Technology acceptance
University platform

ABSTRACT

This research was conducted to evaluate the adoption of e-learning in higher education and its impact on students. The quantitative research design was used in this study, and the technology acceptance model (TAM) was used with two external variables perceived enjoyment (PEN) and perceived self-efficacy (PSE), to analyze the validity and reliability of items and to test the hypotheses. This study was conducted among 592 undergraduate students who were selected using a random sampling technique. The findings of this study have successfully proven all ten hypotheses. It was evident that the students enjoyed e-learning's adoption, which had succeeded in increasing students' motivation to learn, increasing students' confidence, and expanding students' knowledge.

Corresponding Author:

Zulherman
Department of Primary Teacher Education, Faculty of Education,
Universitas Muhammadiyah Prof. DR. HAMKA
South Jakarta, Jakarta Capital Special Region 12130, Indonesia
Email: zulherman@uhamka.ac.id

1. INTRODUCTION

The development of science and technology, particularly the information and communication technology (ICT), also has a lot of potential impacts on the current progress of learning. Primary, secondary, and special education may use ICT to help learners' learning processes. The quality presented is indeed the pace and ease of obtaining information or resources, other than multimedia tools that can improve the interactive representation of an educational process [1], [2]. The implementation of e-learning is now a requirement rather than merely a right or temptation. In the current circumstance, e-learning is unavoidable due to the virus outbreak, making it compulsory to avoid face-to-face interactions. E-learning has many benefits, such as providing a more convenient service that facilitates learning through electronic or online space, enabling users to access flexible education and learning content, making learning processes more accessible, enhancing learning performance, and promoting learning experiences.

Moreover, e-learning assists in the improvement of the quality of the education system as it involves the use of internet technologies in the delivery of learning. The main criteria of e-learning are: i) A network capable of updating, distributing, and sharing teaching and information materials; ii) Sending end users the information by using standard computers. However, the term e-learning is related to the use of the internet and the interpretation of educational technology. E-learning is a system of education that uses electronic applications to support the internet media, computer networks, and stand-alone computing teaching and learning processes. However, it cannot be denied that internet-based learning is among the widely used e-learning platform today [3].

In earlier research [4], a study on the readiness of several universities to use the e-learning readiness (ELR) model on the application of e-learning systems found that five ELR factors, namely human resources, finance, infrastructure, innovation, and organizations influence the instructors' perceived ease of use and perceived usefulness of the e-learning system and consequently their actual use. The study, however, found that instructors are not yet ready for the implementation of e-learning. These findings raise the question of whether the use of e-learning will succeed or not. In order to address this particular issue, more research needs to be conducted to find out how e-learning technology is embraced by users. The level of usage can be described by the degree of consumer acceptance of technology. The use of technology is high when the level of user acceptance is high, and when the principle [5] applies to it, it can be assumed that the implementation of e-learning is successful. Therefore, the confidence level of user acceptance of the e-learning program is evaluated in this study. The performance quality of e-learning programs is expected to be achieved.

Online learning is practiced in almost all universities and tertiary institutions across the globe over the last ten years. Since then, it has adopted the traditional approaches to teaching and learning, allowing students to use a digital system that manages courses, materials, discussions, assignments, and tests through the internet [6], [7]. Universities worldwide have invested millions of dollars in designing and maintaining their e-learning programs. Moodle and Blackboard are among the popular online learning systems. Many universities use their personally-developed e-learning systems. Therefore, it is vital to know the underlying reasons why students choose or avoid using e-learning system to ensure that it is fully implemented and its beneficial [8], [9]. Online education and e-learning are characterized by an internet connection to facilitate the delivery of teaching content, communication, and collaboration in a virtual environment between students and teachers. Furthermore, e-learning also provides face-to-face contact with academic staff [10].

The technology acceptance model (TAM) is a theoretical framework that has been widely used in various fields such as industry and education that supports information technology processes. Many academicians in education have used TAM to clarify consumers' adoption of technology, including e-learning, immersive learning tools, digital libraries, and e-journals. TAM provides different factors to track external influences on two central inner values: perceived usefulness (PUS) and perceived ease of use (PEOU). Davis, Bagozzi, and Warshaw [11] stated that the perceived ease of use is the extent to which a person believes that using a particular system would be effort-free and valuable to the degree a person believes using a particular system would improve employee's productivity. Each of these values impacts the mindsets of consumers toward the use of information systems (IS).

While e-learning is a resource to improve education and training, it is of no use unless users embrace it as a learning tool. As e-learning uses computer technology, TAM is commonly used and expanded in an e-learning area of study. The two TAM constructs (perceived usefulness and ease of use) were used to assess the acceptance of student websites as a practical learning resource by university students. The findings showed that the website's perceived usefulness and ease of use are essential factors for accepting and using the website as a secure and effective learning technology. In order to know an e-learning engineer's acceptance, Bauwens suggested a construct that tests the degree to which one assumes a specific system is free of threats to privacy and health [12], [13]. Their empirical analysis promotes the perceived quality of engineers' intention to use e-learning, suggesting that students must be assured that they are free of threats to privacy and safety. The conceptual model and related hypotheses are depicted in Figure 1.

