

The Mediating Role of the Perceived Usefulness in the Acceptance of E-learning

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ABSTRACT: *The mediating role of the perception on the usefulness of e-learning in the relationship between the perceived ease of use and the acceptance of e-learning for study is important. However, previous research has not discussed and investigated this important relationship. This research applies Sobel's technique to test the mediating effect of the perceived usefulness of e-learning and provides statistical evidence that the perception on the usefulness of e-learning imposes a statistically significant mediation in the association between the perceived ease of use and the acceptance of e-learning. The findings offer researchers and educational managers with good understanding of the complicated relationships among the above variables related to e-learning. This is helpful to educational organizations for their decision in accepting e-learning for education.*

KEYWORDS: *Perceived usefulness of e-learning; Perceived ease of use in e-learning; Acceptance of e-learning*

I. MOTIVATION

Internet as well as information and multimedia technology has been increasingly considered as one of the most vital means to offer students with learning resources to share and obtain information as well as knowledge (Richard and Haya 2009). Especially, they have changed the traditional teaching and learning technique into a new method (Wang et al. 2003 and Tao et al. 2006). This new technique is known as electronic learning or e-learning, which benefits students as well as teachers. E-learning is a technique used to facilitate learning process by employing tools or procedures based on information technology. On the one hand, e-learning helps teachers to construct their educational perception; on the other hand, it also supports students to obtain knowledge by discussion, and so develop their thinking and working skills. E-learning has been regarded as a really useful technique for study. A number of educational organizations accept e-learning to offer the distance education to their students. The distance education is a way used to offer education and instruction to students who are far away from a classroom because of their difficulty in geographical distance. The acceptance of e-learning for the distance education is suggested as an important factor bringing about benefits to teachers as well as students, in which students and teachers do not need meet in person for classes. However, the acceptance of e-learning for study is determined by several driving forces such as students' perception on the usefulness of e-learning or their perceived ease of use in e-learning (Abbad et al. 2009; Al-alak and Alnawas 2011).

Moreover, the perceived usefulness and the perceived ease of use are two important factors in the technology acceptance model- TAM, which is introduced by Davis (1989). Within these two variables that are regarded as antecedents to acceptance behavior, the perceived ease of use is suggested as an affecting factor of the perception on the usefulness. For the e-learning context, the usefulness of e-learning perceived by students may determine the acceptance of e-learning for their study, but it is affected by their perceived ease of use in e-learning for study. As a result, the perceived usefulness of e-learning for study can be proposed as a mediator in the relationship between the perceived ease of use and the acceptance of e-learning for study (Baron and Kenny 1986). Nevertheless, to the best of our knowledge, no studies on e-learning have introduced and justified the mediating role of the perception on the usefulness of e-learning in the relationship between the perceived ease of use and the acceptance of e-learning for study.

This project attempts to discuss the mediating role that students' perception on the usefulness of e-learning may put on the relationship between their perceived ease of use and the acceptance of e-learning for study. Then it applies the procedures suggested by Sobel (1982) to test the statistical significance for the mediating relationship. This research makes some contributions to both literature and practical aspects. To the literature, we will fill the gap in the e-learning literature on the mediating role of the perception on the usefulness of e-learning for study by providing insights into the importance of students' perception on the

usefulness of e-learning in the relationship between the perceived ease of use and the acceptance of e-learning for study, which has been missed in previous e-learning research. To the practice, the results obtained from this research offers better understanding of the complicated associations among the perception on the usefulness, the perceived ease of use and the acceptance of e-learning for study. Especially, it also offers educational managers with good understanding of the mediating role of students' perception on the usefulness of e-learning for their study. Consequently, it will be helpful to educational organizations in designing good education programs using e-learning such as the distance education program.

This research is organized as follows. Subsequently, the literature review will develop the hypotheses being tested. Next, the research methodology will guide the data selection and facilitates the data analyses, followed by the empirical results that will discuss the findings obtained from the research. Finally, the part "conclusion" will offer some summaries.

