

DETERMINANTS OF E-LEARNING ADOPTION: EVIDENCE FROM THE TELECOMMUNICATIONS INDUSTRY IN VIETNAM

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Abstract: As a response to the global digital transformation trend, e-learning has been chosen as a critical method in corporate training worldwide due to its efficiency and flexibility. However, the adoption of an e-learning system is limited in developing countries, particularly in enterprises. In such a context, this research examines factors affecting e-learning adoption in the Vietnamese telecommunications industry. A research model was developed based on the technology acceptance model (TAM), adding three antecedents: management support, technical support, and course quality. Using data collected from 248 employees working in the industry, we ran a structural equation modeling analysis to test seven proposed hypotheses. Our findings showed that perceived usefulness and perceived ease of use mediate the impact of management support, technical support, and course quality on e-learning adoption. Based on our findings, we proposed several suggestions to improve the e-learning system and promote the adoption of e-learning in Vietnamese companies.

Keywords: corporate Training, e-learning, technology acceptance model (TAM), telecommunication industry, Vietnam.

JEL Classification: I20, L96, M12, M15.

1 Introduction

E-learning has been a growing method of corporate training in recent decades, especially in the context of numerous new trends in global workforces. Life-long learning has become vital for progressing in one's profession and ensuring employment stability. E-learning platforms specializing in professional development courses and certificates are anticipated to flourish (E-learning Industry Report, 2022). This industry serves a wide range of professionals seeking to enhance existing skills or acquire new ones to maintain competitiveness in their specific areas.

The worldwide e-learning market is projected to have a significant growth of USD 147.7 billion from 2021 to 2025, with a compounded annual growth rate (CAGR) of 16% throughout the forecast period. The increase in market size can be ascribed to integrating online learning into corporate training and development, as well as improving the learning process in the academic sector (Amaripuja, et al., 2023). The use of e-learning for government programs and academic

learning has been triggered by various factors, including the availability of numerous e-learning technologies, cost savings resulting from consolidated content, effective time management, flexibility and convenience, and consistency in content delivery. Consequently, the e-learning market is expected to experience significant growth compared to the traditional classroom learning sector (Bagdi, 2023).

Nowadays, firms have invested significantly in adopting e-learning to equip employees with the necessary knowledge in the fast-changing business environment. Online resources and infrastructure have been blended strongly with traditional education to enable more effective learning as well as training activities, which is demonstrated notably in the evolution of e-learning (Kem, 2023). The present and upcoming requirements of enterprises necessitate the viability of e-learning due to its strategic values offered to corporate training. Furthermore, the increase in complexity and velocity of the work environment brought about by technological changes are also significant issues that have facilitated the demand for e-learning (Wentling, et al., 2000;

Tuyen, et al., 2022). E-learning has become a powerful instrument that allows organizations to deliver various content to employees (DeRouin, et al., 2005; Kayali and Alaaraj, 2020; Padalia, et al., 2023; Rafique, 2023). The benefits of e-learning, which are cost-efficiency, convenience, improved performance, sustainability, and time efficiency, are believed to be universal. As per the e-learning industry, firms achieve a minimum of 50% cost savings by substituting traditional education with e-learning. The estimated increase in cost savings is expected to be much more significant when considering that e-learning reduces the instruction time by 60% (E-learning Industry Report, 2022).

The Vietnamese telecommunication industry is characterized by rapid technology adoption and industrial transformation while largely under state control. In 2019, Vietnamese state-owned telecom providers could produce 70% of the telecom equipment needed for their own infrastructure and also export them to other developing countries (Thai-Khang and Van-Anh, 2019; Minh-Anh, 2019). The matter of technical training remained crucial due to the impending convergence of the telecom business with the Information and Communications Technologies (ICT) industry, aimed at enhancing the provision of mobile content on mobile phones. Strengthening the connection between the ICT and telecom industries was crucial as the mobile phone market had reached a state of saturation due to intense pricing rivalry. The scarcity of proficient personnel in software and hardware engineering impeded the pace of progress and convergence (Ngo, 2020). In such a context, e-learning is a good choice for telecommunications companies to quickly equip their employees with up-to-date information on products and services and improve their professional skills. However, there is little evidence of how e-learning is being implemented in the Vietnamese telecommunications industry. Thus, this study aims to explore the factors affecting e-learning adoption (EA) in the industry.