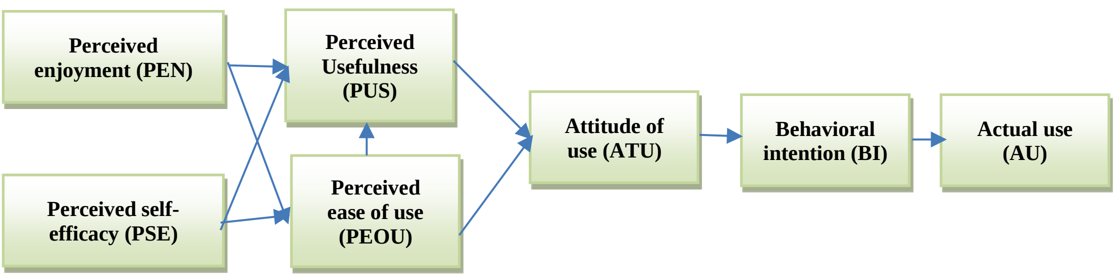

Figure 1. Research model

Based on the figure, and the preceding literature analysis, a conceptual model was established by merging TAM with perceived enjoyment (PEN) and perceived self-efficacy (PSE) to examine the intent of students to adopt and implement e-learning technologies in online learning. The user's understanding of self-efficiency is his ability to use this content to accomplish a topic. Regarding PUS, the user understands everyone's potential for using e-learning. Regarding self-efficacy, the key to explaining the use of technology in classroom education is self-efficacy [14]. Research showed that users have an excellent mindset toward e-learning, including awareness of self-efficacy, pleasure, utility, and purpose of using the behavior [15]. It was then suggested the following hypotheses: PSE has a direct and robust effect on the use of e-learning by PUS (H1); PSE has a direct and robust influence on PEOU's use of e-learning (H2).

PEN is how instructors believe that e-learning teaching is a good and enjoyable activity. Su and Chiu's findings demonstrate that people's intention of using computers is impacted by their perceptions of improving work performance and their entertainment level [16]. The results indicate that responsiveness and perceived gratification play a significant role in shaping users' attitudes and expectations in online learning media [17]. Therefore, concerning e-learning, we can postulate a positive relationship between perceived pleasure and e-learning intent. Thus, the third and fourth hypotheses are as: The PEN has positive and direct effects on the PUS of e-learning (H3); PEN has positive and direct effects on the PEOU of e-learning (H4).

PEOU is defined as how effortlessly technology is to be used [18]. In this study, the e-learning of PEOU is interpreted by how easy it is for users to use E-learning. The analysis shows that the acceptance of technology is growing as PEOU increases [19]. This study identifies the PEOU traits for the educational use of E-learning and the impact of PEOU on PUS and attitude of use (ATU). The hypotheses were then proposed: PEOU has positive and direct effects on the e-learning PUS (H5); PEOU has positive and direct effects on ATU e-learning (H6).

PUS is described as how users feel a particular system will enhance productivity [20]. PUS e-learning is defined in this study as the extent that users believe the use of e-learning will improve educational performance. Literary review in various academic fields has emphasized the significance of PUS in the development of new technologies [21]. The research uses PUS characteristics to examine the effect of e-learning on students and the impact of PUS on ATU and behavioral intention (BI). The following hypotheses were then proposed: PUS has positive and direct effects on ATU e-learning (H7); PUS has substantial and direct effects on e-learning BI (H8).

Several studies on ATU regarding technology acceptability have shown that ATU can improve BI [22]. In studying online, PEOU and PUS [23], affect ATU. In this analysis, the feature of ATU is to test students' acceptability of E-learning. The following theory was formulated: ATU has positive and direct effects on e-learning BI (H9). BI is a behavioral propensity in the future to continue using a tool [24]. Several studies have studied BI's acceptance of technology, and results showed that BI has a strong relationship with AU [25]. Researchers have investigated the BI attributes of actual use in this study. Then the following hypothesis was suggested: BI has a positive and direct impact on the e-learning AU (H10). The full range of modern technologies is AU. The intensity and length of the use of technology can be assessed. According to [26], the AU systems offer substantial practical significance for information and technology impact assessment. AU defines the time and frequency of usage that interacts with advanced technologies [27]. In this study, researchers measured students' AU based on the time allotted to e-learning.

2. RESEARCH METHOD

2.1. Participant

Questionnaires were distributed to 592 undergraduate students from universities in Indonesia, aged between 18 to 23. The respondents were surveyed about their experience using e-learning during the COVID-19 pandemic from September 2021 until January 2022. The study was well-balanced in gender (58% female and 42% male). As university students, the answers varied across the research.

2.2. Data collection

The university students were asked to share their online learning experience during the COVID-19 pandemic through various learning activities in Indonesia. This study aims to clarify the main objectives of this project: to find out the effectiveness of the use of e-learning during the COVID-19 pandemic in Indonesia. The university's findings can be used by the university to evaluate the effectiveness of e-learning in Indonesia. Besides, the findings could also inform the Indonesian Ministry of Education about the effect of online learning in Indonesia. In this study, the researchers worked with the university to help distribute the questionnaire to university students, and it only took 10-13 minutes for the respondents to fill out the questionnaire. A total of 600 respondents filled in the questionnaires, but it turned out that only 592 respondents fulfil the criteria. There were eight incomplete and excluded from the study. The questionnaire used a Likert scale between 1 (strong disagreement) and 5 (strong agreement) to measure 26 items in the model construct. The constructs used in this questionnaire are shown in Table 1.

