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Factors affecting e-learning based cloud computing acceptance: an empirical study at Vietnamese universities

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Abstract

E-learning has been a trend of higher education. Accounting students need to know how to apply flexible learning methods as they are required to study and practise in a technological environment. Nevertheless, studies on e-learning based on cloud computing for accounting students in Vietnam are still limited. This study aims to find out factors affecting the behavioral intention, the direct influence of habits, the beneficiary motivation, and the favorable conditions for the acceptance of using e-learning based on cloud computing. By using data collected from a survey of 696 students and applying the theory of adopting extended UTAUT model, the estimation results from the linear structure models show that there are six determinants of accounting students' behavioral intention, in which the performance expectancy has the strongest impact, followed by effort expectancy, price value, facilitating conditions, hedonic motivation, and social influence. Additionally, our findings suggest that despite not affecting the behavioral intention to use e-learning, habits directly impact the application. The hedonic motivation and the facilitating conditions are found to have direct and significant impacts on the use of e-learning based on cloud computing.

Keywords: E–learning, Cloud computing, Accounting students, UTAUT model

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1. Introduction

E-learning acceptance is a major academic subject. The issue of educational technology has received considerable critical attention from many researchers across the world. With the Covid–19 breakout spreading out all over the world, this pandemic reconfirmed that educational institutions have become increasingly dependent on information technology (IT) to provide students distance learning solutions. Investigating e-learning system adoption is a continuing concern in the education field. Since its formal advent in 2007, the concept of cloud computing has caused a continuing paradigm shift in technology and enabled wide application of cloud computing in organizations.

Among various definitions of cloud computing, in this paper the authors use the definition first provided by the National Institute of Standards and Technology (NIST). Accordingly, NIST defined "cloud computing as a model that enables convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell and Grance, 2011). This is one of the most recognized definitions concerning cloud computing because the concept consists of main specifications about cloud computing. It is a model based on demand and shared-network-involved, available computing resources. Computing resources consist of server configuration, network and storage devices, applications, and other services, which are released with minimal effort and cost (Mell and Grance, 2011).

Existing e-learning systems are not dynamically scalable, and it is hard to separate them. Additionally, it is very costly to integrate current e-learning systems with other e-learning systems. In this study, cloud computing as a way to increase scalability flexibility and availability of e-learning systems are presented. The possibility of using cloud computing infrastructure at schools and organizations is considered. We think that cloud computing adoption will become the widespread standard of e-learning at educational institutions in the future.

Although there has been an increasing interest in cloud computing adoption, most of the previous studies on the cloud are business related, while studies in cloud-based e-learning are quite rare. In addition, while the majority were carried out on business organizations, there has been little research on educational institutions. Moreover, the target respondents in many previous studies have often been IT professionals or technicians. Furthermore, it is found that most of the relevant studies were carried out in developed countries such as Korea and Turkey. So, there is a considerable research gap in investigating the adoption of cloud based e-learning in tertiary education in a developing country, such as Vietnam.

The purpose of this paper is to provide a comprehensive understanding of acceptance and use of e-learning based on cloud computing in the case of Vietnamese students. Our study contributes to this growing area of distance learning by exploring key factors on IT acceptance. In particular, the central question of this paper is to explore determinants of students' acceptance of cloud based e-learning. We also investigate the link between technology acceptance and use behavior.

The remainder of the paper is structured as follows: Section 2 reviews related studies on students' acceptance of e-learning-based cloud computing. Section 3 describes sample selection and data collection. Section 4 presents the empirical findings, focusing on the key factors influencing technology acceptance and use, and then some managerial implications are discussed regarding adoption in Vietnamese universities. Section 5 gives some conclusions, limitations and future directions.