II. LITERATURE REVIEW

The acceptance of e-learning in educational organizations has interested researchers as well as educational managers due to its importance in facilitating the learning and teaching method. The manner of e-learning acceptance is similar to that of the acceptance of a new technology, which is introduced by Davis (1989) in the technology acceptance model (TAM). In TAM, Davis (1989) highlights two important factors that explain the acceptance of a new technology, namely the perceived ease of use and the perceived usefulness. The perceived ease of use is defined as "the degree to which a person thinks that the acceptance of a particular tool will be free of physical and mental efforts", while the perceived usefulness is considered as the extent to which a person thinks that the acceptance of a particular tool will boost their efficiency (Cheong and Park 2005). In addition, Cheong and Park (2005) also refer to the acceptance of a new technology tool as a degree to which a user intends to use this tool. This research employs TAM to explain and justify its research model. Based on TAM suggested by Davis (1989), we can posit that, on the one hand, the perceived ease of use in e-learning may lead to the perceived usefulness of e-learning, which is supposed as a driving force of the acceptance of e-learning for study; on the other hand, the perceived ease of use in e-learning may also directly affect the acceptance of e-learning. Moreover, grounded on the discussions on the mediating role by Baron and Kenny (1986), we can suggest that the perceived usefulness of e-learning may mediate the link between the perceived ease of use in e-learning and the acceptance of e-learning for study. The associations among the perceived usefulness, the perceived ease of use and the acceptance of e-learning for study as well as the mediating role of the perception on the usefulness of e-learning for study in students will be explained and justified below.

Davis (1989) suggests the perceived usefulness of a new technology tool as one of the vital variables that determine the acceptance of this tool. Furthermore, the effect of the perceived usefulness on the acceptance of a new technology tool is confirmed in a study conducted by Igarria et al. (1997). In addition, Abbad et al. (2009) in a study on "Factors affecting student adoption of e-learning systems" point out that the students who consider e-learning as a useful tool are likely to accept it for their education. Likewise, a few years later, Al-alak and Alnawas (2011) also discover that the perceived usefulness plays an important role leading to the acceptance of e-learning. Grounded on the above arguments, we can hypothesize the link between the perceived usefulness and the acceptance of e-learning for study in students and so the following hypothesis H1 can be arrived at.

H1. Students' perception on the usefulness of e-learning imposes a positive effect on their acceptance of e-learning for study

Abbad et al. (2009) apply TAM for their research model. They emphasize that the perceived ease of use in e-learning positively impacts not only on the perceived usefulness of e-learning, but also on the acceptance of e-learning for study. Their findings show the perceived ease of use put a statistically significant effect on both the perceived usefulness of e-learning and on the acceptance of e-learning at the 0.001 level. Furthermore, in the same year, Park (2009) also suggests that both the perceived usefulness and the acceptance of e-learning are positively affected by the perceived ease of use in e-learning for study in students. However, they discover that the perceived ease of use statistically impacts on the perceived usefulness of e-learning in students at the 0.05 significance level, while it put no statistical influence on the acceptance of e-learning. In contrast, Al-alak and Alnawas (2011) offer statistical evidence on the positive association between the perceived ease of use and the acceptance of e-learning at the 0.01 significance level. In addition, Okazaki and Renda dos Santos (2012) in a study on "Understanding E-Learning Adoption in Brazil: Major Determinants and Gender Effects" propose the positive relationship between the perceived ease of use in e-learning and the perceived usefulness of e-learning. Their results indicate that the perceived

ease of use in e-learning directly and significantly impacts on the perceived usefulness of e-learning with the coefficient of 0.61 at the 0.001 significance level. The above studies offer the same statistical evidence on the effect of the perceived ease of use on the perceived usefulness of e-learning and the acceptance of e-learning, only a study by Park (2009) delivers an opposite result on the perceived ease of use and the acceptance of e-learning. Hence, we rely on the majority of the studies and offer the suggestions that the perceived ease of use in e-learning positively impacts on the perceived usefulness of e-learning and the acceptance of e-learning for study in students, as stated in the following hypotheses H2 and H3.