2.3. Measures

In this study, data analysis was conducted using the structural equation modeling (SEM) method. The Smart PLS version 3.0 program [28]. PLS is a well-known method for the evaluation of the path coefficients of structural models and has become more popular with marketing research in general, in the last decade, due to its ability to model latent structures in irregular and small to medium sample size conditions [29]. Nevertheless, PLS research has been carried out and has proven appropriate as one element in this study. The PLS algorithm mechanism is also used to evaluate the set, weight, and path coefficients and determine the hypothesis's significance by using the bootstrap method (5000 samples). The measurement model is accurate and effective for the empirical validation protocol for the structural model dependency structure [30]. Finally, the blindfold technique was used for developing and evaluating the reliability of the theoretical frameworks.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Measurement model evaluation

The evaluation of the measurement model (outer model) is carried out to find out the relationship between latent variables and the indicators being studied to explain each indicator associated with the latent variable. This is related to the validity and reliability of the instruments used [31]. The validity of these instruments was tested using discriminant validity and convergent validity. Based on Table 1, the validity of these instruments was tested using discriminant validity and convergent validity.

Table 1. Measurement instrument

Constructs	Items		Sources
Perceived self-efficacy	PSE1	I feel confident in myself when I teach e-learning	
	PSE2	I am happy with e-learning	[32]
	PSE3	I feel anxious before I teach e-learning.	
Perceived enjoyment	PEN1	E-learning as a tool is satisfactory	
	PEN2	E-learning is enjoyable as a teaching resource	[33]
	PEN3	The use of e-learning as a method is encouraging.	
Perceived ease of use	PEOU1	I consider e-learning easy to use	
	PEOU2	E-learning courses are accessible to schedule and coordinate.	
	PEOU3	I can easily and intuitively use e-learning in my classes.	
	PEOU4	The graphical interface design of e-learning components is clear and comprehensible.	
	PEOU5	The e-learning platform makes it easy for me to achieve my goals.	
Perceived usefulness	PUS1	E-learning increases the work efficiency	
	PUS2	The use of e-learning helps me to save time.	[34]
	PUS3	Using e-learning helps to increase one's work performance.	
	PUS4	Using e-learning makes my job easier.	
Attitude of use	ATU1	It is a good idea to use e-learning	
	ATU2	E-learning is a pleasant way to learn.	
	ATU3	The use of e-learning is a positive idea.	
Behavioral intention	BI1	I expect to continue using e-learning to promote classes.	
	BI2	I plan to use e-learning as much as possible in my classes.	
	BI3	I will discuss the positive benefits of e-learning in my classes.	
	BI4	I expect that in the next I would use e-learning.	
Actual use	AU1	I use e-learning on a daily basis	
	AU2	I use e-learning frequently	
	AU3	I use e-learning to help my studies.	[33]–[35]
	AU4	I use e-learning in my group.	

3.1.2. Convergent validity

Previous research results [36] are evaluated by evaluating the loading factor value of every indicator in the displayed structure. All indicators have a loading factor value that satisfies the validity criteria, more significant than 0.70 (>0.70). This subsequently implies convergent validity. The load of the PSE3 indicator is below the minimum level (<0.70), which means that both indicators must be eliminated. It is in line with the statement from Ali *et al.* [37], where each indicator is a good item if it has a loading factor above 0.70.

3.1.3. Discriminant validity

Table 2 provides the results of an assessment of discrimination based on each indicator's cross-loading factor. The correlation value of the indicator with the intended construct should, be higher than the significance level of the identifier with other constructions [38]. Table 2 shows that the indicator X has a significant load factor with ATU1, ATU2, and ATU3, which are higher than the load factor outside the loading factor, i.e., the ATU1 to BI (0.609), ATU1 to PEN (0.490), ATU1 to PEOU (0.523), ATU1 to PSE (0.495), ATU1 to PUS (0.503). The ATU1 can, therefore, be described as a valid discriminant.

Based on Table 2, the loading factor values of all indicators ranged between 0.804 and 0.938. This proves that sufficient requirements have been established as all values exceed 0.70 (>0.70), implying convergent validity. As an observed variable in the measuring model, there are 25 valid indicators (items). After completing the iteration process, discrimination validity was examined based on the cross-loadings from the final iteration of the measuring model.

