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ASSESSING STUDENT'S ADOPTION OF E-LEARNING: AN INTEGRATION OF TAM AND TPB FRAMEWORK

Van Ky Long Nguyen*	FPT University, Danang, Vietnam	longnvk@fe.edu.vn
Thi My Hanh Le	FPT University, Danang, Vietnam	hanhltm13@fe.edu.vn
Thi Ngoc Mai Duong	FPT University, Danang, Vietnam	maidtnds140138@fpt.edu.vn
Tien Son Nguyen	FPT University, Danang, Vietnam	sonntds140053@fpt.edu.vn
Thi Thu Hien Le	FPT University, Danang, Vietnam	letth.vn@gmail.com
Thi Thanh Huong Nguyen	FPT University, Danang, Vietnam	thanhhuongnt13@gmail.com

* Corresponding author

ABSTRACT

Aim/Purpose	The purpose of this study is to assess the factors that have significant influences on students' adoption of e-learning systems and to what extent these factors affect them.
Background	E-learning has become an essential tool and makes it an inevitable option for education in the future. E-learning has received considerable attention in recent times as a global spread of the COVID-19 pandemic. Nevertheless, developing countries, including Vietnam, are facing many difficulties when adopting e-learning systems. Therefore, it is essential to comprehensively evaluate the factors that influence the intention of students to use e-learning to enhance the implementation process and also improve educational quality.
Methodology	Initially, the authors synthesized a literature review from 112 related studies to complete the proposed research model including the combination of C-TAM-TPB model and external variables impacting students' adoption of e-learning systems. After that, a sample of 172 students at FPT University Vietnam was collected to test the proposed model and explain students' intentions. The dataset was investigated and analyzed with PLS-SEM using the SmartPLS 3.3.3 tool.

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Contribution	The study has made a valuable contribution to the current literature by proposing an extended model between C-TAM-TPB and three external variables to provide a better understanding of learners' intentions with e-learning systems. Furthermore, the research findings also provide useful guidelines for innovating and improving the e-learning system more effectively to advance students' learning motivation in the educational environment.
Findings	The findings demonstrate that Computer Self-efficacy and Perceived Accessibility have an important influence on Perceived Ease of Use by learners of an e-learning system. Furthermore, Perceived Enjoyment affects the Perceived Usefulness of e-learning systems. For the TAM, Perceived Usefulness and Perceived Ease of Use both have a positive impact on Attitude toward Use, and Attitude has a positive relationship with the Behavioral Intention of students. In addition, the factors from the TPB model (i.e., Perceived Behavioral Control and Subjective Norm) were identified as having a significant positive effect on Behavioral Intention to use e-learning.
Recommendations for Practitioners	Firstly, educational institutions should help along with the culture of using e-learning among students and lecturers. A supportive team should be accessible to help students use e-learning by providing instructions and addressing their questions. Secondly, system developers should concentrate on system-related aspects that have a significant influence on learners' attitudes and intentions to utilize, as well as build the most appropriate e-learning system for students.
Recommendations for Researchers	Firstly, the study fulfills a significant literature gap on evaluating e-learning effectiveness for learners in private institutions as they are focusing on developing quality education to gain competitive advantages. Secondly, based on research findings, the researchers may be able to advance studies to improve and innovate a quality system for ensuring the long-term usage of e-learning. Finally, this paper contributes to the theoretical foundation and development of an extended model for future studies to assess the intention when employing new technologies in education and other fields.
Impact on Society	E-learning will become a necessary tool and an unavoidable possibility in the next period of education. Therefore, this study presents an overview of the factors that have a notable influence on students' intention to adopt e-learning systems. This study then proposes to develop an optimal system for the teaching and learning process, as well as to adapt to future demands.
Future Research	Firstly, there are just three external variables that are considered to have an impact on learners' intention via TAM. However, other external factors could be exploited in future research. Secondly, the participants in this study are only students. If the lecturers could take part in this survey, the comparisons between faculty and students may have more usefulness for assessment. Thirdly, this model just interprets the results at a certain time, which is the COVID-19 outbreak and e-learning is an urgent response to maintain the process of teaching and learning. The perception, attitude, and performance of students may change over time. Therefore, as other researchers have recommended, longitudinal surveys should be considered here. Finally, the differences between majors may appear. Future studies can divide groups of learners according to their majors for a more significant test.
Keywords	education, e-learning, private university, technology acceptance, C-TAM-TPB

INTRODUCTION

Information technology has developed and changed the world thoroughly, including human lifestyles, ways of production, and traditional learning (Ye et al., 2010). The advancement of information technologies has resulted in the development of new educational instruments, and they are becoming necessary in education. E-learning also is the result of this progression, which is a new method of education that transfers knowledge to learners by using computer technologies (Binyamin et al., 2019). Students could engage in a variety of activities in a virtual environment when studying online (Al-Rahmi et al., 2018; Persico et al., 2014; Salloum et al., 2019). E-learning systems provide many advantages, including easy access to course materials, a huge amount of information, online discussions, working in groups, soft skills improvement, and a positive teacher-student relationship (Al-Rahmi et al., 2018; Salloum et al., 2019). In the future, e-learning should become an essential tool and make inevitable options in education (Sintema, 2020).

These days, many educational institutions and universities in the world have adopted and implemented e-learning (Almaiah et al., 2020; Alqahtani & Rajkhan, 2020; Jacques et al., 2020; Kanetaki et al., 2021). Especially during COVID-19 outbreaks, education is one of the areas that is mostly impacted by unexpected policies, such as social distancing and lockdowns (Nguyen et al., 2021). Many universities globally have been forced to adopt urgent e-learning to reduce the spread of the epidemic (Aboagye et al., 2021). Nevertheless, in developing countries, most universities are finding it difficult to promote learner acceptance with the utilization of e-learning when compared with developed countries, which already have a high number of young people using the Internet and successful e-learning implementation (Abbad, 2021). The digital gap, low acceptance of technology, low satisfaction of e-learning users, and lack of human and technical infrastructure have led to many challenges in accepting technology in the education sector (Almaiah et al., 2020; Kim & Park, 2018; Pham & Tran, 2020). Despite its benefits, the effectiveness of e-learning will not be exploited fully if students refuse to employ e-learning systems. Learners' willingness to apply and adopt new technology is crucial to the successful implementation of e-learning in the teaching and learning process since learners are the major subjects who are supposed to benefit from adopting e-learning (Almaiah et al., 2020; Tarhini et al., 2014b). Therefore, along the line of improving the student learning experience, policymakers and practitioners should appreciate the factors affecting learners' acceptance of e-learning systems (Tarhini et al., 2014b).

Many higher education institutes in developing nations are not successful with e-learning because of challenges but there are still limited papers that investigated e-learning adoption that were conducted in these countries (Jameel et al., 2020; Samsudeen & Mohamed, 2019). There is some research on this topic in Vietnam, but as the goal of the Ministry of Education and Training, it is crucial to investigate more to fortify the success of e-learning implementation and improve the quality of education training in universities (Pham & Tran, 2020). C-TAM-TPB is a combination of two decision-making theories, with the purpose of developing a more powerful instrument to predict users' behavioral intentions (Ignacio et al., 2019, Taylor & Todd, 1995). However, this model is seldom used in earlier studies about the e-learning topic, which could be considered a theoretical gap to fill. Consequently, this research has two main purposes to fill these significant gaps. Firstly, the authors apply the C-TAM-TPB model in combination with external variables as a novel model to assess the learners' adoption and intention to use the e-learning systems. Then the researchers, point out the factors that are significant in students' acceptance of e-learning. Secondly, some suggestions are given by the authors to expand a more efficient e-learning system and intensify students' level of acceptance. Directed toward increasing the acceptance rate of the e-learning system among students, researchers need to investigate these important factors and rely on research results to facilitate the adoption process. Furthermore, decision-makers and system developers can draw on the findings to evaluate the benefits and drawbacks of using e-learning systems among learners and gain higher levels of technology adoption and diffusion.

The remaining structure of the paper is as follows. The literature review of the study is described in the next section. The research framework and hypotheses are presented next followed by a description of the research methodology in detail. The results of this study are shown in the fifth section and the Discussion section explains more about the research findings. The next sections present the implications of the study for research and practice and provide ideas for limitations and directions for future research. The final section presents the conclusions.