This paper is structured as follows. Section 1 introduces the topic. Section 2 presents the theoretical background and research hypotheses. Section 3 describes the research methods. Section 4 gives the findings, discussions, and implications. Finally, section 5 concludes the paper with some limitations and suggestions for future research.

2 Theoretical background and hypotheses

2.1 E-learning

E-learning has received a massive debate over its definition, causing a lack of a common one. Several studies have attempted to define the term. According to Aparicio, et al. (2016), e-learning includes the delivery of content for learning purposes using various electronic means such as a computer network, audio (or videotape), satellite broadcast, interactive television, and so on (Aparicio, et al., 2016). In its general meaning, e-learning refers to any form of electronically enabled learning. In a narrower explanation, it is learning made feasible by using digital technologies or, more specifically, web-based or Internet-enabled learning (Abbad, 2011; Mailizar and Maulina, 2021).

E-learning refers to the attainment and use of knowledge that is predominantly facilitated and distributed electronically (Wentling, et al., 2000; Al-mulla, 2021; Liao, et al., 2022). Therefore, e-learning is defined as using computer network technology, primarily over an intranet or the internet, to deliver information and instruction to individuals (Welsh, et al., 2003; Amaripuja, et al., 2023). Similarly, Choudhury and Pattnaik (2020) mentioned e-learning as “the transfer of knowledge and skills in a well-designed course content that has established accreditations through electronic media like the Internet, Web 4.0, intranets, and extranets.”

Urdan and Weggen (2000) proposed that e-learning covers a broad range of applications and processes, including computer-based learning, web-based learning, virtual classrooms, and digital collaborations. However, another term – distance learning – was not included in the definition of e-learning and was defined as a learning activity that satisfies three criteria: communication between the trainer and learners is geographically distant; two-way interactive communication; assisted by technology to bridge the space gap (Abuhassna, et al., 2023). The e-learning includes complete courses that are accessible in a just in time manner for supplementing knowledge fulfilling competencies or more fragmented content called “bites” that help learners address immediate issues encountered at work. Learning is and will continue to be a lifelong process that can be accessed anywhere at any time to meet a specific need or want.

2.2 Technology Acceptance Model and E-learning

The technology acceptance model (TAM) constructed by Davis (1989) is known as one of the most common and widely used models that has been employed to explain the intention to use or adopt e-learning in various contexts. For example, TAM has been presented by numerous studies regarding students' or employees' intention to use and continued usage of e-learning systems (Liu, et al., 2010; Tarhini, et al., 2013; Ibrahim, et al., 2017; Alulla, 2021; Ahmed, et al., 2023; Alhur and Alhur, 2023).

For example, Mailizar, et al., (2021) investigated factors that impact behavioral intention of university students on e-learning use during the coronavirus disease 2019 (COVID-19) pandemic in Indonesia using an extended TAM. The model consists of six constructs: system quality, e-learning experience, perceived ease of use (PEOU), perceived usefulness (PU), attitude toward use, and behavioral intention. The findings informed that attitude toward e-learning use was the most prominent construct to predict university students' behavioral intention to use e-learning during the pandemic. Meanwhile, Jimenez, et al. (2020) also employed TAM to predict and evaluate the adoption of information and communications in e-learning context of European farmers.

Similarly, Kayali and Alaaraj (2020) examined the factors that affect the cloud-based e-learning (CBEL) of students in four Lebanese universities. The findings indicated that user satisfaction is the most important predictor of behavioral intention, followed by relative advantage, social influence, and PEOU. Attitude mediated the effects of social influence and user satisfaction on behavioral intention. Decision makers are recommended to focus on user satisfaction and increase the benefits of CBEL.

In addition, Ajibade and Zaidi (2023) adapted TAM to investigate the extent to which Nigerians are adopting social networking media for e-learning. Intentions to utilize social media for e-learning by students and faculty at Nigerian institutions were shown to be impacted by PEOU and PU.