Table 2. Cross loading testing

Indicator	ATU	AU	BI	PEN	PEOU	PSE	PUS
ATU1	0.848	0.557	0.609	0.49	0.523	0.495	0.503
ATU2	0.858	0.575	0.551	0.487	0.486	0.431	0.397
ATU3	0.823	0.505	0.524	0.486	0.517	0.426	0.37
AU1	0.556	0.854	0.543	0.37	0.541	0.498	0.428
AU2	0.56	0.875	0.533	0.458	0.559	0.497	0.469
AU3	0.566	0.865	0.503	0.441	0.541	0.51	0.49
AU4	0.57	0.883	0.566	0.423	0.599	0.546	0.469
BI1	0.543	0.487	0.811	0.492	0.527	0.514	0.517
BI2	0.563	0.495	0.873	0.44	0.522	0.437	0.437
BI3	0.599	0.58	0.896	0.48	0.555	0.494	0.469
BI4	0.579	0.545	0.839	0.421	0.507	0.5	0.453
PEN1	0.475	0.413	0.44	0.838	0.411	0.489	0.482
PEN2	0.533	0.432	0.476	0.9	0.483	0.507	0.508
PEN3	0.518	0.437	0.497	0.901	0.493	0.525	0.517
PEOU1	0.525	0.543	0.517	0.472	0.819	0.546	0.531
PEOU2	0.519	0.538	0.517	0.421	0.852	0.478	0.46
PEOU3	0.482	0.512	0.505	0.41	0.835	0.44	0.443
PEOU4	0.497	0.528	0.522	0.5	0.827	0.55	0.539
PEOU5	0.469	0.548	0.488	0.355	0.804	0.424	0.393
PSE1	0.491	0.532	0.525	0.531	0.546	0.934	0.556
PSE2	0.514	0.573	0.54	0.547	0.567	0.938	0.564
PUS1	0.47	0.479	0.478	0.492	0.511	0.506	0.877
PUS2	0.438	0.479	0.5	0.503	0.525	0.562	0.929
PUS3	0.459	0.48	0.495	0.536	0.528	0.558	0.915
PUS4	0.465	0.491	0.509	0.535	0.527	0.539	0.899

3.1.4. Cronbach's alpha, composite reliability, and average extracted variance (AVE)

Instrument reliability testing is performed by evaluating the composite reliability value (CR), AVE, Cronbach Alpha, and Rho A values, as shown in Table 3. From the table, composite reliability (CR) coefficients surpassed the basic threshold of 0.881 to 0.948 (>0.7). The Cronbach Alpha coefficient ranged from 0.797 to 0.926. All coefficients were higher than the lower limit (>0.7) and were acceptable. Rho A has the lowest score of 0.800 and the highest score of 0.927, which are also higher than 0.7. The average AVE was between 0.711 and 0.876. This shows that the AVE value achieved was higher than the minimum recommended score. The reliability tests showed excellent internal consistency.

Table 3. Reliability test measurement model

Indicator	Cronbach's Alpha	rho_A	Composite reliability	AVE
ATU	0.797	0.800	0.881	0.711
AU	0.892	0.894	0.925	0.756
BI	0.877	0.879	0.916	0.732
PEN	0.854	0.859	0.912	0.775
PEOU	0.885	0.889	0.916	0.685
PSE	0.858	0.859	0.934	0.876
PUS	0.926	0.927	0.948	0.820

3.1.5. Structural model evaluation

The determination coefficient (R Square) is usually used to measure the model's predictive power to evaluate the structural model. This is the square correlation between the actual value and the prediction of particular endogenous buildings. The coefficients represent the combined effects on latent endogenous variables of exogenous variables. Since the range of R Square is 0-1 with higher values suggesting a higher prediction point, it is challenging to create an appropriate thumb rule for R Square. This is because the values PEN on the complexity of the model and the discipline of research.

As presented in Table 4, PSE and PEN are possible to prove 0.404 PEOU variants with satisfactory results. PSE, PEN, and PEOU will then jointly describe 0.477 PUS variants to include sufficient levels, then PUS to ATU with a sufficient number of levels. ATU to BI reveals a variation of 0.505 to an acceptable level, and finally BI to AU is 0.382 to a reasonable degree of BI to AU 0.382.

Table 4. R Square

Indicator	R Square	R Square Adjusted
ATU	0.402	0.400
AU	0.382	0.380
BI	0.505	0.504
PEOU	0.404	0.402
PUS	0.477	0.474

The hypothesis regarding the interaction between the buildings was checked for the strength between the structures listed in the conceptual framework. To use it, the structural equation model was tested by calculating the path coefficient between structures and by evaluating the significance of the path coefficient and the level of importance. In Smart PLS, T values were calculated using the bootstrap method and a two-tail t-distribution table to evaluate the critical level of the direction. Path coefficients and significance rates were reached by using Smart PLS with 5000 samples. Bootstrapping.

Table 5 shows that the H1 through H10 hypotheses are supported by structural models where each hypothesis reinforces one another. The first hypothesis (H1) shows that with the support of a t-value of 5.922 (>1.65) and a P-value of 0.000 (<0.05), PSE has a significant positive effect on EFA. The second hypothesis (H2) indicates that PSE has a significant effect of 11.698 (>1.65) and 0.000 (<0.05) t-values on the PEOU. The PEN hypothesis also has a significant and positive impact on the PEOU with a t-value of 6.137 (>1.65) and a P-value of 0.000 (<0.05), with a t-value of 7.239 (>1.65), and a P-value of 0.000 (<0.05) in the 3rd hypothesis (H3) PEN. The fifth hypothesis of the PEOU with a t-value of 6.762 (>1.65) and a p-value of 0.000 (<0.05), and the sixth hypothesis that a PEOU has an impact on ATU with a t-value of 10.435 (>1.96) at P of 0.000 (<0.05) which was positively affected. In the seventh hypothesis, in which PUS affects ATU significantly and positively with the t value of 5.064 (>1.65) and the value P of 0.000 (<0.05), a hypothesis of PUS 8 with the value t 7.563 (>1.65) and the value P of 0.000 (<0.05) was also significantly positive in BI. Besides, the ninth hypothesis of ATU on BI showed a positive and meaningful effect of t 14.522 (>1.65) and P 0.000 (<0.05), and the tenth hypothesis (H10) of BI on AU indicated the highest positive value of t 22.531 (1.65) and P of 0.000 (<0.05). Based on the results, the ten hypotheses were accepted.