LITERATURE REVIEW

ELECTRONIC LEARNING (E-LEARNING)

E-learning has been described as a tool that provides learning instructions to users using computer networking technologies; for instance, intranets, peripheral networks, and the World Wide Web (Engelbrecht, 2005; Welsh et al., 2003). A virtual study environment is a "new" type of learning that exploits the Internet's ability to provide customized, frequently interactive learning programs to enlarge communities of remote practice (Nicholson, 2007). Furthermore, e-learning refers to education remotely through the use of digital media (Internet or other e-media) (Engelbrecht, 2005). E-learning is also becoming a powerful technology that grants organizations the means to disseminate learning and teaching information at a learner's convenience (Baylari & Montazer, 2009). Recently, the spread of COVID-19 is a development factor driving the global e-learning market (Nguyen et al., 2021). Wood (2022) showed that there were 21 million learners who went in for Coursera online courses in 2016 and this is expected to grow by nearly 7 million annually in the next couple of years. Nevertheless, as the epidemic spread, the transfer to distance working and learning has tripled new enrollments, bringing the total number of participants to 71 million in 2020 and most recently to 92 million in 2021 (Wood, 2022). In addition, *Vietnam Times* (2022) stated that Vietnam has great development potential when implementing e-learning in education and Vietnam's e-learning market is expected to reach USD4 billion by 2023. These rises show an increasing global development and the future potential growth of e-learning.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

TAM, developed by Davis (1989), is among the best well-acknowledged and used frameworks in numerous domains, along with relevant information systems and information technology approval studies (Chau, 1996). Thus, C. T. Chang et al. (2017) asserted that it has become crucial in the literature on technology acceptance. TAM is also utilized frequently to determine whether or not e-learning is accepted or employed (Al-Gahtani, 2016; Y.-H. Lee, Hsiao et al., 2014; Tarhini et al., 2014a). Numerous studies have explored Perceived Ease of Use and Perceived Usefulness using a variety of cases, and both were recognized universally as major determinants of IS/IT acceptability and use (Nagovitsyn et al., 2021; Schepers & Wetzels, 2007). According to the theory, external variables influence both personal perspectives and technology attitudes. The behavioral intention of using, which predicts real system utilization, is influenced by the approach to utilization.

THEORY OF PLANNED BEHAVIOR (TPB)

The TPB defines behavior that is forecasted by behavioral intentions, and that is forecasted by Perceived Behavioral Control, Subjective Norm, and Attitudes (Ajzen, 1991). Attitude is common wisdom about desired behavior and outcomes, Behavior Control is identified as a series of opinions regarding a person's abilities to carry out behavior in careful preparation, and Subjective Norm is a system of faith regarding societal tension related to participation in an activity (Ajzen, 2015). Users of e-learning are inhibited by some factors, including the availability of specific resources and skills (Behavioral Control), as well as the effect of significant people's perspectives (Subjective Norm). TPB was developed to address these challenges, and Subjective Norms and Behavioral Controls were demonstrated to have a considerable impact on behavioral intent. Hence, a behavioral intention is

formed by considering a combination of Attitudes toward Use, Subjective Norms, and Perceived Behavioral Control. The more determined a person is to engage in the conduct, the higher their likelihood of doing so. If individuals have a considerable level of effective management over their behavior, they are anticipated to pursue it through their aspirations when the chances occur (Gollwitzer, 1993; Triandis, 1979).

Combination Between Technology Acceptance Model and Theory of Planned Behavior (C-TAM-TPB)

The TPB (i.e., Attitude toward Use, Subjective Norms, and Perceived Behavioral Control) was assessed as three main components to provide researchers insights into which factors have a notable influence on one's behavioral intention (H.-H. Chen & S.-C. Chen, 2009). From the TAM perspective, this model focuses on the impact of Perceived Ease of Use and Perceived Usefulness to investigate the acceptance of new technology commodities (C. C. Chen, 2013; Taylor & Todd, 1995). When compared to TAM, it is obvious that a more comprehensive view of belief systems could be accommodated in TBP for scholars and researchers to deal with using technology issues (Smarkola, 2008; T. Teo, 2011). Ignacio et al. (2019) supposed that in TPB, the beliefs affect the users' behavioral intention, but TAM implies that the decision to accept, adopt or use the technology intentionally of a user was essentially defined by Perceived Ease of Use and Perceived Usefulness.

Davis (1989), based on the research outcomes, has pointed out that, compared with TBP, TAM is the more effective predicting technique for the explanation of using information technologies (C. D. Chen et al., 2007; Taylor & Todd, 1995). Besides, the social variable and the control variable were not involved in TAM, as there is not a significant influence on behavioral intention (H.-H. Chen & S.-C. Chen, 2009; Ignacio et al., 2018). Taylor and Todd (1995) argued that to maintain a high level of convenience, the explanatory power of behaviors in TAM (social norm and control) must be sacrificed. However, social and control variables were explored that have notable and direct relationships with the behavioral intention variable (Taylor & Todd, 1995). Therefore, C-TAM-TPB is a combination of the TAM and TPB models, two decision-making theories to develop a more powerful technique to predict the behavioral intentions of users (Ignacio et al., 2019). TAM's cognitive influences may serve as crucial antecedents for TPB's attitudinal beliefs, which in turn, may improve TAM's explanatory power by adding dimensions that are critical to individual technology acceptance. The empirical result also demonstrated that C-TAM-TPB is a good technique with high fitness to elucidate user behavior while using new technologies (C. C. Chen, 2013; H.-H. Chen & S.-C. Chen, 2009; Taylor & Todd, 1995).

Data Sources

The research concentrated on students' behavioral intention as an assessment of students' acceptance toward the e-learning systems via the C-TAM-TPB, as well as exploring how each factor affects student acceptance. Nevertheless, the authors realize that, in addition to the factors mentioned in these models, there are other influences on learners' decision to adopt e-learning through TAM. As a result, this research will expand the combination and development of the C-TAM-TPB by incorporating external variables.

A synthesis of the literature review was conducted on external variables affecting the TAM model. These studies were used to predict user behavior decisions - new technology and real-world uses have been supported by numerous empirical studies. By synthesizing the literature review, keywords such as TAM and e-learning were chosen to find related papers. A total of 112 studies were collected based on these above different databases (shown in Appendix).

Procedures performed according to previous studies were applied to carry out similar studies (Al-Emran et al., 2018; W.-H. Wu et al., 2012). To make sure of the consistency of the collected papers, the following criteria were considered:

- Articles must be published in the last 20 years when governments recognized the important role of e-learning in 2000 (Nicholson, 2007).
- Articles are checked for acceptance by learners or acceptance of e-learning.
- Articles must involve the TAM and the acceptance of e-learning.
- Articles must have specific methods and results.
- Research outcomes and results are given, and findings should be finalized and presented.

In general, three external factors were identified in this proposed research framework study: Computer Self-efficacy, Perceived Enjoyment, and Perceived Accessibility. In addition to recent studies, the Subjective Norm has also appeared. However, according to previous researchers, this variable is used in TPB. Therefore, the authors considered the Subjective Norm has a direct impact on intended use behavior as a potential factor without passing through other mediating variables. The results of synthesizing 112 related studies were used to figure out the common external variables in previous studies (shown in Table 1).

Table 1. External variables explored across different databases

External variables	Databases				Total
	Google Scholar	IEEE	Science Direct	Springer	
Computer Self-efficacy (CS)	51	7	13	3	74
Perceived Enjoyment (PE)	28	5	5	0	38
Perceived Accessibility (PA)	24	6	1	1	32

As a result, the synthesis of 112 previous studies explored the external factors to expand a complete research model including the model C-TAM-TPB, which is applied in combination with external variables and discovered research findings in prior papers to derive the proposed hypotheses.

RESEARCH FRAMEWORK AND HYPOTHESES

COMPUTER SELF-EFFICACY (CS)

CS is explained as having a considerable influence on a person's expectations about the results of computer use, their emotional responses to personal computer systems, and their use of computers (Compeau & Higgins, 1995). When an accurate and fair examination of self-efficacy is used to help companies assess the effectiveness of technological system applications throughout training and deployment, the evaluation process becomes more productive. CS will be connected to this investigation, as well as users' confidence in their potential capabilities of utilizing their e-learning system. Many scholars have argued in past research that CS has a direct influence on the PEOU and PU of e-learning adoption (Ong et al., 2004; S. Y. Park, 2009).

PERCEIVED ENJOYMENT (PE)

PE is identified as the action of using a certain system that is considered pleasurable in its right, in addition to performance results coming from using the system (Venkatesh, 2000). In the field of education, student feelings related to pleasure, relaxation, and holisticness when having a positive experience with an object, also play an essential role to explain learner adoption and behavior intention of using e-learning (Saadé et al., 2008). Moreover, according to Venkatesh (2000), people who look for the technology they utilize to be entertaining will begin to like the activities they have experienced, perceive its use, and discover it less difficult to utilize. PE has also been shown in earlier studies to have a considerable impact on PEOU (Kanwal & Rehman, 2017; Martínez-Torres et al., 2008), and PU (C. T. Chang et al., 2017).