Furthermore, Stiller and Wager (2023) used the general extended TAM for e-learning and collected data from 113 employees from a medical institution to examine factors influencing the intention to use e-learning in Germany. The PEOU was best explained by the factors computer experience, computer self-efficacy, computer anxiety, and enjoyment.

In TAM, the motivation of an individual to adopt new technology can be explained by three constructs: PEOU, PU, and behavioral intention to use the new technology. Both PEOU and PU impact the adoption of the new technology, particularly the e-learning system.

2.3 Hypotheses

In the present study, we used TAM as the basic research framework and added three variables, management support (MS), technical support (TS), and course quality (CQ), to explain EA more comprehensively. The proposed hypotheses are presented in Figure 1.

2.3.1 Management support

Management support (MS) is defined by Purnomo and Lee (2013) as the encouragement of a user's management, the allocation of resources, and assistance for instructional development. In another view, Facteau, et al. (1995) and Stiller and Wager (2023) concerned MS with learners' perception and belief of the fact that managers offer them the chances and reinforcement with the purpose of acquiring new knowledge, skills, and attitudes via participating in continuous learning and development. Managers and supervisors have a role not only in motivating their staff to embrace internet self-directed learning, but also in facilitating staff's perception of web-based training. Noticeably, Walker and Johnson (2008) concluded that the adoption of e-learning systems was predicted by several factors, of which MS is the main one.

In general, e-learning and new technology are often requested by the organization's workforce and are not voluntary.

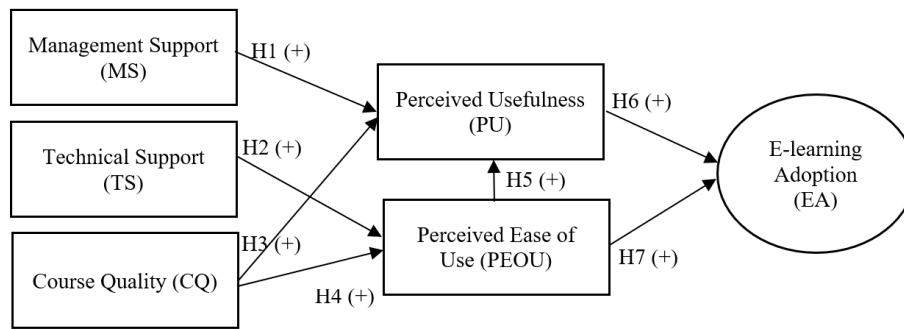


Figure 1. Proposed research model
(Source: Own elaboration)

Thus, management at the middle level can contribute to a more positive attitude toward the systems by showing encouragement, emphasizing the importance and values brought, and even modeling their personal usage of the system. MS was confirmed to affect PU (Lee, et al., 2011; Alhur and Alhur, 2023). Based on the above discussion, we posed the following hypothesis:

H1: MS has a positive effect on the PU of e-learning.

2.3.2 Technical support

TS is defined as the assistance of people provided to computer hardware or software users by means of hot-lines, online support, frequently asked questions (FAQs), automated voice answer systems, or other platforms. This can be operated either by humans or not. In the academic context, TS involves university support aiming to provide learners with timely and effective assistance and is measured by four aspects: online technology support availability and accessibility, the timeframe of assistance, quality of deliveries, and TS team readiness and proficiency. TS availability could be assessed by the extent to which a responsible person helps when users of the new technology have inquiries or questions and the extent to which they are trained to use the technology and attain self-confidence (Lin, et al., 2013).

The role of TS as a key determinant of technology acceptance has been confirmed by several researchers (Hofmann, 2002; Alshehri, et al., 2019; Alhur and Alhur, 2023). The effectiveness of a web-based learning system is contributed significantly by TS. Specifically, TS influences both students' behavioral

intention to use and the actual use of a learning management system (Alshehri, et al., 2019). TS strongly affects PU and PEOU (Abbad, 2011).

Therefore, the following hypothesis was suggested:

H2: TS has a positive effect on the PEOU of e-learning.