Table 5. Hypothesis testing

Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T Statistics (|O/STDEV|)	P values	Decision
ATU -> BI	0.525	0.526	0.036	14.522	0.000	Supported
BI -> AU	0.618	0.619	0.027	22.531	0.000	Supported
PEN -> PEOU	0.275	0.277	0.038	7.239	0.000	Supported
PEN -> PUS	0.265	0.266	0.043	6.137	0.000	Supported
PEOU -> ATU	0.467	0.469	0.045	10.435	0.000	Supported
PEOU -> PUS	0.267	0.268	0.040	6.762	0.000	Supported
PSE -> PEOU	0.436	0.436	0.037	11.698	0.000	Supported
PSE -> PUS	0.287	0.286	0.048	5.922	0.000	Supported
PUS -> ATU	0.236	0.237	0.047	5.064	0.000	Supported
PUS -> BI	0.282	0.282	0.037	7.563	0.000	Supported

3.2. Discussion

This study aimed to examine the dimensions of the TAM model for implementing e-learning in higher education by studying the factors influencing the willingness of students to use e-learning. BI is one of the critical factors in AU e-learning. The effectiveness of such a sample is controlled by the participation of university students in the model. Therefore, it is essential to evaluate university students' acceptance to ensure that students adopt this learning platform at the end of the course. An important finding of this research is that the external variables, namely PEN and PSE, play a crucial role in specifically impacting the understanding of the advantages and expectations of ease of use. Each exciting outcome of this research seems to be that external variables, pleasure perception, and self-efficacy are considered to play a significant role in impacting the perception of e-learning advantages and perceptions of ease of use.

Based on the ten hypotheses that were tested, it turned out that the results showed that all hypotheses were proven and accepted, and thus this study was successful. Although there are many determinants in research, it does not affect the truth of this research results. Two external construct variables, namely PSE and PEN, also significantly influence the results on PEOU and PUS, as mentioned in hypotheses 1 to 2 between PSE to PUS and PEOU, the results were supported by the findings from previous studies [8], [14], [15]. The PSE is a reflection of students' self when using e-learning and this has a direct impact when thinking about aspects of usefulness in using e-learning. Meanwhile, this PEOU shows that student efficacy is important in determining how to think about the ease of using e-learning. In hypotheses 3 and 4, PEN has a significant positive effect on PEOU and PU the results were supported by [16] and according to [39], [40], so perceptions of pleasure in students have an impact on students' decisions that by using e-learning comfortably and being able to explore creativity. In hypotheses 5 and 6, PEOU has a significant positive effect on PUS and ATU. This finding is concurrent with the findings in [41]–[43] according to [44].

In hypotheses 7 and 8, PUS has a direct positive effect on ATU and BI. This finding is similar to the findings in [41] and related to [45]. The last two hypotheses, the 9th hypothesis, which is ATU on BI, showed a significant, positive effect, similar to the findings in [46], [47] to support [48]–[50] and the 10th hypothesis of BI on AU, the highest significant value is the findings from [51] supported by [52], [53]. These further strengthen the truth of this current research findings.

4. CONCLUSION

The results of this current study have shown that students enjoy their e-learning experience and have posited that e-learning is an effective teaching and learning method to help the teaching and learning process. E-learning aims to promote interactive, positive, and generative education. This finding suggests that e-learning is a student-centered learning approach that could increase students' understanding, confidence, and knowledge development.

ACKNOWLEDGEMENTS

This research was supported by the LEMLITBANG Universitas Muhammadiyah Prof. DR. HAMKA Indonesia, under Grant No. 657/F.03.07/2021.

REFERENCES

[1] S. N. Sailin and N. A. Mahmor, "Improving student teachers' digital pedagogy through meaningful learning activities," *Malaysian Journal of Learning and Instruction*, vol. 15, no. 2, pp. 143–173, 2018, doi: 10.32890/mjli2018.15.2.6.

[2] N. D. Rahayu, Zulherman, and I. Yatri, "Animated Video Media Based on Adobe after Effects (AEF) Application: An Empirical Study for Elementary School Students," *Journal of Physics: Conference Series*, vol. 1783, no. 1, p. 012116, Feb. 2021, doi: 10.1088/1742-6596/1783/1/012116.

[3] R. Baki, B. Birgoren, and A. Aktepe, "A meta analysis of factors affecting perceived usefulness and perceived ease of use in the adoption of E-Learning systems," *Turkish Online Journal of Distance Education*, vol. 19, no. 4, pp. 4–42, 2018, doi: 10.17718/tojde.471649.

[4] N. Hannache-Heurteloup and K. Moustaghfir, "Exploring the barriers to e-learning adoption in higher education: A roadmap for successful implementation," *International Journal of Management in Education*, vol. 14, no. 2, pp. 159–182, 2020, doi: 10.1504/IJMIE.2020.105407.

[5] A. Hanif, A. F. Siddiqi, and Z. Jalil, "Are computer experience and anxiety irrelevant? Towards a simple model for adoption of e-learning systems," *International Journal of Engineering Pedagogy*, vol. 9, no. 5, pp. 112–125, 2019, doi: 10.3991/ijep.v9i5.11488.