2. Literature review and hypothesis development

2.1 Cloud-based e-learning acceptance and use

Over the past decade, most research on adoption of cloud computing has emphasized the use of technology in business organizations toward hardware solutions. Some previous studies in the field of e-learning-based cloud have only focused on the role of applications of cloud computing in higher education (Bora and Ahmed, 2013; Ishaq and Brohi, 2015; Shirzad *et al*., 2012). Technology acceptance has been examined extensively in the research of information system. Several studies analyze the behavioral intention, which is conscious of user decision to accept technology. Several theories have been developed to explain the phenomena from different studies. Theory of Reasoned Action (TRA) identifies elements of the conscious behavior. Theory of planned behavior (TPB) is constructed by Ajzen. "Technology acceptance model (TAM) is based on the theoretical foundation of the TRA to establish relationships between variables to explain human behavior regarding acceptance of information systems" (Nguyen *et al*., 2014). These models have explored factors influencing the intention to use and actual usage of technology. Traditionally, scholars used TAM model in order to explain technology acceptance. The major determinants studied on TAM have been ease of use and usefulness.

2.2 Why was extend UTAUT (UTAUT 2) theory selected in this paper?

After reviewing, analyzing and integrating the literature of cloud-based e-learning, it shows that TAM has been the most adopted theoretical model. However, while TAM has been one of the most popular models of acceptance in the information system literature, it is not the most comprehensive model (Livermore, 2012). This

paper uses extended UTAUT because this is a new model and it has the highest explanatory power. Additionally, UTAUT is based on intergrating and combining many theories to result in a stronger model that can be used in the acceptance of new technology.

There are 11 hypotheses in this model, which are shown in Figure 1. Scale of construct could be seen in the survey questionnaire (see Appendix 1).

2.3 Proposition of research hypothesis

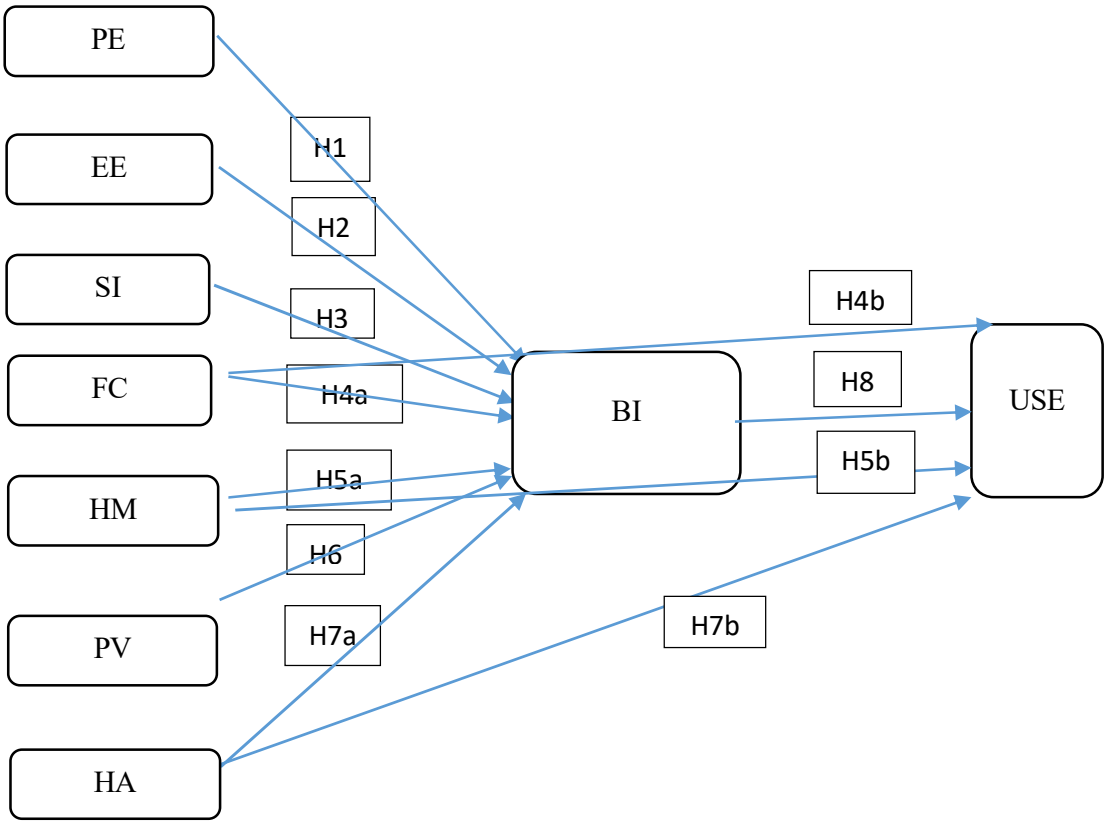

Figure 1. Conceptual model and hypothesis

Source: Authors' proposal

It can be seen from Figure 1 that there are nine constructs in the conceptual model. All constructs existed in the literature, coming from Venkatesh *et al*. (2012) and qualitative interview findings.