2.3.3 Course quality

Since online learning is web based, whereas interaction mainly happens between learners and the presented content, the design of course content is important for participants using e-learning and can even be an essential factor in deciding the success of e-learning. Content quality is imperative for e-learning participants (Ibrahim, et al., 2017). For the enhancement of values generated, learners' requirements and demands should be considered during the design phase of online course content. DeRouin, et al. (2005) found that the online course design has a positive effect on both PU and PEOU of an online learning program (Chen, 2008). Lee (2006) and Almulla (2021) found that the update and personalization of e-learning create engaging user experiences. More specifically, according to Ansong, et al. (2017), the complexity of e-learning course content has a direct relationship with EA: less attractiveness and thus adoption is the consequence of complicated content visualization.

The CQ consists of (1) content quality (its structure, complexity/difficulty, length, relevance) and (2) design (interactivity, attractiveness), both of which impact a learner's motivation to enroll in an e-learning course. Therefore, this research hypothesizes that CQ affects the adoption of e-learning in enterprises

through PU and PEOU. The following hypotheses were formulated:

H3: CQ has a positive effect on the PU of e-learning.

H4: CQ has a positive effect on the PEOU of e-learning.

2.3.4 Perceived usefulness and perceived ease of use

In TAM, both PU and PEOU have an influence on a person's intention to use a new technology, which then influences the usage behavior in which PU has a greater impact than PEOU.

Many previous researches have indicated that PU and PEOU have effects on the intention to use e-learning. Moreover, the more users see the system is easy to use, the more they feel it is useful and will be more likely to use it (Purnomo, et al., 2013). Thus, PU has a positive effect on the intention to use an e-learning system, but PEOU does not. According to Alharbi and Drew (2014) and Amaripuja, et al. (2023), PEOU and PU positively affect attitudes toward using a learning management system (LMS). The current study uses TAM by focusing on the adoption of an internal e-learning system. Therefore, three hypotheses were generated as follows:

H5: PEOU has a positive effect on PU.

H6: PU has a positive effect on EA.

H7: PEOU has a positive effect on EA.

3 Methodology

3.1 Measurements

In this study, EA is the dependent variable. The measurement scale of EA (three items) was adapted from the study of Liu (2009). Three independent variables, MS (four items), TS (four items), and CQ (six items), were also adopted from Liu (2009).

Two mediators in this research model adapted from TAM are PU (three items) and PEOU (three items). These scales were adopted and adapted from other studies on technological-based products and services, such as Lee (2010). The measurement items are presented in Appendix.

3.2 Sampling and data collection

In this study, a self-administered online survey was conducted in 2021 from March to May. The population of this study is the total number of employees working in three largest companies in the Vietnamese telecommunication industry. Thus, the nonprobability and convenient sampling methods were applied. The data collection process is as follows: (1) acquiring permission to collect data from the telecommunication companies; (2) distributing the questionnaire randomly through the company's email system; and (3) screening to select valid received questionnaires for further analysis.

The questionnaire was randomly distributed to employees within the chosen telecommunication companies through the company mail system. The purpose of the survey was clearly stated in the email. Potential respondents were asked to participate in the study by clicking a hyperlink to the Google Form of the questionnaire. All replies were treated with complete confidentiality. After 2 months, 248 valid questionnaires were returned and employed in the analysis using the Statistical Package for the Social Sciences and Analysis of Moment Structures (AMOS) software.

4 Results and discussion

4.1 Preliminary analysis

4.1.1 Sample demographics

In our sample, the majority of respondents were male (60%) and less than 40 years old (65.3%). However, many of the respondents had been working for more than 10 years (52.8%). Details of sample demographics are presented in Table 1.

4.1.2 Reliability and validity test of measurements

Our preliminary analysis included the tests of reliability and validity of the measurement instruments. The reliability of measurements was checked in SmartPLS using several criteria, including Cronbach's alpha, outer item loadings, and composite reliability (CR).