[6] D. Hariyanto, M. B. Triyono, and T. Köhler, "Usability evaluation of personalized adaptive e-learning system using USE questionnaire," *Knowledge Management and E-Learning*, vol. 12, no. 1, pp. 85–105, 2020, doi: 10.34105/j.kmel.2020.12.005.

[7] M. Djannah, Zulherman, and Nurafni, "Kahoot Application for Elementary School Students: Implementations of Learning Process from Distance during Pandemic period of COVID 19," *Journal of Physics: Conference Series*, vol. 1783, no. 1, p. 012121, Feb. 2021, doi: 10.1088/1742-6596/1783/1/012121.

[8] M. U. Ahmed, S. Hussain, and S. Farid, "Factors influencing the adoption of e-learning in an open and distance learning institution of Pakistan," *Electronic Journal of e-Learning*, vol. 16, no. 2, pp. 148–158, 2018.

[9] M. S. Pratiwi, Zulherman, and G. Amirullah, "The Use of the Powtoon Application in Learning Videos for Elementary School Students," *Journal of Physics: Conference Series*, vol. 1783, no. 1, p. 012115, Feb. 2021, doi: 10.1088/1742-6596/1783/1/012115.

[10] S. K. Mathivanan *et al.*, "Adoption of E-Learning during Lockdown in India," *International Journal of Systems Assurance Engineering and Management*, 2021, doi: 10.1007/s13198-021-01072-4.

[11] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science*, vol. 35, no. 8, pp. 982–1003, 1989, doi: 10.1287/mnsc.35.8.982.

[12] R. Bauwens, J. Muylaert, E. Clarysse, M. Audenaert, and A. Decramer, "Teachers' acceptance and use of digital learning environments after hours: Implications for work-life balance and the role of integration preference," *Computers in Human Behavior*, vol. 112, no. July, p. 106479, 2020, doi: 10.1016/j.chb.2020.106479.

[13] C. Audia, I. Yatri, Aslam, S. Mawani, and Zulherman, "Development of Smart Card Media for Elementary Students," *Journal of Physics: Conference Series*, vol. 1783, no. 1, p. 012114, Feb. 2021, doi: 10.1088/1742-6596/1783/1/012114.