Perceived Accessibility (PA)

PA is defined as the users being able to access and utilize information from technology systems easily (Al-Debei, 2014). Accessibility means there are not any barriers to the use of a system, and it helps the users' more favorable use (S. Y. Park, 2009). As a result, many scholars recognized PA as the main factor to forecast the accomplishment of adopting the e-learning system (Y.-H. Lee, Hsiao et al., 2014; S. Y. Park et al., 2012). PA was discovered that affects crucially PEOU (Almaiah et al., 2016; Martínez-Torres et al., 2008; S. Y. Park et al., 2012; Revythi & Tselios, 2019; T. Teo, 2010), and PU (Almaiah et al., 2016; Revythi & Tselios, 2019; T. Teo, 2010) of e-learning based on previous paperwork.

Subjective Norm (SN)

SN is a component of the social influence variable that represents the felt social impact to engage in or refrain from engaging in an action (Ajzen, 1991). Stakeholders may affect learners' decision to employ e-learning systems while they are assessing them. Furthermore, the TPB model has covered SN, demonstrating that it can change the behavior of people by affecting intentions and behavior (Rivis & Sheeran, 2003). In several previous studies, SN was revealed to be one of the most influential variables in BIU e-learning systems (Cheon et al., 2012; Grandon et al., 2005; M.-C. Lee, 2010).

Perceived Behavior Control (PBC)

PBC is described as a personal evaluation of how difficult or easy it is to conduct a specific behavior (Cheon et al., 2012). Various research has highlighted the merging of perceived pleasure or technological adoption with psychological attributes and students' beliefs (Al-Azawei et al., 2017; Gist, 1989; Grandon et al., 2005). In contrast, when people believe in their confidence that can help them achieve a duty has a major impact on behavior (Ajzen, 2002). People, who feel that they can learn and develop a skill or have the resources to execute an activity, are more likely to achieve the ability. According to earlier paperwork, higher degrees of PBC are associated with higher levels of BIU of technological systems (Compeau & Higgins, 1995; Gist, 1989).

Perceived Ease of Use (PEOU)

The level at which a learner considers that the use of a given technology is not complex is mentioned as the PEOU of a system (Davis, 1989). In the e-learning environment, PEOU refers to the motivation of students and is based on their evaluation of an important feature of technology usage (Davis, 1989). PEOU was identified to encourage strongly the Behavioral Intention to Use technology by C. C. Chang et al. (2012). Elkaseh et al. (2016) found that PEOU has a considerable effect on the user's intent to accept the technology. PEOU influences PU, according to the TAM model, and growth in PEOU could assist in improving performance. Furthermore, an earlier study has found a favorable correlation between PEOU and ATU in e-learning (Calisir et al., 2014; Revythi & Tselios, 2019).

Perceived Usefulness (PU)

The degree to which people consider that modern technology could improve better job accomplishment is known as PU (Davis, 1989). The PU of e-learning has proved to be useful in providing timely and relevant details for the assistance and enrichment of learners' educational environments (H.-R. Chen & Tseng, 2012). Students will only accept e-learning if that e-learning use will enhance their academic achievement. There is a substantial optimistic association between PU and BIU systems in previous e-learning topic studies (Hsia et al., 2014; Mahmodi, 2017). There was a suggestion that the higher the level of PU of the e-learning system, the more positive one's attitude (T. S. H. Teo et al., 2008). The literature indicates that the relationship between PU and ATU has significant empirical support (Akman & Turhan, 2017; Al-Adwan et al., 2013; H.-R. Chen & Tseng, 2012; B. Wu & Zhang, 2014).

Attitude towards Use (ATU)

The level at which an individual has an optimistic or pessimistic feeling toward e-learning platforms is referred to as ATU (Fishbein & Ajzen, 1975; Z. Hussein, 2017). Following the TPB, users' ATU has a direct impact on their Behavioral Intentions, which in turn has an impact on their actual conduct. People who have an emphatic ATU e-learning will have more intention to adopt and use this platform. Recently, various research has equated users' continuation and acceptance decisions with acceptance (Hong et al., 2006; Hsu et al., 2006). Various papers have revealed that one's ATU had a direct positive effect on one's BIU to accept new technologies (H.-R. Chen & Tseng, 2012; Revythi & Tselios, 2019; Vidanagama, 2016).

Behavioral Intention to Use (BIU)

BIU is identified as the user's willingness to use the information system, and it is thus a direct determinant of actual use (Alharbi & Drew, 2014; Prieto et al., 2016). When it comes to the e-learning field, BIU is considered as learners' intentions in current and coming times to utilize e-learning systems (Liao & Lu, 2008). According to previous TPB research, SN, ATU, and PBC have a favorable impact on human intentions and have significant explanatory power (C. C. Chen, 2013). Davis (1989) discovered that PEOU and PU are two significant influencing factors for ATU when assessing technology acceptance. Two characteristics of PU and PEOU cause an influence on ATU adopting technologies to further impact BIU, according to empirical verification (C. C. Chen, 2013). Therefore, when adopting C-TAM-TPB, the relationships between ATU, PBC, and SN toward BIU are employed in this study.

This study investigated the following 13 hypotheses (shown in Table 2 and Figure 1) based on the research framework outlined above.

Table 2. Research variables and hypotheses

Dependent Variable	Independent Variables	Hypotheses	
Perceived usefulness (PU)	Computer Self-efficacy (CS)	H1	CS has a positive impact on PU
	Perceived Enjoyment (PE)	H2	PE has a positive impact on PU
	Perceived Accessibility (PA)	H3	PA has a positive impact on PU
	Perceived Ease of Use (PEU)	H4	PEU has a positive impact on PU
Perceived ease of use (PEU)	Computer Self-efficacy (CS)	H5	CS has a positive impact on PEU
	Perceived Enjoyment (PE)	H6	PE has a positive impact on PEU
	Perceived Accessibility (PA)	H7	PA has a positive impact on PEU
Attitude towards use (AU)	Perceived usefulness (PU)	H8	PU has a positive impact on AU
	Perceived Ease of use (PEU)	H9	PEU has a positive impact on AU
Behavioral intention to use (BIU)	Perceived Usefulness (PU)	H10	PU has a positive impact on BIU
	Attitude towards Use (AU)	H11	PEU has a positive impact on BIU
	Perceived Behavioral Control (PBC)	H12	PBC has a positive impact on BIU
	Subjective Norms (SN)	H13	SN has a positive impact on BIU

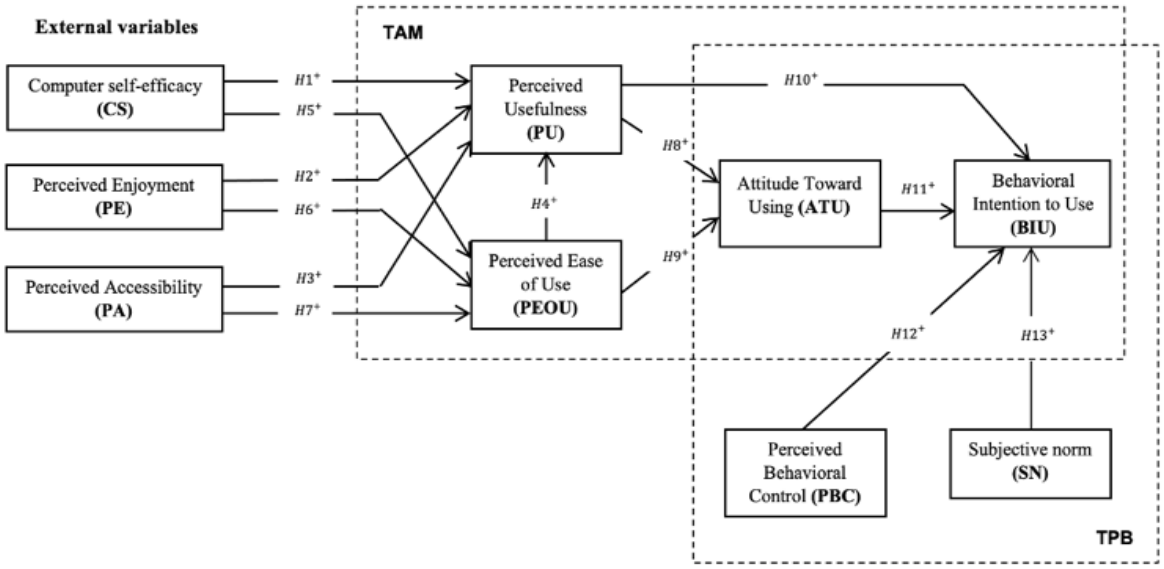

Figure 1. Proposed research model

RESEARCH METHODOLOGY

DATA COLLECTION

A quantitative method was used in this research with a questionnaire to gather the data. The students who have been using e-learning at FPT University Danang filled in an online survey. As Barclay et al. (1995) supposed, the "10 times rule" is a method to find out the minimal sample based on the PLS-SEM literature. This was also mentioned in previous studies for choosing the sample size while using this quantitative method (Chin, 1998; Hair et al., 2021). A total of 13 variables were expressed in the research model which stood for 13 links at latent variables, so the sample size was at least 130 responses. To sum up, the survey approached 174 students of which 2 representatives were not accepted because of their invalidation. Therefore, the number of the representative sample was 172 is considered acceptable.