Table 1. Sample characteristics (N = 248)
(Source: Own elaboration)

Variable	-	Frequency	Percent
Gender	Male	149	60.0
	Female	99	40.0
Age (years)	18–29	43	17.3
	30–39	119	48.0
	40–49	78	31.5
	50–60	8	3.2
	<3 years	38	15.3
Work experience	3–5 years	39	15.7
	5–10 years	40	16.1
	>10 years	131	52.8
	Employee	116	46.8
Job position	First-line manager	64	25.8
	Middle manager	39	15.7
	Top manager	29	11.7

Table 2. Mean, standard deviation, convergence, validity of measurements
(Source: Own elaboration)

Factor	Indicator	Mean	Standard deviation	Standardized loading	Composite reliability	AVE
Management support (MS)	MS1	3.47	1.20	0.879	0.832	0.553
	MS2	3.39	1.24	0.866		
	MS3	3.29	1.24	0.961		
	MS4	3.34	1.18	0.906		
Technical support (TS)	TS1	3.45	1.15	0.871	0.809	0.515
	TS2	3.48	1.14	0.780		
	TS3	3.48	1.15	0.839		
	TS4	3.54	1.10	0.764		
Course quality (CQ)	CQ1	3.56	1.19	0.839	0.884	0.562
	CQ2	3.53	1.12	0.734		
	CQ3	3.46	1.21	0.974		
	CQ4	3.44	1.16	0.896		
	CQ5	3.44	1.10	0.801		
	CQ6	3.44	1.14	0.920		
Perceived usefulness (PU)	PU1	3.51	1.17	0.816	0.812	0.590
	PU2	3.46	1.13	0.936		
	PU3	3.42	1.21	0.939		
Perceived ease of use (PEOU)	PEOU1	3.47	1.33	0.958	0.757	0.511
	PEOU2	3.42	1.29	0.975		
	PEOU3	3.46	1.24	0.817		
E-learning adoption (EA)	EA1	3.51	1.15	0.729	0.758	0.516
	EA2	3.35	1.16	0.733		
	EA3	3.46	1.16	0.993		

Table 3. Discriminant validity analysis result
(Source: Own elaboration)

Factor	1	2	3	4	5	6
1. MS	0.744	-	-	-	-	-
2. TS	0.268**	0.718	-	-	-	-
3. CQ	0.260**	0.230**	0.750	-	-	-
4. PU	0.487***	0.356*	0.397*	0.768	-	-
5. PEOU	0.002	0.489***	0.364**	0.444**	0.715	-
6. EA	0.314***	0.311*	0.402***	0.654***	0.499***	0.718

Note: MS: Management Support; TS: Technical Support; CQ: Course Quality; PU: Perceived Usefulness; PEOU: Perceived Ease of Use; EA: E-learning Adoption

Table 4. Standardized causal effects for the structural model and hypotheses assessment
(Source: Own elaboration)

Endogenous variable	Determinant	Standardized causal effect	Result
PU ($R^2 = 0.473$)	H1 – MS	0.403***	Supported
	H3 – CQ	0.157*	Supported
	H5 – PEOU	0.317***	Supported
-	-	-	-
PEOU ($R^2 = 0.304$)	H2 – TS	0.461***	Supported
	H4 – CQ	0.311***	Supported
-	-	-	-
EA ($R^2 = 0.505$)	H6 – PU	0.484***	Supported
	H7 – PEOU	0.199**	Supported

The validity of the measurements was evaluated based on the average variance extracted (AVE). Table 2 shows the details.

As shown in Table 2, all items met the cut-off value. Regarding the reliability of the measurements, all factors have Cronbach's alpha value higher than 0.7, among which the highest factor is CQ (0.884). This result confirmed the convergence of all factors in the research model.

4.1.3 Correlations among the constructs

The Fornell and Larcker (1981) test was applied to verify the discriminant validity. The procedure dictates that the square root of AVE of each construct exceeds the shared correlation between the construct and other constructs in the model to obtain the discriminant validity. Table 3 shows the details of this analysis. All constructs successfully passed the test; the square root of AVE (on the diagonal) is greater than the inter-construct correlations. All eligibility criteria exceed the threshold levels commonly suggested in the literature and show good reliability and validity of all constructs.

4.2 Hypothesis testing

This study employed structural equation modeling (SEM) to examine the hypotheses. Hypothesized effects were positive and statistically significant, indicating that the three external variables and the two mediating variables were all significant determinants. Test results are shown in Table 4.

As shown in Table 4, seven hypotheses were accepted. Particularly, PU is confirmed to be strongly influenced by MS ($\beta_1 = 0.403$), followed by PEOU ($\beta_5 = 0.317$), and CQ ($\beta_3 = 0.157$). Meanwhile, PEOU is mostly affected by TS ($\beta_2 = 0.461$) and CQ ($\beta_4 = 0.311$). In turn, EA is more strongly affected by PU ($\beta_6 = 0.484$) than PEOU ($\beta_7 = 0.199$).