PE, which stands for performance expectancy, according to Venkatesh *et al.* (2012), is defined as the degree to which an individual believes that using the system will help him or her to have better job performance. PE consists of four items (see Appendix 1). The students believe that the e-learning based on cloud computing is helpful to their academic performance and the specific learner would be more satisfied with e-learning. Thus, Hypothesis 1 is stated as follows:

H1: PE has a positive impact on e-learning based on cloud computing intention.

EE is an abbreviation for effort expectancy. EE is defined as the degree of ease associated with the use of the system. EE is comprised of four items (see Appendix 1). The effort expectancy of e-learning based on cloud computing would influence users' decision on whether to use the application. Thus, we hypothesize that:

H2: EE has a positive impact on e-learning based on cloud computing intention.

Social influence (SI) is defined as the degree to which an individual perceives what others believe that they should use the new system. SI includes three items (see Appendix 1). According to Venkatesh *et al.* (2003),"the role of SI in technology acceptance decisions is complex and subject to a wide range of contingent influences. Other authors such as Ma and Yuen (2011) and Nguyen *et al.* (2014) note that learners recognize the fact that there might be a lot of problems in the E-learning based cloud computing process. Thus, we hypothesize that:

H3: SI has a positive impact on e-learning based on cloud computing intention.

Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exist to support the use of the system. SI is composed of three items (see Appendix 1). Accordingly, there are all sorts of problems involved in using e-learning based on cloud computing due to hardware, software and support. Thus, it is hypothesized that:

H4a: FC has a positive impact on e-learning based on cloud computing intention.

H4b: FC has a positive effect on the usage of e-learning based on cloud computing.

"Hedonic motivation (HM) is defined as the fun or pleasure derived from using a technology, and it has been shown to play an important role in determining technology acceptance and use" (Brown and Venkatesh, 2005). Regarding educational technology research, such hedonic motivation, which is conceptualized as perceived enjoyment, has been found to influence technology acceptance and use directly. In terms of consumer context, hedonic motivation has also been found to be an important determinant of technology acceptance and use (Brown and Venkatesh, 2005). Thus, we add hedonic motivation as a predictor of e-learning behavioral intention to use an e-learning based on cloud computing. It is, hence, hypothesized as follows:

H5a: HM has positive impact on e-learning based on cloud computing intention.

H5b: HM has positive effect on the usage of e-learning based on cloud computing.

Price value (PV) means that the cost and pricing structure may have a significant impact on the consumer technology user. The monetary cost and price is usually conceptualized together with the quality of products or services to determine the perceived value of products or services (Zeithaml, 1988). According to Venkatesh *et al*. (2012), the price value is positive when the benefits of using a technology are perceived to be greater than the monetary cost, and such price value has a positive impact on intention. Thus, we hypothesize that:

H6: PV has positive effect on e-learning based on cloud computing intention.

Habit has been defined as the extent to which people tend to perform behaviors automatically because of learning and equate habit with automaticity. According to Venkatesh *et al.* (2012), the role of habit in technology use has delineated different underlying processes by which habit influences technology use. Thus, Hypotheses 7a and 7b are yielded as follows:

H7a: Habit has a positive effect on e-learning based on cloud computing intention.

H7b: Habit has a positive effect on the usage of e-learning based on cloud computing.

According to Nguyen *et al.* (2014), e-learning based on cloud computing is consistent with the underlying theory for all of the intention models *(Sheppard et al*., 1988; Venkatesh *et al*., 2003). Thus, behavioral intention has a significantly positive effect on e-learning based cloud computing usage. The next hypothesis is stated as follows:

H8: E-learning based on cloud computing intention has a positive effect on the usage of e-learning based on cloud computing.