SURVEY STRUCTURE

An online questionnaire was sent to the respondents. The survey includes two main sections: (1) the participants' demographics as well as information about how they used e-learning platforms; and (2) questions relating to variables influencing the e-learning platform's approval. Along with previous studies, this study uses a 5-point Likert scale to measure "from 1 to 5", which refers to the degree of strongly disagreeing to strongly agreeing.

PILOT STUDY

In a pilot study, 21 students of all majors at FPT University Danang were selected randomly with at least one semester of e-learning experience. All reliability indicators evaluated based on Cronbach's Alpha index must be greater than 0.7 (Hair et al., 2021). Hence, Table 4 presents all items that are reliable and can support the final research.

Table 4. Results of the pilot test are based on the scale's reliability rating

Dimensions	Cronbach's Alpha
Computer Self-efficacy (CS)	0.876
Perceived Enjoyment (PE)	0.912
Perceived Accessibility (PA)	0.867
Subjective Norm (SN)	0.756
Perceived Behavioral Control (PBC)	0.968
Perceived Usefulness (PU)	0.960
Attitude towards Use (ATU)	0.943
Perceived Ease of Use (PEOU)	0.747
Behavioral Intention to Use (BIU)	0.977

MEASUREMENTS

The aim of this paper was to assess the students' adoption of e-learning with the integration of TAM and TPB extending to external variables, including nine constructs and 27 items. Specifically, the external variables include CS (3 items), PE (3 items), and PA (3 items). The integrated model C-TAM-TPB includes PU, PEOU, ATU, PBC, and SN have 3 corresponding items for each variable; these factors are hypothesized and considered to affect the dependent variable BIU (3 items). Table 3 shows the results when measurement items were synthesized, adjusted from the literature, and then tested for reliability through a pilot study.

Table 3. Measurement items of constructs in the model

Constructs	Codes	Measurement items	Sources
Computer Self-efficacy (CS)	**CS1**	I am confident in my ability to study with the electronic learning system when no one helps.	S. Y. Park (2009); Fathema et al. (2015); Salloum et al. (2019);
	CS2	I believe that I have enough skills to utilize the electronic learning platform.	
	CS3	I am confident in using electronic learning while I just have support from the online guidance.	
Perceived Enjoyment (PE)	**PE1**	I feel interested in using e-learning systems.	Martínez-Torres et al. (2008); C. T. Chang et al. (2017); Salloum et al. (2019)
	PE2	The e-learning system might stimulate my imagination.	
	PE3	My curiosity is aroused by using the electronic learning system.	
Perceived Accessibility (PA)	**PA1**	There is no trouble in accessing and using the university's electronic learning system.	Martínez-Torres et al. (2008); S. Y. Park (2009); Salloum et al. (2019)
	PA2	Depending on my personal preferences, that can be accessible.	
	PA3	In the university, there are no difficulties accessing an electronic learning system.	

Constructs	Codes	Measurement items	Sources
Perceived Usefulness (PU)	**PU1**	My academic performance is enhanced because of the electronic learning system.	Davis (1989); Martínez-Torres et al. (2008); Fathema et al. (2015); Salloum et al. (2019)
	PU2	My learning effectiveness improves when using the electronic learning system.	
	PU3	I found the electronic learning system to my benefit in learning.	
Perceived Ease of Use (PEOU)	**PEOU1**	My interaction with the e-learning system is simple and straightforward.	Davis (1989); Martínez-Torres et al. (2008); Fathema et al. (2015); Salloum et al. (2019)
	PEOU2	For me, the electronic learning system is used simply.	
	PEOU3	It does not require more mental effort when interacting with the electronic learning system.	
Attitude towards Use (ATU)	**ATU1**	I have a positive feeling about the use of the electronic learning system.	Fathema et al. (2015); Sánchez & Hueros (2010); Salloum et al. (2019)
	ATU2	The electronic learning system provides an appealing environment for learning.	
	ATU3	Generally, I like studying with the electronic learning system.	
Perceived Behavioral Control (PBC)	**PBC1**	I believe I would be able to make use of any electronic learning system.	Taylor & Todd (1995); Lu et al. (2009); M.-C. Lee (2010)
	PBC2	If I used the electronic system, I would have completely controlled the situation.	
	PBC3	I believe I own sufficient knowledge, and the ability to utilize the electronic learning platform.	
Subjective Norm (SN)	**SN1**	Depending on who influences my behavior or whose opinions I evaluate, I should use the e-learning system.	M.-C. Lee (2010); C. T. Chang et al. (2017); Salloum et al. (2019)
	SN2	In general, I believe that the university would support the use of an electronic learning system.	
	SN3	My friends advise me to use the electronic learning system.	
Behavioral Intention to Use (BIU)	**BIU1**	I plan to utilize the functions of the electronic learning system to support my academic studies.	M.-C. Lee (2010); Fathema et al. (2015); Salloum et al. (2019)
	BIU2	I will encourage others to use the electronic learning system.	
	BIU3	I plan to regularly use the electronic learning system in the long run.	

Data Analysis

SmartPLS 3.3.3 tool was used for analyzing collected data in this study. Hair et al. (2021) suggested that PLS-SEM was a choice for evaluating structural and measuring models. Barclay et al. (1995) stated that PLS-SEM could lead to more accurate estimates. In the evaluation of the theoretical model, convergent validity and discriminant validity are two criteria employed. For convergent validity, the authors first looked at the external loadings and the average variance extracted (AVE). These items are greater than 0.7 and no value is under 0.7 providing sufficient validity of the convergent (Hair et al., 2021). Second, if the value of composite reliability (CR) is larger than 0.7, it will show consistent reliability (Hair et al., 2021). Third, the criterion of the Fornell-Larcker was used to examine the discriminatory validity as a cross-load criterion (Henseler et al., 2015). By analyzing the Variance Inflation Factor (VIF), if the values are higher than 2.0 and lower than 5.0, multicollinearity issues will not happen (Hair et al., 2021).

The determination coefficient (R^2) quantifies a suggested model's predictive accuracy. The relationship between a certain endogenous building is considered a square correlation. The higher values are above 0.75, moderate is 0.50, and weaknesses are 0.25 (Hair et al., 2021). In the proposed model, a value that would be used to analyze the different hypothesized associations is the path coefficient. Because partial least squares (PLS) cannot test the significance of path coefficients directly, this study uses bootstrapping techniques to perform 5,000 iterations on samples to evaluate the significance of each path in the model (Henseler et al., 2016). Thus, the authors included bootstrap resampling with 5,000 to examine how the variables impact the student's intention to learn via e-learning systems. A one-tailed t-test was used in this investigation. The use of the one-tailed t-test can be justified based on the hypotheses that are directional and predicted the path analysis.

RESULTS

Demographic Data

The survey was carried out by 172 participants at FPT University in Danang, Vietnam (shown in Table 5). There was no major difference between the genders in the number of respondents, consisting of 92 (53.5%) male and 82 (46.5%) female students. Most respondents are seniors (82.3%), while the remaining are freshmen (9.3%), sophomores (20.3%), and juniors (18.1%). The distribution is also divided into different majors, of which the Information Technology major has 62 (36.0%) students, followed by Business Administration 37 (21.5%), International Business 28 (16.3%), Languages 15 (8.7%), Graphic Design 11 (6.5%), Digital Marketing 10 (5.8%), and Hospitality Management 9 (5.2%). This shows that most of the students studying at FPT University Danang in all majors have been tested and evaluated fairly, and students who have had at least one semester have applied the e-learning method.