4.3 Discussion

The primary objective of this study was to verify the relationship among employees' PU, PEOU, and EA. In this research, we used the extended TAM, which fea-

tured specific variables relating to an enterprise context. In addition, the effect of MS, TS, and CQ on employees' PU and PEOU was investigated.

Data analysis showed the predictive relevance and validity of the model to evaluate the adoption of e-learning systems among employees. One of the main reasons for this finding may be the ease with which these staff use technology as they work for leading Vietnamese technology enterprises. Moreover, working in this ICT-related field, employees are relatively tech-proficient and, of course, face less difficulty in mastering the e-learning system. The empirical results were consistent with most studies mentioned in the literature review, such as Alharbi and Drew (2014), Ibrahim, et al. (2017) and Alshehri, et al. (2019). Two dominant determinants, PU and PEOU, positively influenced surveyed employees' adoption of the e-learning system in corporate training. Our study suggested that the core TAM relationships hold just as well in an enterprise setting as in other fields. The data support all hypothesized relationships. Our findings are in line with the study of Alluma (2021).

In the present study, it could be concluded that all three factors (MS, TS, and CQ) significantly impacted the adoption of e-learning in the Vietnamese telecommunications industry. PU was the most critical factor influencing employees' adoption of e-learning. Recognizing PU as the factor with the biggest impact on the intention to use e-learning supports existing research (Venkatesh and Davis 2000; Alsabawy, et al., 2016). Although PEOU also recorded a positive effect, it was less impactful. This result concurs with Pituch and Lee (2006), who stated that the effect of PEOU depends on the nature of the task the technology is applied to. Furthermore, our finding is also in line with the studies of Ansong (2017), Castiblanco Jimenez (2020) and Almulla (2021). Hence, a possible explanation for its limited importance on employees' intention to accept e-learning may be the application of technological training would more likely lead to replacing job tasks, rather than just a higher competence and cognitive capacity for employees. Since e-learning programs could be carried out with fewer expenses on organizing (in comparison with classroom training regarding travel, lodging, meals, and, for some courses, the instructor's salary) and materials could be reused, in the

long run, benefits of some divisions in charge of corporate training would be negatively affected.

The increasing popularity of online learning in the COVID-19 pandemic context has led to the extensive use of digital resources as additional tools for training. The embracing of online instruction could generate additional workload, conflicts, and negative affective responses to technology use for employees. To decrease these negative consequences, it is necessary to accurately identify the predictive factors that can influence the degree of adoption and continuity in the use of technology. Our finding is also supported by several other studies such as Kayali and Alaaraj (2020), Mailizar, et al. (2021), Abuhassna, et al. (2023), and Padalia, et al. (2023).

Furthermore, it is beneficial to identify which factors enable and inhibit employees' acceptance of technology-driven training programs to take corrective actions to increase acceptability. This study contributed to developing a predictive model for the acceptance of e-learning among employees. In line with previous research, we concluded that PU has the biggest predictive power, while PEOU also contributes, but with a lower impact. This finding is similar to the studies of Liao, et al. (2022) and Stiller and Wager (2023). Nonetheless, this factor should not be overlooked since it appears to have a strong predictive power on PU. In addition, our model included external variables, which show a significant correlation with the two aforementioned mediating variables.

4.4 Implications

4.4.1 Theoretical implications

This study contributes to understanding employees' readiness to join e-learning projects by identifying underlying factors and causal relationships that predict their adoption of e-learning. Our present study extended TAM framework with three antecedents, including MS, TS, and CQ. Our research results highlighted that the three antecedents, which are MS, TS and CQ play a critical role in determining the PEOU and PU of the e-learning system and indirectly affect the adoption of the system. This finding of our study is a new contribution to the existing literature as we consider PEOU and PU as two mediators in our research model.

4.4.2 Practical implications

In terms of practices, there are some suggestions to enhance e-learning in Vietnamese telecommunications companies.