H2. Students' perceived ease of use in e-learning positively affects their acceptance of e-learning for study

H3. Students' perceived ease of use in e-learning positively determines their perception on the usefulness of e-learning for study

As above mentioned; students' acceptance of e-learning for study is suggested being determined both by their perception on the usefulness of e-learning (H1) and by their perceived ease of use in e-learning (H2); whereas, students' perception on the usefulness of e-learning for study is posited an effect of their perceived ease of use in e-learning (H3). We base our mediating hypothesis on the discussions by Baron and Kenny (1986), in which if the explanatory variable statistically impacts on an intermediary variable and also on the explained variable and at the same time the intermediary variable imposes a statistically significant unique impact on the explained variable, it is posited that the intermediary variable may mediate the relationship between the explanatory variable and the explained variable. Additionally, Mia (1988) and Spencer (2011) point out that when there is a link between two variables at least partly through an intermediary variable, the intermediary variable can be suggested to mediate the association between those two variables. Grounded on H1, H2, and H3 as well as on the arguments by Baron and Kenny (1986), Mia (1988) and Spencer (2011), we can establish the following mediating hypothesis H4.

H4. Students' perception on the usefulness of e-learning may mediate the relationship between their perceived ease of use and their acceptance of e-learning for study

III. RESEARCH METHODOLOGY

Having developed the four hypotheses H1, H2, H3 and H4 that will be tested in this research, we would like to discuss the research methodology that we employ to guide the data selection and facilitate the data analyses. The research methodology will be explained in detail below.

Measurement of variables

We base the measurements of our three main variables on the research by Okazaki and Renda dos Santos (2012). The measurements of our three variables (Perceived usefulness of E-learning, Perceived Ease of Use in E-learning and Acceptance of E-learning) will be explained in detail. First, "Perceived usefulness of E-learning (PUS)" is based on the three items. They are (PUS1) - Using e-learning improves my performance in my study, (PUS2) - Using e-learning improves my productivity in my study, and (PUS3) - E-learning to be useful in my study. To measure, we apply a five-point scale (1.strongly disagree, 2.disagree, 3.neutral, 4.agree, and to 5.strongly agree to evaluate the above three dimensions. Second, "Perceived Ease of Use in E-learning (PEU)" is also measured with the three items; namely (PEU1) - Learning to use e-learning is easy for me, (PEU2) - My interaction with e-learning is clear and understandable and (PEU3) - E-learning is easy to use for me. To assess the three items, we utilize a five-point scale as above discussed. Third, "Acceptance of E-learning (ACP)" is calculated based on the four components, which are (ACP1) - I intend to use e-learning to assist my study, (ACP2) - I intend to use e-learning as much as possible for my study, (ACP3) - I intend to use online instruction to assist my study and (ACP4) - I intend to recommend the e-learning system to others. A five-point scale is employed to measure the above four dimensions.

Data selection

Our sample for the research consists of students in Vietnam National University of Ho Chi Minh, which delivers about 120 majors to about 35,000 students. 1,350 students from this university were asked to offer the information for the research. Nevertheless, of the 1,350, only 498 provided good responses with adequate information needed for analyses conducted to test the hypotheses in this research.

Data analyses

First, we employ the reliability and exploratory factor analyses to test the validity and reliability of the measurement scales. Then, we calculate the correlations among the variables to test whether the problem of multicollinearity occurs in the data. To investigate the causal hypotheses, we run regression analyses. We

employ the following two empirical regression equations to examine the causal hypotheses: (1) for H1 and H2, while (2) for H3.