Table 5. Summary of the profile of respondents

Items		Frequency	Percentage
Gender	Female	82	46.50
	Male	92	53.50
Session	Freshman	16	9.30
	Sophomores	35	20.30
	Seniors	90	52.30
	Juniors	31	18.10
Major	Business Administration	37	21.50
	International Business	28	16.30
	Digital Marketing	10	5.80

Items		Frequency	Percentage
	Hospitality Management	9	5.20
	Information Technology	62	36.00
	Languages	15	8.70
	Graphic Design	11	6.50
Previous Experience	1 semester	18	10.50
	2 semesters	59	34.30
	3 semesters	52	30.20
	More than 3 semesters	43	25.00

Measurement Model Evaluation

Table 6 indicates all factor loadings had coefficients above 0.7, which shows high convergent validity except for the PEOU3 indicator. Furthermore, AVE values reach 0.5 or more, which means that the reliability of the indicator has been met. Therefore, it demonstrates that the constructions fulfill the dependability and convergent validity requirements. All inner VIF values are in the range of 2.0 to 5.0, so the multicollinearity of this investigation is confirmed not to be an issue.

Table 6. Convergent validity

Constructs	Items	Factorloadings	VIF	Cronbach's Alpha	CR	AVE
Attitude towards Use (ATU)	ATU1	0.883	2.193	0.883	0.928	0.811
	ATU2	0.916	2.915			
	ATU3	0.902	2.626			
Behavioral Intention to Use (BIU)	BIU1	0.904	2.654	0.901	0.938	0.835
	BIU2	0.915	2.829			
	BIU3	0.921	3.075			
Computer Self-efficacy (CS)	CS1	0.836	1.633	0.759	0.861	0.676
	CS2	0.733	1.396			
	CS3	0.889	1.902			
Perceived Accessibility (PA)	PA1	0.875	1.872	0.785	0.875	0.700
	PA2	0.813	1.543			
	PA3	0.821	1.634			
Perceived Behavioral Control (PBC)	PBC1	0.887	2.353	0.889	0.931	0.819
	PBC2	0.927	3.211			
	PBC3	0.900	2.597			
Perceived Enjoyment (PE)	PE1	0.839	1.850	0.876	0.924	0.802
	PE2	0.920	3.159			
	PE3	0.925	3.208			
Perceived Ease of Use (PEOU)	PEOU1	0.894	1.465	0.721	0.877	0.781
	PEOU2	0.874	1.465			

Constructs	Items	Factorloadings	VIF	Cronbach's Alpha	CR	AVE
Perceived Usefulness (PU)	PU1	0.909	3.040	0.916	0.947	0.856
	PU2	0.944	4.252			
	PU3	0.922	3.069			
Subjective Norm (SN)	SN1	0.741	1.557	0.727	0.843	0.643
	SN2	0.860	1.802			
	SN3	0.800	1.307			

The Fornel-Larcker scale is an important indicator when considering discriminant validity. They are calculated by taking the AVE's square root and compared to the loading indicators in relevant columns and rows (Hair et al., 2021). In a case, if the correlation values in each row are higher than the coefficients of AVE's square root, but these are too small, the discrimination might still be accepted (Rahim & Magner, 1995). However, Table 7 shows that each construct has sufficient discrimination for ATU (0.900), BIU (0.914), CS (0.822), PA (0.836), PBC (0.905), PE (0.895), PEOU (0.884), PU (0.925), and SN (0.802). The correlation coefficients are also satisfied when the loading indicators in each row are under the above results (Rahim & Magner, 1995). This points out the other constructs' indications were convertible.

Table 7. Discriminant validity (Fornell-Larcker Scale)

	ATU	BIU	CS	PA	PBC	PE	PEOU	PU	SN
ATU	**0.900**								
BIU	0.783	**0.914**							
CS	0.589	0.646	**0.822**						
PA	0.489	0.572	0.590	**0.836**					
PBC	0.625	0.768	0.765	0.594	**0.905**				
PE	0.753	0.655	0.584	0.464	0.515	**0.895**			
PEOU	0.595	0.645	0.692	0.566	0.702	0.485	**0.884**		
PU	0.821	0.725	0.560	0.451	0.576	0.740	0.512	**0.925**	
SN	0.707	0.735	0.595	0.519	0.695	0.531	0.629	0.634	**0.802**

Structural Model Evaluation

Table 8 presents the R^2 values for ATU (0.716, high), BIU (0.759, high), PEOU (0.522, moderate), and PU (0.584, moderate). Therefore, the structure of the proposed research model shows that the predictive ability is considered to be high.

Table 8. The value of R^2 for coefficient of determination

Dependent variables	R Square	Levels
ATU	0.716	High
BIU	0.759	High
PEOU	0.522	Moderate
PU	0.584	Moderate

Table 9 and Figure 2 show the hypotheses test findings of the proposed research model. The model has examined four endogenous variables (PU, PEOU, ATU, and BIU). Eight of the thirteen hypotheses have generally been validated. The strongest relationship emerged, supporting (H8); PU significantly predicted ATU ($\beta = 0.700$; $p < 0.001$), followed by (H2), the predicting role of PE to PU ($\beta =$

0.602; p < 0.001). The relationship between CS and PEU shows positively (H5) (β = 0.511; p < 0.001). In affecting BIU, PBC (H12) showed a significant prediction (β = 0.377; p < 0.001). In addition, (H11) was also supported; ATU impacts BIU (β = 0.313; p < 0.001) significantly. In predicting ATU, PEOU also was reported to be significant; (H9) (β = 0.236; p < 0.001). PA influences positively PEOU (β = 0.227; p < 0.01); hence, (H7) is supported. From the results, SN is positively influencing BIU (β = 0.155; p < 0.05), and (H13) showed support. However, in predicting PU, CS (β = 0.093; p > 0.05), PA (β = 0.042; p > 0.05), and PEOU (β = 0.132; p > 0.05) have not been affected. Therefore, (H1), (H3), and (H4) were rejected. The finding pointed out a positive effect among PE and PEOU (β = 0.082; p > 0.05); therefore, (H6) is generally rejected. Moreover, the influence of PU and BIU (β = 0.153; p > 0.05) was not important; (H10) also is rejected.

Table 9. Hypotheses testing results

H	Relationship	β	Mean	SD	t-value	p-values	Decision
H1	CS → PU	0.093	0.098	0.090	1.029	0.304	Not support
H2	PE → PU	0.602	0.602	0.064	9.369	0.000	Support
H3	PA → PU	0.042	0.043	0.055	0.761	0.446	Not support
H4	PEOU → PU	0.132	0.126	0.089	1.487	0.137	Not support
H5	CS → PEOU	0.511	0.511	0.083	6.190	0.000	Support
H6	PE → PEOU	0.082	0.083	0.074	1.100	0.272	Not support
H7	PA → PEOU	0.227	0.228	0.070	3.232	0.001	Support
H8	PU → ATU	0.700	0.701	0.044	16.052	0.000	Support
H9	PEOU → ATU	0.236	0.236	0.055	4.330	0.000	Support
H10	PU → BIU	0.153	0.148	0.090	1.703	0.089	Not support
H11	ATU → BIU	0.313	0.314	0.082	3.816	0.000	Support
H12	PBC → BIU	0.377	0.379	0.072	5.263	0.000	Support
H13	SN → BIU	0.155	0.157	0.066	2.346	0.019	Support