3. Research methodology

In this paper, the authors applied a mixed research method. Initially, a systematic qualitative method was used by reviewing and analyzing the related literature. In order to identify the relevant documents, we used keywords such as e-learning, cloud computing, cloud based e-learning, distance learning and cloud computing as well as a combination of these keywords. Information sources were searched on prestigious publishing houses such as Emerald, Elsevier, Sage, Springer and Taylor & Francis. A screening process was adopted to refine the articles. After removing irrelevant literature, selected articles were used in this study. Questionnaire development was used in next stage. A self-administered questionnaire was developed based on a comprehensive review of extended UTAUT model and e-learning based cloud computing for this study to measure determinants of

behavioral intention and use behavior, which were slightly modified based on the research purposes and specific student groups. Three educational practitioners and two professors from Thuongmai university, Hanoi University of Technology, and University of Economics in Ho Chi Minh city reviewed the measurement items to ensure content validity. Reviews from the practitioners and professors help ensure the accuracy of the translation and remove any discrepancies between the translation and the original items (Duong and Thuy, 2019). These items are shown in Appendix 1.

The questionnaires were distributed during three months, from February to April in 2020, using both paper and google form, which is a web-based software survey tool of Google. First of all, the target population was identified. The full-time students who are studying in faculties of accounting in Vietnamese universities are included in the target population. Following Zimund (2015), the sampling frame of this study focuses on the full–time students who are from economic universities in Vietnam including Thuongmai University (TMU) in Northern Vietnam, Danang University of Economics (DUE) in Central Vietnam, and University of Economics in Ho Chi Minh city (UEH) in Southern Vietnam. A convenient sample from the population of the study was selected. According to the official websites of three universities, i.e., TMU, DUE, and UEH, the number of full-time students in accounting faculties is 1,200, 1,000, and 2,800, respectively. Thus, an initial sample consisting of 1,000 questionnaires, which represent 20% of the total population, were selected. Paper and google document questionnaires were sent to students in the sample. At the end of the survey, 696 questionnaires were collected and were valid for this study. The effective response rate is nearly 70%. According to the literature, surveys with 20% response rate are considered unacceptable, while surveys with the response rate of at least 60% or above are acceptable.

Structural equation modelling (SEM) was employed with the maximum likelihood to test the advanced hypotheses. The software AMOS 20 was used to solve the SEM because it provides consistent and unbiased parameter estimatations under condition of missing data (Antonio *et al.*, 2007).

4. Research results

4.1 Reliability and validity

4.1.1 Overall evaluation

Following the recommended two-step process to analyze their data (Anderson and Gerbing, 1988), the confirmatory factor analysis (CFA) with the software AMOS 20 was used to assess the psychometric properties of all the scales, prior to testing the advanced hypotheses. The three-factor and 31-item measurement model fits the

data satisfactorily: GFI = 0.921; TLI = 0.917; CFI = 0.930; RMSEA = 0.045; RMR = 0.040; $\chi 2$ = 923.328; df = 388; p = 0.000; $\chi 2$/df = 2.38, which is better than their recommended cut-off values; GFI > .90; CFI > .90; TLI > .90; RMSEA < .08; RMR < 0.08, which is advised by Hu and Bentler (1999); and 1 < $\chi 2$/df < 3, which is proposed by Wheaton and Muthen (1977). Overall model fit of this scale met the standard.