[14] N. Thongsri, L. Shen, and Y. Bao, "Investigating factors affecting learner's perception toward online learning: evidence from ClassStart application in Thailand," *Behaviour and Information Technology*, vol. 38, no. 12, pp. 1243–1258, 2019, doi: 10.1080/0144929X.2019.1581259.
[15] N. Valencia-Vallejo, O. López-Vargas, and L. Sanabria-Rodríguez, "Effect of a metacognitive scaffolding on self-efficacy, metacognition, and achievement in e-learning environments," *Knowledge Management and E-Learning*, vol. 11, no. 1, pp. 1–19, 2019, doi: 10.34105/j.kmel.2019.11.001.
[16] C. Y. Su and C. H. Chiu, "Perceived Enjoyment and Attractiveness Influence Taiwanese Elementary School Students' Intention to Use Interactive Video Learning," *International Journal of Human-Computer Interaction*, vol. 37, no. 6, pp. 574–583, 2021, doi: 10.1080/10447318.2020.1841423.
[17] S. A. Salloum, A. Qasim Mohammad Alhamad, M. Al-Emran, A. Abdel Monem, and K. Shaalan, "Exploring students' acceptance of e-learning through the development of a comprehensive technology acceptance model," *IEEE Access*, vol. 7, pp. 128445–128462, 2019, doi: 10.1109/ACCESS.2019.2939467.
[18] O. O. Jaiyeoba and J. Iloanya, "E-learning in tertiary institutions in Botswana: apathy to adoption," *International Journal of Information and Learning Technology*, vol. 36, no. 2. emerald.com, pp. 157–168, 2019, doi: 10.1108/IJILT-05-2018-0058.
[19] C. C. Huang, "Cognitive factors in predicting continued use of information systems with technology adoption models," *Information Research*, vol. 22, no. 2, 2017.
[20] Y. Zhao, N. Wang, Y. Li, R. Zhou, and S. Li, "Do cultural differences affect users' e-learning adoption? A meta-analysis," *British Journal of Educational Technology*, vol. 52, no. 1, pp. 20–41, Jan. 2021, doi: 10.1111/bjet.13002.
[21] N. K. Ibrahim *et al.*, "Medical students' acceptance and perceptions of e-learning during the Covid-19 closure time in King Abdulaziz University, Jeddah," *Journal of Infection and Public Health*, vol. 14, no. 1, pp. 17–23, 2021, doi: 10.1016/j.jiph.2020.11.007.
[22] D. Abdou and S. M. Jasimuddin, "The use of the UTAUT model in the adoption of E-learning technologies: An empirical study in France based banks," *Journal of Global Information Management*, vol. 28, no. 4, pp. 38–51, 2020, doi: 10.4018/JGIM.2020100103.
[23] Y. Siron, A. Wibowo, and B. S. Narmaditya, "Factors affecting the adoption of e-learning in Indonesia: Lesson from Covid-19," *Journal of Technology and Science Education*, vol. 10, no. 2, pp. 282-295, 2020, doi: 10.3926/jotse.1025.
[24] M. A. Yeop, M. F. M. Yaakob, K. T. Wong, Y. Don, and F. M. Zain, "Implementation of ICT policy (blended learning approach): Investigating factors of behavioural intention and use behaviour," *International Journal of Instruction*, vol. 12, no. 1, pp. 767–782, 2019, doi: 10.29333/iji.2019.12149a.
[25] M. A. Almaiah, A. Al-Khasawneh, and A. Althunibat, "Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic," *Education and Information Technologies*, vol. 25, no. 6, pp. 5261–5280, 2020, doi: 10.1007/s10639-020-10219-y.
[26] H. Mohammadi, "Social and individual antecedents of m-learning adoption in Iran," *Computers in Human Behavior*, vol. 49, pp. 191–207, 2015, doi: 10.1016/j.chb.2015.03.006.
[27] C. Ching-Ter, J. Hajiyev, and C. R. Su, "Examining the students' behavioral intention to use e-learning in Azerbaijan? The General Extended Technology Acceptance Model for E-learning approach," *Computers and Education*, vol. 111, pp. 128–143, Aug. 2017, doi: 10.1016/j.compedu.2017.04.010.
[28] J. F. Hair, C. M. Ringle, and M. Sarstedt, "Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance," *Long Range Planning*, vol. 46, no. 1–2, pp. 1–12, 2013, doi: 10.1016/j.lrp.2013.01.001.
[29] T. Tung, S. S. Chuang, and K. H. Niu, "Antecedents and outcomes of university students' it purchase intention: Exploring ewom adoption on e-learning," in *IAMOT 2016 - 25th International Association for Management of Technology Conference, Proceedings: Technology - Future Thinking*, 2016, pp. 1156–1170.
[30] B. D. Liengaard *et al.*, "Prediction: Coveted, Yet Forsaken? Introducing a Cross-Validated Predictive Ability Test in Partial Least Squares Path Modeling," *Decision Sciences*, vol. 52, no. 2, pp. 362–392, 2021, doi: 10.1111/deci.12445.
[31] S. Tehseen, S. Sajilan, K. Gadar, and T. Ramayah, "Assessing cultural orientation as a reflective-formative second order construct-A recent PLS-SEM approach," *Review of Integrative Business and Economics Research*, vol. 6, no. 2, p. 38, 2017.
[32] R. Gholami, A. B. Sulaiman, T. Ramayah, and A. Molla, "Senior managers' perception on green information systems (IS) adoption and environmental performance: Results from a field survey," *Information and Management*, vol. 50, no. 7, pp. 431–438, 2013, doi: 10.1016/j.im.2013.01.004.
[33] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology," *MIS Quarterly*, vol. 27, no. 3, pp. 425–478, 2003.
[34] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly: Management Information Systems*, vol. 13, no. 3, pp. 319–339, Sep. 1989, doi: 10.2307/249008.
[35] V. Venkatesh, J. Y. L. Thong and X. Xu, "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology," *MIS Quartery*, vol. 36, no. 1, pp. 157–178, 2012, doi: 10.2307/41410412.
[36] J. H. Cheah, M. Sarstedt, C. M. Ringle, T. Ramayah, and H. Ting, "Convergent validity assessment of formatively measured constructs in PLS-SEM: On using single-item versus multi-item measures in redundancy analyses," *International Journal of Contemporary Hospitality Management*, vol. 30, no. 11, pp. 3192–3210, 2018, doi: 10.1108/IJCHM-10-2017-0649.
[37] F. Ali, S. M. Rasoolimanesh, M. Sarstedt, C. M. Ringle, and K. Ryu, "An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research," *International Journal of Contemporary Hospitality Management*, vol. 30, no. 1, pp. 514–538, 2018, doi: 10.1108/IJCHM-10-2016-0568.
[38] J. Henseler and G. Fassott, "Testing moderating effects in PLS path models: An illustration of available procedures," In *Handbook of Partial Least Squares. Springer Handbooks of Computational Statistics*. Springer, Berlin, Heidelberg, 2010, pp. 713–735, doi: 10.1007/978-3-540-32827-8_31.
[39] W. A. Winarno, I. Mas'ud, and T. W. Palupi, "Perceived Enjoyment, Application Self-efficacy, and Subjective Norms as Determinants of Behavior Intention in Using OVO Applications," *Journal of Asian Finance, Economics and Business*, vol. 8, no. 2, pp. 1189–1200, 2021, doi: 10.13106/jafeb.2021.vol8.no2.1189.
[40] E. Holdack, K. Lurie-Stoyanov, and H. F. Fromme, "The role of perceived enjoyment and perceived informativeness in assessing the acceptance of AR wearables," *Journal of Retailing and Consumer Services*, vol. 65, no. July, p. 102259, 2022, doi: 10.1016/j.jretconser.2020.102259.
[41] F. Abdullah and R. Ward, "Developing a General Extended Technology Acceptance Model for E-Learning (GETAMEL) by analysing commonly used external factors," *Computers in Human Behavior*, vol. 56, pp. 238–256, 2016, doi: 10.1016/j.chb.2015.11.036.