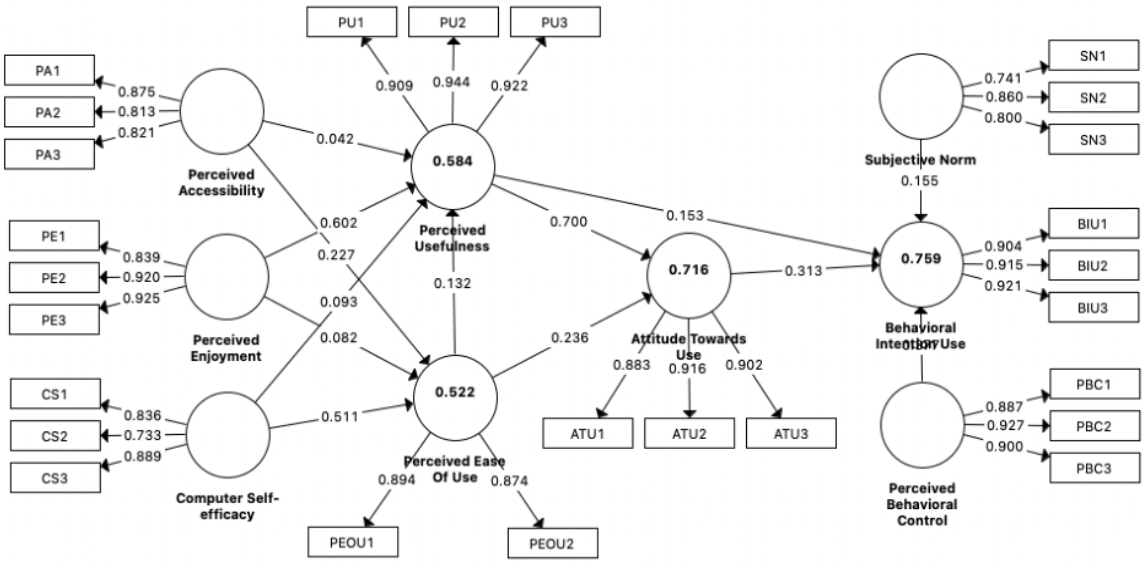

Figure 2. The structural model

DISCUSSION

Regarding the external variables affecting the TAM model, this study investigates the hypotheses H1, H2, H3, H5, H6, and H7 shown in the proposed research model (shown in Figure 1). The results demonstrated that PE impacts significantly on PU (H2) but has not a predictor of PEOU (H6). In contrast, CS impacts positively on PEOU (H5) but rejects an impact on the PU of learners (H1). This result also agrees with outcomes reported in previous studies (Abdullah et al., 2016; C. T. Chang et al., 2017; Kaakour et al., 2022; Salloum, 2018). This finding shows that when using e-learning systems, the student directs attention to the system that provides learners with conditions to stimulate enjoyment in the activities they have experienced. From that, learners can realize the benefits of e-learning, and learners' PU will increase. Conversely, this does not mean the PEOU effect on learners, interested in and excited about e-learning, but users are limited when they have difficulty using it. Instead, users could master and trust the use of e-learning, which leads to influence beneficially PEOU. Besides, PA positively impacts PEOU (H7) and does not influence PU (H3). This result reinforces previous research (Farooq et al., 2021; S. Y. Park et al., 2012). However, these outcomes do not reflect the influence of the results produced in the past on both sides. In the context of the period, the variance between links observed in the study and the literature relations can reflect the quality features of e-learning. Meanwhile, with the drawbacks of e-learning in institutions related to higher education in Vietnam, learners may have difficulties using the system instead of the traditional method. Therefore, taking advantage of the difficulty of the COVID-19 outbreak is also an opportunity to improve the number of services to achieve higher adoption rates as the gaps in these institutions include policymakers and IT managers. Then, policymakers and IT managers may build training courses to practice habits, and access more technology for learners in the future.

For C-TAM-TPB constructions, the study analyzed all the remaining hypotheses in the proposed research model, including H4, H8, H9, H10, H11, H12, and H13. The results show that PEOU does not have any positive impact on PU (H4) but significantly affects the ATU of e-learning (H9). The result is the initial theoretical basis of TAM (Calisir et al., 2014; Revythi & Tselios, 2019). In addition, PU has the most positive effect on ATU (H8) but is discovered to have no impact on learners' BIU (H10). This result also supports previous conclusions (Akman & Turhan, 2017; Al-Adwan et al., 2013; Mailizar, Burg, & Maulina, 2021). This shows the fact that students are still viewing e-learning only as a matter of maintaining knowledge exchange and with an attitude of maintaining usage has not yet assessed whether existing support platforms can provide usefulness. On the other hand, during the process of using, the learning effect has determined the attitude of the learner, a good attitude is maintained, and the student's performance can be improved in the face of handicaps. The PU cannot determine completely learners' BIU in using e-learning in the long term. Finally, a positive predictor between ATU and BIU (H11) was detected, where learners' good attitude brought a strong association with the intention to use e-learning. Different scientific work has demonstrated that BIU has a direct effect (Farooq et al., 2021; Mailizar, Almanthari, & Maulina, 2021; Revythi & Tselios, 2019). This shows that shaping ATU has an important impact on learners' future BIU. In terms of related variables extended in the TPB model, both PBC and SN significantly impact BIU e-learning (H12, H13). The finding indicates that when users perceive that the people around them use an e-learning service, they will also be more willing to use it. In the online environment, with its impersonal nature, users could master certain necessary resources and skills if equipped with the knowledge and provided with knowledge and support. Previous studies had similar results (Mouloudj et al., 2021; Rajeh et al., 2021).

In general, some variables are not supported by FPT University Danang, given the contextual vulnerability of e-learning methods and the combination of TAM and TPB models that should be considered and assessed by various elements that influence the core structure. The proposed model solves up to 75.9% of the significance level for user ATU, SN, and PBC to learners' BIU. Following that, it is 71.6% for PU and PEOU in the TAM model structure when affecting learners' ATU. Expanding to external variables (i.e., CS, PE, and PA), explained 58.4% for PU and 52.2% for PEOU. Research

results have shown that the prediction of this structure is considered moderate and high, while the remaining significance is influenced by the non-model variables and random error. This necessitates further research to investigate other items that can impact the uptake of e-learning. Furthermore, recognition of these factors will improve researchers' capacity and improve the adoption rate of e-learning in different contexts, taking into account the factors studied here.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Firstly, these research results point out that SN impacts significantly on students adopting e-learning. Thus, educational institutions should facilitate the culture of using e-learning so that it can be encouraged and spread among students and teachers. Furthermore, a suitable infrastructure should be established by doing research focused on students' attitudes and intentions. There should be a team in the administration department available to assist students using e-learning by giving instructions and answering students' questions. This will help save time for students and improve usage efficiency and learning outcomes.

Secondly, the developers of e-learning systems should focus on factors related to the system itself that strongly influence students' attitudes and intentions of use. Based on these variables, such as PE, PEOU, and PU, system developers can develop optimal and suitable electronic learning systems for students. Interfaces, configurations, features, and course content should be designed properly and easy to be proficient for students. As a result, it could increase the attitudes of learners and the intention of their behaviors toward utilizing online systems. PE is also an essential determinant that impacts students' BIU toward e-learning. Therefore, balancing and combining academic and enjoyment elements is important when designing and developing a system to help learners feel less bored and stimulate imagination and enjoyment when using e-learning. For example, many functions might be added to the e-learning system, such as filters for cameras, a virtual assistant, and a funny mini-game to encourage a constructive study environment in the class. Besides, it is necessary to do surveys on students' experiences and their expectations after using e-learning systems to have an objective evaluation of the effectiveness of e-learning, while making improvements and changes to enhance student acceptance and adoption.

Student satisfaction is determined significantly by educational quality, so providing a good, appropriate e-learning system and improving the student's user experience will become a competitive advantage for universities as the education market is more competitive than ever, especially in private universities. And because e-learning will become an inevitable choice, developing a great e-learning system in all aspects is an absolute necessity. This system will not only meet the needs and enhance the student experience but will also enhance the reputation of the school, attracting more learners who want to experience a high-quality educational environment. Besides, e-learning systems can also be used for commercial purposes, to replicate and diffuse this system in the future.

Finally, this paper provides related parties with a deeper understanding and an objective view of making effective decisions associated with the implementation of an electronic learning system. These findings could significantly encourage the adoption of the systems and could be used in other similar contexts. In addition, this paper also contributes to the literature foundation for further research based on the proposed model.

LIMITATION AND FUTURE RESEARCH DIRECTION

This research paper provided literature reviews and results for both scholars and practitioners about e-learning systems' admittance in the educational environment. However, there are some limitations in this research, and they could be addressed in the next studies.

Firstly, just three external factors of the TAM were added. Additionally, just two other factors affect the TPB model and indirectly influence the intention to use electronic learning platforms. However, the previous authors also mentioned other external factors based on 112 articles synthesized. Thus,

those factors could be exploited in the future. The more factors are analyzed, the more useful research results are in terms of e-learning.

Secondly, the participants in this study are just students. If lecturers can take part in this survey, comparisons between faculty and students would have more usefulness for assessment. This is a remarkable point since the system for teachers will have some different features when compared with the system for students.

Thirdly, this model just interprets the results at a certain time; that is the COVID-19 pandemic outbreak. E-learning is an instant solution to maintain the exchange of knowledge for students and educational quality. The perception, attitude, and performance of students can change over time. Therefore, as the other researchers recommended, longitudinal surveys should be considered here. In terms of time, learners can completely form extensive experiences, teaching content is also standardized, and differences between majors may appear. Therefore, future studies can divide groups of subjects according to the majors of learners to further test the significance of the research.