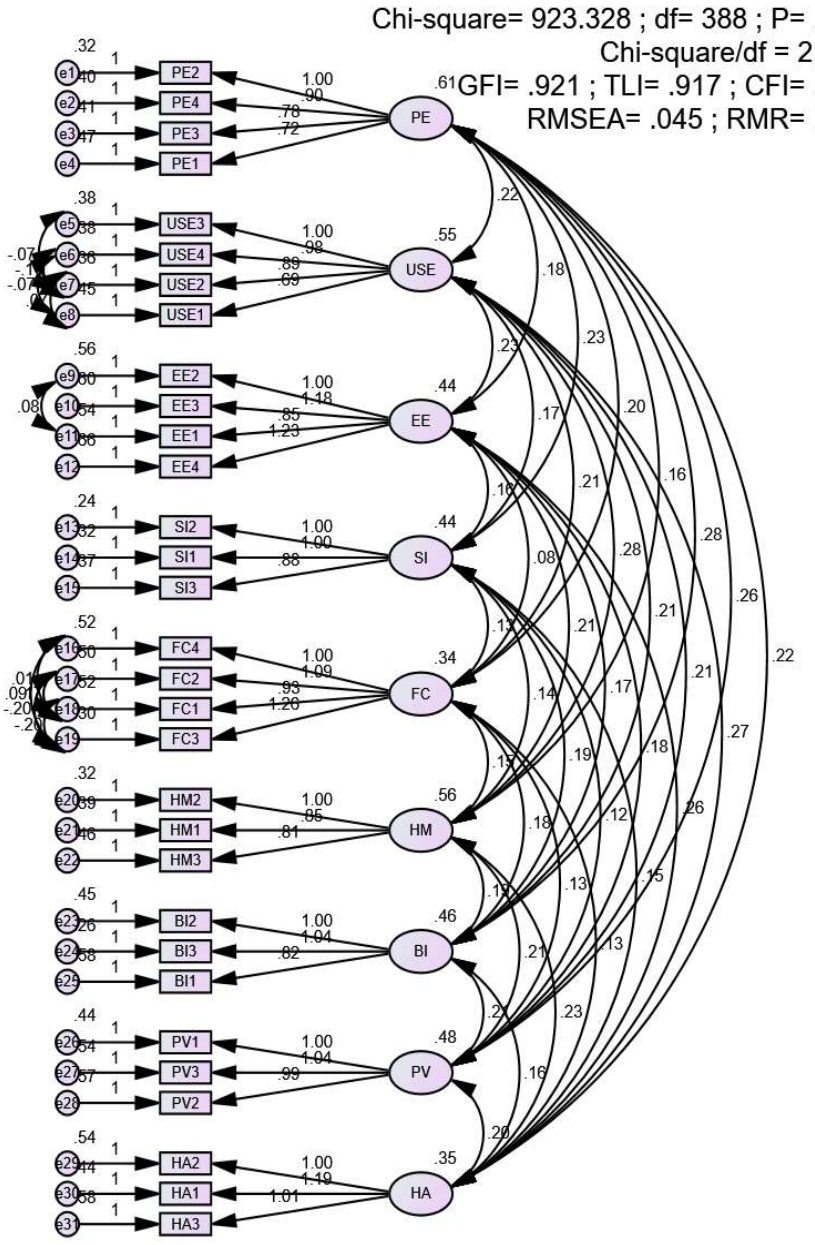

Figure 2. Model fit index

Source: Analysis from IBM SPSS AMOS

Table 2. The properties of scale

Scale of latent variable	Items	Standardized loading	CR	AVE	Cronbach alpha
Performance expectancy	PE2	0.812	0.814	0.524	
	PE4	0.743			
	PE3	0.693			
	PE1	0.811			
Effort expectancy	EE2	0.665	0.770	0.47	0.776
	EE3	0.711			
	EE1	0.614			
	EE4	0.709			
Social influence	SI2	0.804	0.797	0.568	0.793
	SI1	0.759			
	SI3	0.694			
Facilitating condition	FC4	0.630	0.774	0.464	0.753
	FC2	0.672			
	FC1	0.604			
	FC3	0.802			
Hedonic motivation	HM2	0.797	0.771	0.53	0.768
	HM1	0.713			
	HM3	0.668			
Price value	PV1	0.719	0.741	0.489	0.740
	PV3	0.673			
	PV2	0.703			
Habit	HA2	0.628	0.697	0.44	0.695
	HA1	0.729			
	HA3	0.617			
Behavioral intention	BI2	0.713	0.751	0.505	0.739
	BI3	0.812			
	BI1	0.590			
Use behaviour	USE3	0.768	0.812	0.522	0.780
	USE4	0.764			
	USE2	0.741			
	USE1	0.603			