First, managers should focus on building an open-minded e-learning culture within the company. Organizational culture is critical to the fruitful inception, development, and ultimate success of e-learning in any organization. A strategic e-learning plan that has not addressed its corporate culture has little viability. Thus, a deep understanding of culture and its functional influence in an organization should always precede a strategic e-learning plan (Wentling, et al., 2000).

Second, combining conventional learning with e-learning should be thoroughly considered and implemented. Despite having many advantages, e-learning with no appearance of the human touch provides little motivation. The presence of a teacher in traditional courses helps keep track of learners' progress and motivates them with feedback and assistance. Adopting e-learning with the addition of teachers could strengthen the advantages and weaken the disadvantages of adopting e-learning on its own.

Third, utilizing the role of MS. Management and TS are connected with workers' perception and belief of the degree to which employees are provided with opportunities and reinforcement for acquiring new knowledge, skills, and abilities through participation in continuous learning and developmental activities by their supervisors and managers (Lee, et al., 2011). According to the expectancy theoretical model of training motivation, perceived managerial support may enhance one's perception and belief of the valence of the outcomes (i.e., supervisor recognition) gained through participation in learning. From the technology acceptance perspective, managerial support is an antecedent of user's PU of an e-learning system (Lee, et al., 2011; Cheng, et al., 2012).

5 Concluding remarks

This study provides new insight into the determinants of perceptions in the Vietnamese telecommunications companies. However, it is merely a steppingstone as no single research is conclusive of facts. More studies

in the future are needed to verify and refine the findings of this study to expand the knowledge base on essential determinants that will assist managers in understanding the factors leading to effective and efficient adoption of e-learning in their companies. In addition, the present study has several limitations that future research should address.

First, there was a bias toward young people in our sample, with 65.3% under 40 years old. However, it is recognized that older participants are more likely to resist adopting new technologies (Brougham and Haar, 2018). In addition, people working for telecommunications companies are much more prone to be technology literate than the average worker. That is why it cannot be claimed that the sample used in this research represents different fields of work. Future research should, therefore, use a more representative sample.

Another limitation is that this research did not consider how participants' attitudes might change over time. The adoption of e-learning programs is in its beginning phase, and adoption is an ongoing process. Therefore, future research should use longitudinal data to measure potential changes in adoption behaviors to facilitate a more comprehensive understanding of the relationships between different constructs.

The final limitation concerns using self-reported values as opposed to objectively measured attitudes. Several previous studies doubted the validity of such subjective measures of the variable and recommended using objective measures instead (Venkatesh, et al., 2003). Therefore, future research should combine different measurement methods for the best results.

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8 Appendix: Measurement items

No	Scale	Item
Management support (MS)		
1	MS1	My manager encourages me to upgrade my capabilities by studying e-learning
2	MS2	My manager suggests relevant content to me on e-learning
3	MS3	My manager supports and encourages me to refer e-learning for my work
4	MS4	My manager cares about my using e-learning
Technical support (TS)		
5	TS1	A hotline is available to support technical issues about the e-learning system
6	TS2	An email line is available to support technical issues about the e-learning system
7	TS3	TS for e-learning is provided shortly after requested
8	TS4	Overall, I am satisfied with the TS regarded to e-learning
Course quality (CQ)		
9	CQ1	The courses' difficulty is moderate on e-learning to me
10	CQ2	The courses' duration is suitable on e-learning for me
11	CQ3	The courses' structure is clear and understandable on e-learning
12	CQ4	The courses' content is presented attractively
13	CQ5	The courses are relevant to my work requirement
14	CQ6	Overall, I am satisfied with the course content on e-learning
Perceived usefulness (PU)		
15	PU1	Using e-learning helped me to improve my learning effectiveness
16	PU2	Using e-learning helped me to improve my performance
17	PU3	Overall I think e-learning is beneficial to my work
Perceived ease of use (PEOU)		
18	PEOU1	I understand how to use e-learning system
19	PEOU2	I do not have difficulties in interacting with e-learning system
20	PEOU3	Overall I think the system is easy to use
E-learning adoption (EA)		
21	EA1	I intend to use e-learning as a method to study
22	EA2	I prefer e-learning over other traditional methods
23	EA3	I would recommend e-learning to my colleagues