CONCLUSION

This study focuses on students' behavioral intentions as a measure and assessment of students' acceptance of electronic learning by using C-TAM-TPB, a blended model of TAM and TPB, as well as exploring how each factor impacts student acceptance and finding out which factors are most important. An extended model was developed by combining and extending TAM from 112 relevant studies and TPB with these components. As a result, for the external variables, the study expressed that CS and PA influence positively PEOU, and PE influences the PU of electronic learning platforms. In addition, in the TAM constructs, both PU and PEOU significantly affect AT, then the relationship between AT and BIU of learners is positive. At the same time, two factors in the TPB model are PBC and SN as positive predictors of the BIU of learners. From that, the proposed innovations are derived from research findings to build and enhance the e-learning platform, as well as learners' intent to use the e-learning systems.

The study also emphasizes building a useful system and creating excitement, stimulating imagination and curiosity for students throughout their studies. If the e-learning system responded quickly to the requests of students, they would be more interested and engaged in e-learning. Hence, it is required to have constant and consistent feedback from the e-learning system to embolden the learners to use the system. Universities should provide knowledge and training courses to improve the experience, from which students can be completely confident enough to master when using e-learning. In addition, the word-of-mouth approach could be used actively by e-learning service providers to raise awareness about e-learning and advertise its advantages. They should recognize how to provide a positive experience for current customers so that they will still be accepted by them in the future, instead of relying solely on the mass media. Moreover, it is important to provide similar knowledge, resources, and support to learners so that they can master their ability to control their behavior in using e-learning. Depending on these findings, the role of the e-learning system is a pivotal key to improving its quality in the long-term usage of e-learning in any future unexpected pandemic. As a result, for universities in general, the quality of the e-learning system must be managed, controlled, and upgraded to maintain their competitive advantage in the education market, becoming competitive day by day.

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APPENDIX

Summary of the results of a literature review of 112 recent studies to identify external variables

No	Studies	Database	External Factors								
1	**Abdullah & Ward (2016)**	*Google Scholar*	Experience	Perceived Enjoyment	Computer Anxiety	Subjective Norm					
2	**Abdullah et al. (2016)**	*Google Scholar*	Experience	Computer Self-efficacy	Perceived Enjoyment	Computer Anxiety	Subjective Norm				
3	**Al Kurdi et al. (2020)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Subjective Norm						
4	**Al-Adwan et al. (2013)**	*Google Scholar*	Student's Attitude								
5	**Al-Ammari & Hamad (2008)**	*Google Scholar*	Computer Self-efficacy	Content Quality							
6	**Al-Aulamie (2013)**	*Google Scholar*	Perceived Enjoyment	Information Quality	Computer Playfulness	Perceived Accessibility	Functionality	User-interface design	Learning Goal Orientation		
7	**Al-Aulamie et al. (2012)**	*IEEE*	Perceived Enjoyment	Computer Playfulness							
8	**Al-Busaidi (2013)**	*Google Scholar*	Experience	Computer Self-efficacy	Technology Innovation moderates						
9	**Al-Debei (2014)**	*Google Scholar*	System Quality	Perceived Enjoyment	Information Quality						
10	**Alenezi et al. (2010)**	*Google Scholar*	Experience	Computer Self-efficacy	Perceived Enjoyment	Computer Anxiety					
11	**Alenezi et al. (2011)**	*Google Scholar*	Training	Technical Support	Facilitating conditions						
12	**Alfadda & Mahdi (2021)**	*Springer*	Computer Self-efficacy								
13	**Al-Gahtani (2016)**	*Science Direct*	Computer Self-efficacy	Perceived Enjoyment	Computer Anxiety	Computer Playfulness	Subjective Norm	Result demonstrability	Facilitating conditions	Job relevance	Image

No	Studies	Database	External Factors								
14	**AlHamad (2020)**	*Google Scholar*	Perceived Enjoyment	Subjective Norm	Perceived Accessibility						
15	**Al-hawari & Mouakket (2010)**	*Google Scholar*	Perceived Enjoyment	Design Feature							
16	**Almaiah et al. (2016)**	*Google Scholar*	Perceived Accessibility	Responsiveness	Personalization	Functionality	Interactivity	Content Quality	Learning content Quality	User-interface design	
17	**Al-Mushasha (2013)**	*IEEE*	Computer Self-efficacy	Organization Support							
18	**Al-Rahmi et al. (2018)**	*IEEE*	Computer Self-efficacy	Content/ Online Course Design							
19	**Al-Rahmi et al. (2019)**	*IEEE*	Perceived Enjoyment	Compatibility	Relative Advantages	Complexity	Trialability	Observability			
20	**Alshammari et al. (2016)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Perceived Accessibility						
21	**Alshibly (2014)**	*Google Scholar*	System Quality	Computer Self-efficacy							
23	**Binyamin et al. (2018)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm							
22	**Binyamin et al. (2019)**	*Google Scholar*	System Quality	Technical Support	User-interface design	Perceived interactivity					
24	**Boateng et al. (2016)**	*Google Scholar*	Computer Self-efficacy								
25	**Briz-Ponce & García-Peñalvo (2015)**	*Springer*	Subjective Norm	Computer Anxiety	Computer Self-efficacy	Facilitating conditions					
26	**Briz-Ponce et al. (2017)**	*Science Direct*	Subjective Norm	Computer Anxiety	Computer Self-efficacy	Facilitating conditions					
27	**Cigdem & Topcu (2015)**	*Science Direct*	Computer Self-efficacy	Subjective Norm							

No	Studies	Database	External Factors								
28	**C. T. Chang et al. (2017)**	*Science Direct*	Experience	Computer Self-efficacy	Perceived Enjoyment	Subjective Norm	Technology Innovation moderates	Computer Anxiety			
29	**Y.-C. Chen et al. (2013)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Systems characteristics	Subjective Norm	Computer Anxiety				
30	**Cheung & Vogel (2013)**	*Science Direct*	Computer Self-efficacy	Subjective Norm	Facilitating conditions	Compatibility					
31	**Chung et al. (2015)**	*Science Direct*	Computer Self-efficacy	Compatibility							
32	**Dart et al. (2020)**	*Google Scholar*	Content/ Online Course Design	Perceived Accessibility							
33	**Daud & Ghani (2017)**	*Google Scholar*	Perceived Accessibility								
34	**Elkaseh et al. (2015)**	*Google Scholar*	Perceived Enjoyment	Subjective Norm							
35	**Eraslan Yalcin & Kutlu (2019)**	*Google Scholar*	Computer Self-efficacy	Computer Playfulness	User-interface design						
36	**Estriegana et al. (2019)**	*Science Direct*	User Satisfaction	Perceived Enjoyment	Computer Self-efficacy						
37	**Fadare et al. (2011)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Subjective Norm	Perceived Accessibility					
38	**Farahat (2012)**	*Science Direct*	Subjective Norm								
39	**Farooq et al. (2021)**	*Google Scholar*	Subjective Norm	Perceived Accessibility							
40	**Fathema et al. (2015)**	*Google Scholar*	System Quality	Computer Self-efficacy	Facilitating conditions						
41	**Granić & Marangunić (2019)**	*Google Scholar*	Computer Self-efficacy								

No	Studies	Database	External Factors								
42	**Güllü et al. (2016)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
43	**Hanif et al. (2018)**	*IEEE*	Computer Self-efficacy	Perceived Enjoyment	Perceived Accessibility	Subjective Norm	Result demonstrability	Perception of External Control			
44	**Ho et al. (2020)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm	System Interactivity						
45	**Hsia & Tseng (2008)**	*Google Scholar*	Computer Self-efficacy								
46	**Huang et al. (2007)**	*Google Scholar*	Perceived Enjoyment								
47	**R. Hussein et al. (2007)**	*Google Scholar*	Computer Self-efficacy	Instructor Characteristic							
48	**T. A. Ibrahim (2018)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
49	**R. Ibrahim et al. (2017)**	*Google Scholar*	Computer Self-efficacy								
50	**Jan & Contreras (2011)**	*Science Direct*	Compatibility	Subjective Norm							
51	**Jatmikowati et al. (2021)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
52	**Javadi Bora et al. (2013)**	*Google Scholar*	Computer Self-efficacy	Organization Support	Perceived Accessibility						
53	**Kanwal & Rehman (2014)**	*Google Scholar*	Experience	Computer Self-efficacy	Perceived Enjoyment	Subjective Norm	Computer Anxiety	Perceived Accessibility			
54	**Kanwal & Rehman (2017)**	*IEEE*	Experience	Computer Self-efficacy	Perceived Accessibility	Perceived Enjoyment	Systems characteristics	Subjective Norm	Computer Anxiety		
55	**Kang & Shin (2015)**	*Google scholar*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
56	**Khamaruddin et al. (2017)**	*IEEE*	Perceived Accessibility	Computer Self-efficacy							