1. $ACP = \alpha_1 PUS + \alpha_2 PEU + \varepsilon_1$
2. $PUS = \beta_1 PEU + \varepsilon_2$

In order to investigate the mediating role of the perception on the usefulness of e-learning in the relationship between the perceived ease of use in e-learning and the acceptance of e-learning, we utilize Sobel's (1982) technique, which is to test the statistical significance for the indirect effect of the mediating variable "the perception on the usefulness of e-learning" by examining the null hypothesis that there is no difference between the total effect and the direct effect.

IV. EMPIRICAL RESULTS

To test the reliability and validity of the data, we carry out the reliability and exploratory factor analyses. The reliability analysis is to investigate the properties of measures and the dimensions making up the measures; while the exploratory factor analysis is a procedure used to test for construct validity. The results obtained from these two procedures are given in Table 1. The findings disclose that the ten dimensions in this research all achieve their item-total correlations exceeding the lowest limit of 0.5, required by Nunnally (1978). Table 1 also indicates that the Cronbach's alphas obtained from the reliability analysis for the three factors (PUS, PEU and ACP) all pass the value of 0.7, the smallest level proposed by Nunnally (1978). Hence, the three measures in this research satisfy sufficient internal reliability. Then, these ten dimensions continue going through the exploratory factor analysis. The results shown in Table 1 reveal that all the factor loadings are more than 0.4 and all the cross loadings are greater than 0.3 (because the coefficients of below 0.35 from the exploratory factor analysis are suppressed). This reflects that our measures achieve convergent validity and discriminant validity (Hair et al. 2009). Hence, they satisfy the construct validity. Furthermore, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Communalities are larger than 0.7 and 0.5 respectively, as the lowest limits stipulated by Hair et al. (2009). In addition, the exploratory factor analysis also offers statistical evidence at the 0.01 significance level. Our ten items all achieve the construct validity and reliability, so they are suitably retained for further analyses.

Table 1: Results from Reliability and Exploratory Factor Analyses

Items	N of Items	Item-total Correlations	Cronbach's Alpha	Factor Loadings			Communalities
				1	2	3	
PUS1	3	0.732	0.829			0.787	0.776
PUS2		0.660				0.829	0.757
PUS3		0.674				0.776	0.729
PEU1	3	0.807	0.879	0.886			0.850
PEU2		0.784		0.878			0.839
PEU3		0.732		0.802			0.760
ACP1	4	0.671	0.835		0.718		0.651
ACP2		0.684			0.735		0.673
ACP3		0.639			0.812		0.689
ACP4		0.673			0.785		0.702
KMO						0.865	
P _{value}						0.000	

For the problem of multicollinearity, we calculate the correlations among the main variables. The results are exhibited in Table 2. All the correlations are smaller than the biggest value of 0.8, suggested by Kennedy (1992). This implies that the research model does not suffer the problem of multicollinearity. Accordingly, the variables in our model are sufficiently reliable.

Table 2: Matrix of Correlations

	PUS	PEU	ACP
PUS	1.000	0.496**	0.584**
PEU	0.496**	1.000	0.476**
ACP	0.584**	0.476**	1.000

**_ Correlation is significant at the 0.01 level (2-tailed)

Next, we run regression analyses to test our causal hypotheses H1, H2 and H3. The regression analyses yield the results given in Table 3. According to Table 3, both the perception on the usefulness of e-learning and the perceived ease of use in e-learning positively impact on the acceptance of e-learning for study at the statistical significance level of 0.01 with the coefficients of 0.431 and 0.260 respectively, which statistically support our hypotheses H1 and H2. Both the perception on the usefulness of e-learning and the perceived ease of use in e-learning jointly explain 38.7% of the variation in the acceptance of e-learning. Meantime, the perceived ease of use in e-learning also puts a positive effect on the perceived usefulness of e-learning at the 0.01 significance level with the coefficient of 0.558. The explanation of the perceived ease of use in the variance of the perceived usefulness of e-learning is 24.6%. Therefore, our hypothesis H3 is statistically supports. Overall, the findings from the regression analyses offer statistical evidence on our causal hypotheses H1, H2 and H3, in which the perceived ease of use in e-learning and the perceived usefulness of e-learning are two vital variables leading to the acceptance of e-learning, whereas the perceived ease of use in e-learning is a driver of the perceived usefulness of e-learning. The students who regard e-learning is easy to use will likely think it useful to their study. And as results they are more likely to accept and use it for their study.