[42] A. Tarhini, T. Elyas, M. A. Akour, and Z. Al-Salti, "Technology, Demographic Characteristics and E-Learning Acceptance: A Conceptual Model Based on Extended Technology Acceptance Model," *Higher Education Studies*, vol. 6, no. 3, p. 72, 2016, doi: 10.5539/hes.v6n3p72.
[43] Zulherman, Z. Nuryana, A. Pangarso, and F. M. Zain, "Factor of zoom cloud meetings: Technology adoption in the pandemic of COVID-19," *International Journal of Evaluation and Research in Education*, vol. 10, no. 3, pp. 816–825, Sep. 2021, doi: 10.11591/ijere.v10i3.21726.
[44] F. M. Zain, E. Hanafi, Y. Don, M. F. M. Yaakob, and S. N. Sailin, "Investigating student's acceptance of an EDMODO content management system," *International Journal of Instruction*, vol. 12, no. 4, pp. 1–16, 2019, doi: 10.29333/iji.2019.1241a.
[45] M. Salehudin, Z. Zulherman, A. Arifin, and D. Napitupulu, "Extending Indonesia Government Policy for E-Learning and Social Media Usage," *Pegem Egitim ve Ogretim Dergisi*, vol. 11, no. 2, pp. 14–26, 2021, doi: 10.14527/pegegog.2021.00.
[46] R. Cheung and D. Vogel, "Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning," *Computers and Education*, vol. 63, pp. 160–175, 2013, doi: 10.1016/j.compedu.2012.12.003.
[47] J. Cho, H. E. Lee, and M. Quinlan, "Cross-national comparisons of college students' attitudes toward diet/fitness apps on smartphones," *Journal of American College Health*, vol. 65, no. 7, pp. 437–449, 2017, doi: 10.1080/07448481.2016.1270949.
[48] H. P. Shih, "Using a cognition-motivation-control view to assess the adoption intention for Web-based learning," *Computers and Education*, vol. 50, no. 1, pp. 327–337, 2008, doi: 10.1016/j.compedu.2006.06.001.
[49] B. Wu and C. Zhang, "Empirical study on continuance intentions towards E-Learning 2.0 systems," *Behaviour and Information Technology*, vol. 33, no. 10, pp. 1027–1038, 2014, doi: 10.1080/0144929X.2014.934291.
[50] T. Klaus and C. Changchit, "Toward an Understanding of Consumer Attitudes on Online Review Usage," *Journal of Computer Information Systems*, vol. 59, no. 3, pp. 277–286, 2019, doi: 10.1080/08874417.2017.1348916.
[51] B. Al Kurdi, M. Alshurideh, S. A. Salloum, Z. M. Obeidat, and R. M. Al-dweeri, "An empirical investigation into examination of factors influencing university students' behavior towards elearning acceptance using SEM approach," *International Journal of Interactive Mobile Technologies*, vol. 14, no. 2, pp. 19–41, 2020, doi: 10.3991/ijim.v14i02.11115.
[52] A. Q. Mohammad AlHamad, "Acceptance of E-learning among university students in UAE: A practical study," *International Journal of Electrical and Computer Engineering*, vol. 10, no. 4, pp. 3660–3671, 2020, doi: 10.11591/ijece.v10i4.pp3660-3671.
[53] Zulherman, F. M. Zain, D. Napitupulu, S. N. Sailin, and L. Roza, "Analyzing Indonesian students' Google Classroom acceptance during COVID-19 outbreak: Applying an extended unified theory of acceptance and use of technology model," *European Journal of Educational Research*, vol. 10, no. 4, pp. 1697–1710, Oct. 2021, doi: 10.12973/EU-JER.10.4.1697.

BIOGRAPHIES OF AUTHORS

Zulherman is a Ph.D. Student, Awang Had Salleh Graduate School, Universiti Utara Malaysia. He is a Lecturer, Faculty of Education, Universitas Muhammadiyah Prof. DR. HAMKA, Indonesia. His research focuses on Technology Acceptance in Education. He can be contacted at email: zulherman@uhamka.ac.id or zulherman@ahsgs.uum.edu.my.

Farah Mohamad Zain is a Senior Lecturer of Educational Technology at the School of Education and Modern Languages, College of Arts and Sciences, University Utara Malaysia. She graduated with a doctoral degree (Ph.D.) from University Sains Malaysia in October 2016. Dr. Farah has extensive experience in digital content development (video production, editing, narrating, and interactive content) for Open Educational Resources (OER), Open Courseware (OCW) and Massive Open Online Courses (MOOCs). Her research areas include flipped classroom, blended learning, e-portfolio, augmented reality and immersive learning. She can be contacted at email: mz.farah@uum.edu.my.

Siti Nazuar Sailin is a Senior Lecturer in Educational Technology. She is currently the Coordinator of Postgraduate Diploma Programmer at the School of Education and Modern Languages, College of Arts and Sciences, University Utara Malaysia. Dr. Naz holds a Ph.D. from Monash University, Australia and has 15 years of teaching experience. Her research areas include technology integration in education, electronic portfolio, teacher professional development, scholarship of teaching and learning, Communities of Practice, blended learning and flipped classroom. Dr. Naz was the recipient of UUM's Distinguished Teaching Award (2018). To know more about Dr. Naz's current research works and publications please go to her e-portfolio at www.edtechuum.weebly.com. She can be contacted at email: sitinaz@uum.edu.my.