No	Studies	Database	External Factors								
57	**Y.-C. Lee (2006)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm	Content Quality						
58	**Y.-C. Lee (2008)**	*Science Direct*	Perceived Accessibility								
59	**Y.-H. Lee, Hsiao et al. (2014)**	*Google Scholar*	Computer Self-efficacy	Internet self-efficacy	Content/ Online Course Design	Instructor Characteristic	Perceived Accessibility				
60	**Y.-H. Lee, Hsieh et al. (2011)**	*Google scholar*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
61	**B. C. Lee et al. (2009)**	*Science Direct*	Teaching materials	Content/ Online Course Design	Instructor Characteristic	Computer Playfulness					
62	**Lin et al. (2010)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Systems characteristics	Courseware features					
63	**Liu et al. (2010)**	*Science Direct*	Experience	Content/ Online Course Design	User-interface design						
64	**Mahmodi (2017)**	*Google Scholar*	System Quality	Computer Self-efficacy	Subjective Norm	Facilitating conditions	Student's Attitude				
65	**Mailizar, Almanthari, & Maulina (2021)**	*Google Scholar*	Experience								
66	**Mailizar, Burg, & Maulina (2021)**	*Springer*	System Quality	Experience							
67	**Martínez-Torres et al. (2008)**	*Google scholar*	Perceived Enjoyment	Perceived Accessibility	Reliability						
68	**Nagy (2018)**	*Google Scholar*	Computer Self-efficacy	Perceived interactivity							
69	**Nikou & Economides (2017)**	*Science Direct*	Computer Self-efficacy	Facilitating conditions	Subjective Norm	User-interface design	Computer Anxiety				
70	**Ong & Lai (2006)**	*Science Direct*	Computer Self-efficacy								

No	Studies	Database	External Factors								
71	**Ong et al. (2004)**	*Science Direct*	Perceived Credibility	Computer Self-efficacy							
72	**Padilla-Meléndez et al. (2013)**	*Science Direct*	Perceived Enjoyment								
73	**S. Y. Park (2009)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
74	**S. Y. Park et al. (2011)**	*Google Scholar*	Major relevance	Perceived Accessibility	Computer Self-efficacy	Subjective Norm					
75	**Y. Park et al. (2012)**	*Science Direct*	System Quality	Subjective Norm	Training	Perceived Enjoyment	Computer Anxiety	Organization Support	Information Quality	User Satisfaction	
76	**Punnoose (2012)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Computer Playfulness	Subjective Norm	Personality Traits				
77	**Pho et al. (2020)**	*Google Scholar*	Computer Playfulness	Subjective Norm	Output Quality						
78	**Rabaa'i (2016)**	*Google Scholar*	Computer Self-efficacy	User Satisfaction	Perceived Credibility	Subjective Norm					
79	**Rafiee & Abbasian-Naghneh (2021)**	*Google Scholar*	Perceived Enjoyment								
80	**Baki & Birgören (2020)**	*Google Scholar*	Perceived Enjoyment	Subjective Norm							
81	**Baki et al. (2018)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Subjective Norm	Computer Anxiety	Interactivity				
82	**Ramírez Anormaliza et al. (2016)**	*Google Scholar*	Computer Self-efficacy	Perceived Enjoyment	Subjective Norm	Technical Support					
83	**Revythi & Tselios (2019)**	*Springer*	Computer Self-efficacy	Subjective Norm	Perceived Accessibility						
84	**Rizun & Strzelecki (2020)**	*Google Scholar*	Computer Anxiety	Experience	Computer Self-efficacy	Perceived Enjoyment					
85	**Roca et al. (2006)**	*Science Direct*	System Quality	Information Quality							

No	Studies	Database	External Factors								
86	**Salloum (2018)**	*Google Scholar*	System Quality	Computer Self-efficacy	Perceived Enjoyment	Information Quality	Computer Playfulness	Subjective Norm	Perceived Accessibility	Perceived Credibility	Content Quality
87	**Salloum et al. (2019)**	*IEEE*	System Quality	Computer Self-efficacy	Content/ Online Course Design	Perceived Enjoyment	Computer Playfulness	Subjective Norm	Perceived Accessibility	Information Quality	
88	**Sánchez & Hueros (2010)**	*Science Direct*	Technical Support	Computer Self-efficacy							
89	**Sánchez et al. (2013)**	*Google Scholar*	Technical Support	Computer Self-efficacy							
90	**Scherer et al. (2018)**	*Science Direct*	Subjective Norm	Facilitating conditions	Computer Self-efficacy						
91	**Shen & Eder (2009)**	*Google Scholar*	Computer Playfulness	Computer Anxiety	Computer Self-efficacy						
92	**Shin & Kang (2015)**	*Google Scholar*	Computer Self-efficacy	Subjective norm	Perceived Accessibility						
93	**Siron et al. (2020)**	*Google Scholar*	Computer Anxiety	Experience	Computer Self-efficacy	Perceived Enjoyment					
94	**Smeda et al. (2015)**	*Google Scholar*	Cost	Technical Support	Computer Self-efficacy	Subjective Norm	Perceived Accessibility				
95	**Šumak et al. (2011)**	*Science Direct*	System Quality	Experience	Computer Self-efficacy	Information Quality	Subjective Norm	Technical Support	Facilitating conditions	Compatibility	
96	**Tabak & Nguyen (2013)**	*Google Scholar*	Computer Self-efficacy	Experience							
97	**Tantiponganant & Laksitamas (2014)**	*IEEE*	Subjective Norm	Perceived Accessibility	Computer Self-efficacy						
98	**Tarhini et al. (2014b)**	*Google Scholar*	Computer Self-efficacy	Subjective Norm							
99	**T. Teo (2010)**	*Google Scholar*	Subjective Norm	Facilitating conditions							
100	**Thongsri et al. (2020)**	*Google Scholar*	Computer Self-efficacy								

No	Studies	Database	External Factors								
101	**Unal & Uzun (2021)**	*Google Scholar*	Subjective Norm	Output Quality	Perceptions of External Control	Perceived Enjoyment	Technological Complexity	Computer Self-efficacy			
102	**Vidanagama (2016)**	*Google Scholar*	Task Technology Fit	Experience	Computer Self-efficacy	Perceived Enjoyment	Technical Support	Facilitating conditions			
103	**Wang (2013)**	*Science Direct*	Systems characteristics	Teaching materials							
104	**Wong et al. (2012)**	*Google Scholar*	Computer Self-efficacy								
105	**Wongvilaisakul & Lekcharoen (2015)**	*IEEE*	Functionality	Perceived Accessibility	Information Quality						
106	**Wu & Zhang (2014)**	*Google Scholar*	Perceived Accessibility	Sociality	Altruism	Completeness	Accuracy	Reliability			
107	**Ye et al. (2010)**	*Google Scholar*	User-interface design								
108	**Yeou (2016)**	*Google Scholar*	Computer Self-efficacy								
109	**Yi-Cheng et al. (2007)**	*Google Scholar*	Computer Self-efficacy	Instructor Characteristic	Content/ Online Course Design						
110	**Yoon (2016)**	*Science Direct*	Perceived interactivity								
111	**Zhang (2010)**	*Google Scholar*	System Quality	Perceived Accessibility	Perceived Enjoyment						
112	**Zhonggen & Xiaozhi (2019)**	*Google Scholar*	Perceived Enjoyment	Peer influence	Superior influence						

AUTHORS

Mr. Van Ky Long Nguyen is a lecturer at the Faculty of Business, FPT University, Vietnam. He is dedicated to improving the quality of education and learning for students in higher education. His current research interests are in education, finance, and economics.

Ms. Thi My Hanh Le is the Head of the Faculty of Business at FPT University, Vietnam. She has more than ten years of teaching and mentoring experience with undergraduate and graduate students. Education and supply chains are two of her current study interests. She has published many research articles in several international journals.

Ms. Thi Ngoc Mai Duong is a senior at FPT University where she is majoring in Business Administration. Her area of research is mostly related to education and service, including the educational experience of students in higher education, e-learning, and self-service technology. She has published many research articles in several international journals.

Mr. Tien Son Nguyen is a senior Business Administration student at the FPT University, Vietnam. His recent research concerns the learning and development of graduate students and various fields. His publications cover topics such as education quality, higher education, and the impact of the pandemic on the global economy.

Ms. Thi Thu Hien Le is a graduate student at FPT University, where she pursued a bachelor's degree in International Business. Her current research interests include education, entrepreneurship & innovation, and technology. She has published many research articles in several international journals.

Ms. Thi Thanh Huong Nguyen is currently a recent graduate student with a bachelor's degree in International Business from FPT University. Her areas of interest are education, technology, and supply chain. She has conducted many studies related to the above topics.