Source: Analysis from IBM SPSS AMOS

4.1.2 Scale reliability and validity

For reliability testing

Reliability of the measures in this study was first assessed using Cronbach's coefficient alpha and then using CFA. As the Alpha values in Table 2 for all the constructs in our study were higher than the guideline of 0.70, of which only the Habit scale reliability is lower than but it is near this cutoff point, so that it can be concluded that the scales can be applied for the analysis with acceptable reliability. In using the CFA, CR and AVE were calculated from the model estimates using the CR formula and AVE formula given by Fornell and Larcker (1981). Bagozzi and Yi (1988) recommend that CR should be equal to or greater than 0.60, and AVE should be equal to or greater than 0.40. Taking these assessments into account, measures used within this study were within the acceptable levels supporting the reliability of the constructs in Table 1. The composite reliability coefficients range from 0.697 to 0.814 and the AVE is higher than 0.4.

For validity

The CFA has also been used to assess construct validity of the prior factor structures retained 31 items to measure latent variable. As indicated in Table 1, all estimate standard loadings are greater than 0.5 and statistically significant, suggesting good convergent validity. The results of the AVE are from 0.44 to 0.568. Thus, convergent validity is satisfied with acceptable ranges. For discriminant validity determined by comparing AVEs with the squared multiple correlation coefficients between any pairs of constructs (Fornell and Larcker, 1981), the results from Table 3 indicate that discriminant validity is ensured because AVEs are greater than the square multiple correlation coefficients. These findings show that all the constructs meet this criterion.

Table 3. Correlations and AVE

	PE	**EE**	**SI**	**FC**	**HM**	**PV**	**HA**	**BI**	**USE**
PE	0.524								
EE	0.352	0.47							
SI	0.445	0.363	0.568						
FC	0.426	0.208	0.343	0.464					
HM	0.282	0.415	0.284	0.335	0.53				
PV	0.48	0.401	0.269	0.310	0.409	0.489			
HA	0.469	0.652	0.387	0.384	0.529	0.484	0.44		
BI	0.53	0.380	0.413	0.456	0.374	0.445	0.391	0.505	
USE	0.376	0.47	0.357	0.484	0.499	0.418	0.608	0.418	0.522

Source: Analysis from IBM SPSS AMOS

4.1.3 Test of structural equation model

This section will discuss the evaluation of theoretical models, direct effect validations, and explained variances of latent dependent variables.

This study employed a structural equation model (SEM) approach to develop a model that represents the causal relationships among the nine variables in this model. The sample size required for SEM should be more than 200 (Anderson and Gerbing, 1988). The number of samples collected in this study is 696. Thus, the number of samples is appropriate for SEM.

The second step after the establishment of reliability and validity is the use of the structural equation modeling to assess the predicted structural relationships. This is consistent with the recommendation by Anderson and Gerbing (1988) regarding the two-stage process in model testing. Model indices point towards that. Overall, the model is a satisfactory fit with GFI = 0.923; TLI = 0.921; CFI = 0.934; RMSEA = 0.043; RMR = 0.039; $\chi 2 = 892.221$; df = 388; and p = 0.000 (Hu and Bentler, 1999).