Table 3: Results from Regression Analyses for Causal Relationships

Dependent Variable	Independent Variable	Coefficients	Standard Error	t-statistics	P _{value}	R ²	Supported
ACP	PUS	0.431	0.038	11.364	0.000	0.387	H1
	PEU	0.260	0.043	6.101	0.000		H2
PUS	PEU	0.558	0.044	12.731	0.000	0.246	H3

To test our mediating hypothesis H4, we firstly examine the link between the perceived ease of use in e-learning and the acceptance of e-learning; and then include the variable “the perceived usefulness of e-learning” into the research model and investigate the change in this relationship. We run the regression of the acceptance of e-learning on the perceived ease of use in e-learning and obtain the result that the perceived ease of use in e-learning positively affects the acceptance of e-learning at the 0.01 significance level with the estimate of 0.501 (untabulated). When the perceived usefulness of e-learning is included into the research model; the effect of the perceived ease of use in e-learning on the acceptance of e-learning will decline to 0.260 (as shown in Table 3) from 0.501. Consequently, in concurrence with Baron and Kenny (1986), we can suggest the perceived usefulness of e-learning may play the mediating role. We then apply Sobel’s (1982) method to test the statistical significance for the mediating role. The results are provided in Table 4. The findings reveal that the perceived usefulness of e-learning mediates the relationship between the perceived ease of use in e-learning and the acceptance of e-learning at the statistical significance level of 0.01 with the t-statistics of 8.454. These findings statistically support our mediating hypothesis H4 at the 0.01 significance level. The relationship between the perceived ease of use in e-learning and the acceptance of e-learning will be decreased, when the perception toward the usefulness of e-learning is entered into the research model. Accordingly, researchers when examining the link between the perceived ease of use in e-learning and the acceptance of e-learning should take into account the mediating role of the perception towards the usefulness of e-learning.

Table 4: Results from Sobel’s Analysis for Mediating Relationship

Mediating Factor	Correlation	t _{indirect}	P _{value}
PUS	PEU and ACP	8.454	0.000

V. CONCLUSION

This research tries to explore the relationships among the perception towards the usefulness of e-learning, the perceived ease of use in e-learning and the acceptance of e-learning for study. Especially, it emphasizes the mediating role of the perception towards the usefulness of e-learning. The findings indicate that not only the perceived usefulness of e-learning but also the perceived ease of use in e-learning affects the acceptance of e-learning. Meanwhile, the perceived usefulness of e-learning is explained by the perceived ease of use in e-learning. More importantly, this research offers statistical evidence on the mediating role of the perception towards the usefulness of e-learning in the association between the perceived ease of use in e-learning and the acceptance of e-learning for study. Overall, this research provides the findings that highlight the importance of the perception towards the usefulness of e-learning in the research model. The perceived usefulness of e-learning is not only a driver of the acceptance of e-learning, but it also mediates the link between the perceived ease of use in e-learning and the acceptance of e-learning.

This research offers some contributions. It is the first to offer statistical evidence on the mediating role of the perception towards the usefulness of e-learning. It is helpful to school-managers, in which it offers them with insight into the complex links among the perception towards the usefulness of e-learning, the perceived ease of use in e-learning and the acceptance of e-learning for study. Therefore, the school-managers can make better decisions on designing good education programs using e-learning.

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