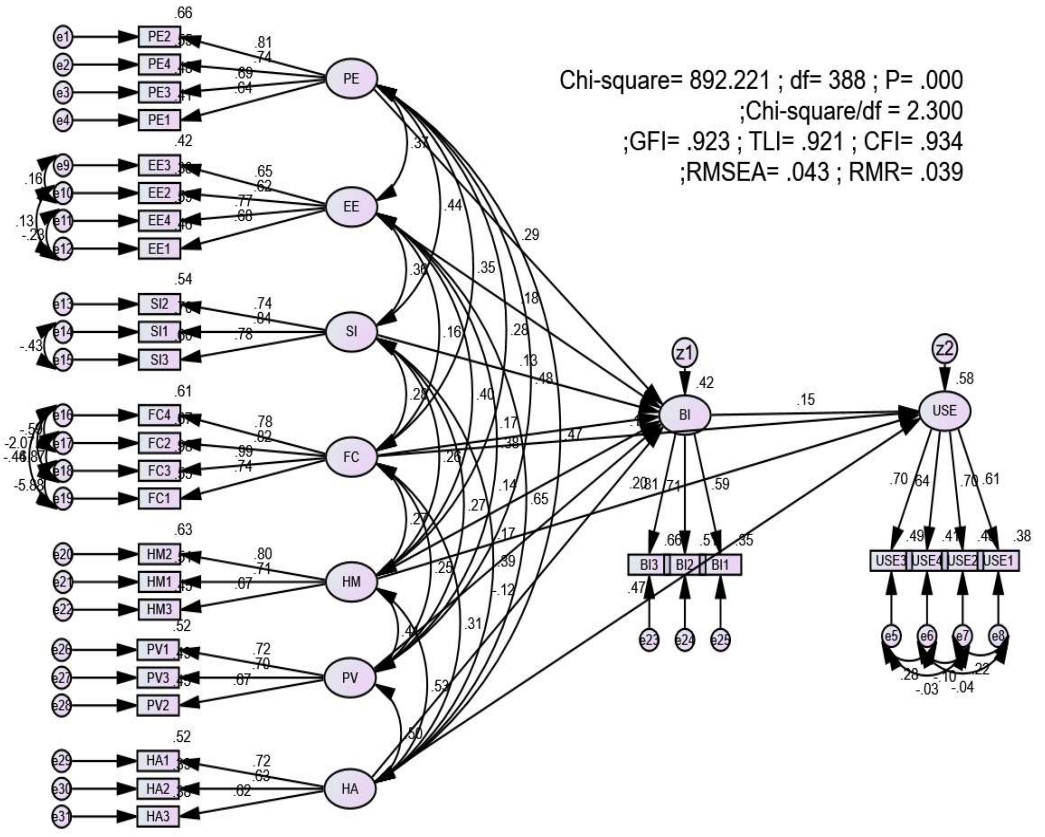

Figure 3. Structural model

Source: Analysis from IBM SPSS AMOS

4.1.4 Hypothesis testing

The outcomes for the hypothesis testing are summarized in Table 3. Most of the hypotheses are supported. It is found that six out of seven factors are positively and significantly related to behaviourial intention. As a result, only Hypothesis H7 is not supported with $p = 0.153 > 0.05$.

Table 4. Hypothesis test summary

Hypothesis	Regression weights	Standardized regression weights	P-value	Supported/ rejected
PE → BI	0.256	0.285	0.000	Supported
EE → BI	0.172	0.175	0.007	Supported
SI → BI	0.153	0.132	0.005	Supported
FC → BI	0.160	0.165	0.000	Supported
HM → BI	0.129	0.137	0.012	Supported
PV → BI	0.173	0.170	0.003	Supported
HA → BI	-0.118	-0.118	0.153	Rejected
BI → USE	0.150	0.155	0.002	Supported
FC → USE	0.156	0.167	0.000	Supported
HA → USE	0.456	0.470	0.000	Supported
HM → USE	0.182	0.199	0.000	Supported

Source: Analysis from IBM SPSS AMOS

Regarding determinants of behavioral intention, the findings show that six factors including performance expectancy, effort expectancy, social influence, facilitating condition, hedonic motivation, and price value positively impact acceptance of cloud-based e-learning. Performance expectancy has largest effect with standardized regression weights of 0.285, which is followed by effort expectancy, price value and facilitating condition, and finally hedonic motivation and social influence. Six factors explained cloud-based e-learning intention by 41.7%, while behavioral, facilitating condition, habit and hedonic motivation predicted cloud-based e-learning usage nearly 60%.

Table 5. Squared multiple correlations: (Group number 1 - default model)

	Estimate
BI	0.417
USE	0.578

Source: Analysis from IBM SPSS AMOS

5. Discussion and recommendation

The findings of the this study are consistent with those of Venkatesh *et al.* (2012), who created an orginal UTAUT model. The findings are also in line with the results of Nguyen *et al.* (2014).

Nevertheless, our findings are not similar to other previous studies. The results stress the role of performance and effort expectancy, while most of the previous studies show that usefulness and ease of use as the most frequent factors for the adoption of cloud-based e-learning. Interestingly, there is no relationship between habit and behavioural intention, but habit had a direct impact on students' cloud-based e-learning usage. Specifically, habit is indicated as the strongest factor. There are several possible explanations for this result. First, students' learning habit is shown by the total number of hours of self–study at home during the time off school, including the number of hours of online self–study and traditional learning. A student, who has been learning at a private university, would be more likely to use e-learning compared to a student in a public university.

Further, we find that for hedonic motivation, the previous studies confirmed that use of technology is influenced by three factors including behavioral intention, facilitating conditions and habit. The results from Table 4 also reconfirm the relationship between these three factors and behavioral intention. In addition, hedonic motivation also has a significant effect on students' usage of cloud based e–learning.

Several recommendations could be considered as follows. The first is for educational institutions. It is important to organize seminars on Industry Revolution 4.0 for lecturers and students to raise awareness of the importance of this revolution regarding the opportunities and challenges. It is also necessary to inform them of the variability of the future job markets and universities' mission to train high-quality human resources and to participate in the labor market restructuring. Universities need to proactively approach advances of educational technology to apply to training programs. They should allow learners to actively select, plan, and register for modules in the integrated program. They also should conduct more online classes, deliver high quality lectures on a variety of subjects. Thorough reviewing the curriculum is needed to ensure that students no longer have to study unnecessary modules and subjects. Teaching majors in accordance with the development trend should be considered. In addition, it is effective to carry out activities including improving the quality of facilities in the classrooms, arranging desks and teaching and learning equipment reasonably in order to enhance the results of teaching and learning to the highest level. Universities also need to

strengthen the relationship with businesses and support students to have more opportunities to learn and practise soft skills, for example, problem-solving, logical reasoning, teamwork, and adaptability skills. With these supports, it would help students find and apply for a job after graduation more easily.

For trainers, it is necessary to generate trainers' and their students' inspiration and motivation in the pursuit of lifelong and continuous learning. It is necessary to adjust old thoughts and teaching methods to a new way so that learners can acquire knowledge and stimulate creativity in practice. In particular, combining traditional teaching methods, which are such as presentation, communication, or practice, with new ones including problem solving, case study, and action-oriented teaching at the same time is warranted. Applying methods associated with modern technology such as e-learning should be carried out. Moreover, it is needed to change the way of sharing knowledge and experiences so that teaching and learning and go beyond the classroom. It should be noted that knowledge can be gained anywhere, and learning can take place despite time and place. Another no less important point that trainers should keep in mind is that the number of classes a lecturer hold should be reduced and replaced by online learning to shorten the learners' studying time. Currently, there are numerous softwares available to help lecturers teach online via the internet. Instead of going to school to attend classes, students are now able to study at home by accessing to their teachers' websites, videos and materials, which helps students to study better. Moreover, unlike "traditional" classes, online classes can be served for classes with a large number of students. As a result, requirements for the lecturers' quota lessons also need to be adjusted accordingly. Last but not least, the teaching method needs to be changed significantly by using tools such as internet, online education, cloud computing technology to enable lecturers and teachers to provide materials for learners. Also, this teaching method will be adjustable in time and create a suitable space to meet the conditions and needs of the learners.

6. Conclusion

Our findings provide a useful framework of cloud-based e-learning to Vietnamese universities to enhance their digital competences. This study also contributes to the current literature by extending the UTAUT 2 into the context e-learning-based cloud computing at universities in a developing country like Vietnam. This study confirms previous findings and contributes additional evidence that suggests institutions innovating advanced educational technology proactively, improving the quality of facilities by digitalizing modules. Regarding lecturers, it is necessary to motivate students toward life-long learning

However, our study has some implications. First, the survey used an inconvenience sample that could tend to miss other specific student groups. In addition, an issue that is not addressed in this study is the role of demographic variables such as students' age, gender, location in the extended UTAUT model. A further study could combine UTAUT and TOE model together to come up with a strong model that explain more detail students' behavioral intention in adopting a new technology. Moreover, future research might explore the role of demographic variables in order to examine more closely the links between behavioral intention and usage of acceptance of new educational technology.

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