Acceptance of Web-Based E-Learning Systems: Behavioral Intention and Impacts

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Abstract

Information technology has been a critical factor to organizational success because of its great impact on organizational and individual achievement. Through information technology and information systems, e-learning not only makes changes to the learning model but also overcomes the limitations of face-to-face learning. Based on the technology acceptance model (TAM) and DeLone & McLean's model (D&M model), this study develops a comprehensive research framework to give a better explanation to intention to use e-learning and its impact. This study identifies the determinants of intention to use and the consequences of using e-learning systems. The proposed framework includes seven variables, through which we examine the relationship between critical factors (perceived quality, perceived support, perceived benefits, users' anxiety, self-efficacy), and intention to use, and how the intention to use e-learning systems will influence individuals and organizations (individual impact and organizational impact). Based on 206 e-learners' responses, Structural Equation Modeling (SEM) with AMOS 21.0 was used to conduct data analysis. The results show that perceived quality and perceived benefits have a direct impact on intention to use e-learning, which support the proposed hypotheses. However, the study ascertained that the influence of perceived support, users' anxiety and self-efficacy on intention to use e-learning, conflicts with the proposed hypotheses. This finding may come from the mandatory nature of e-learning systems (Saba, 2012). The findings from this study confirm the importance to organizations of using e-learning. Using e-learning in the workplace can improve the staff's individual and organizational performance. However, organizations should be more careful when considering compulsory or optional policies for using e-learning systems. The mandatory nature may result in negative behavior intention and impact. In order to avoid blind investment in new technology, managers can base their decisions on quality factors when reviewing the success of different e-learning systems. Due to organizations' limited resources, this finding is very meaningful. Additionally, organizations should pay attention to the intrinsic and extrinsic motivation of their staff to enhance the e-learning system's effectiveness.

Keywords: TAM, D&M model, SEM, e-learning, intention to use

1. Introduction

In recent years, web-based learning systems have been widely employed in both educational and non-educational institutions. Moreover, academia and the business community have paid attention to the model and performance of e-learning systems (Wang and Wang, 2009). Additionally, Pituch and Lee (2006) argued that if users lacked the sufficient motivation and intention to use web-based learning systems, the unused systems would eventually become useless. Thus, it is becoming more and more important to apply information technologies/systems to facilitate student learning, enhance instructor teaching performance and reduce educational costs

(Pituch and Lee, 2006; Selim, 2007). Asia has the highest growth rate for e-learning in the world at 17.3%. Its revenues, which reached $5.2 billion in 2011, are predicted to more than double to $11.5 billion by 2016 (Sam, 2012).The e-learning model has been changed by the evolution of technology. The recent advance in cloud computing and mobile devices empowers many innovative e-learning systems or applications with increased interactivity and improved features.

E-learning systems, taught through the Internet, multimedia and information systems, have made changes to learning methods. E-learning has broken face-to-face learning methods, which are time-space constrained. One of the main goals of the systems is to deliver instruction which can produce an equal or better outcome than previously. To achieve this goal, many researches have been conducted to explore the antecedents of e-learning user behavior.

The TAM (Technology Acceptance Model) and the D&M model (DeLone and McLean, 1992) have been widely applied to address this issue. However, the TAM is too focused on internal cognitive variables (perceived usefulness and perceived ease of use), which limits most of the external environmental variables in this regard. Meanwhile, the D&M model is biased in favor of quality related aspects of information system (IS). Only using quality variables to measure the systems seems too narrow. Besides, many research findings indicate that there are dozens of external environmental factors that affect the intention to use and actual use behavior (Davis, 1989; Wixom and Todd, 2005; Roca et al., 2006; Martínez-Torres et al., 2008; Wang and Wang, 2009; Cho et al., 2009; Saba, 2012). To date, due to the involvement of many factors, there has not been a comprehensive model to address this issue.

On the other hand, we find that researchers seldom study the impact of e-learning use behavior on both individuals and an organizations performance. DeLone and McLean (1992) argued that "use" and "user satisfaction" are direct antecedents of individual impact; and lastly, this impact on individual performance should eventually have some organizational impact. Similarly, it will result in certain "net benefits". Gable et al. (2008) proposed that the IS-Impact measurement model represents the stream of net benefits from an information system. Although they mentioned individual and organizational impact, they have not been demonstrated empirically. Instead, most of these negligible researches are used to evaluate the relationship between quality and IS success or the impact of e-learning systems usage on individuals or organizations, respectively (Lin et al., 2011; Chen, H.J. 2010; Liao et al., 2009; Chiu et al., 2007).

Therefore, based on the TAM and D&M model, this study combines and develops a more comprehensive research framework to give a better explanation to intention to use e-learning. The proposed framework includes seven variables (perceived quality, perceived support, perceived benefits, users' anxiety, self-efficacy, intention to use e-learning and e-learning impact), aiming to explore the antecedents and the consequences of using e-learning systems.

The objectives of this study are to identify the determinants of users' intention to use e-learning systems and explore how systems will impact on individual and organizational performance.

It is hoped that the research objectives and research findings provide organizations with more references to promote the use of e-learning, as well as a reference for future research. Through a literature review and questionnaire, this study collates and analyzes relevant factors to establish a comprehensive model for decision-making on e-learning use. This study includes four parts: literature review, research methodology, research analysis and results, conclusions.

2. Literature Review

2.1 Theoretical Background

2.1.1 Technology Acceptance Model

The Technology Acceptance Model (TAM) was first developed by Davis (1989), and aims to explain and predict the users' acceptance behavior. This model emphasized that the two important drivers of information technology system acceptance are perceived usefulness and perceived ease of use. The TAM model is an adaptation of the Theory of Reasoned Action (TRA, Fishbein and Ajzen, 1975) and Theory of Planned Behavior (TPB, Ajzen, 1991). The original TAM (Davis, 1989) has six constructs: external variables, perceived usefulness, perceived ease of use, attitude towards usage, intention to use and actual use. However, in 1992, "attitude" was dropped from the TAM because it was believed to be a weaker mediator. Since then, many researchers keep extending this model by adding different constructs.

2.1.2 Theory of Information Success

DeLone and McLean (1992) reviewed IS related researches published during 1981-1987 and developed an interactive model for IS success. At first there were six main dimensions in this model, which were: system quality, information quality, use, user satisfaction, individual impacts and organizational impacts. Ten years after the first version of the D&M model, the paper was cited by around 300 researches.

In 2003, the two authors of the D&M model made some modifications to this model. The new version of the D&M model accepted service quality as a new construct. The variables of individual impact and organizational impact were also combined into "net benefits". Also, in the new version, "intention to use" is suggested as a worthwhile alternative to "use" behavior.

2.2 Hypotheses Development

2.2.1 Perceived Quality

The previous IS literatures studied perceived quality including systems quality, information quality and service quality. These factors have a different influence on IS systems. DeLone and McLean (2002) indicated that information quality and systems quality can be important to measure a system's success while service quality can be a more important variable for the overall success of IS.

Systems quality mainly elaborates on the characteristics of a system, including the e-learning system's ease of use, flexibility and reliability, as well as the system's features of intuitiveness, sophistication, flexibility and response time. Information quality describes the characteristics of the system's outputs, which are management reports and web pages, including relevance, understandability, accuracy, conciseness, completeness, currency, timeliness, and usability. Service quality is the quality characteristics that the support users receive from the IS/ IT department. The measurement scales of SERQUAL can also be used to measure part of the service quality constructs. For example, responsiveness, assurance, reliability, visibility and empathy (DeLone and McLean, 2003; Wixom and Todd, 2005; Petter, DeLone and McLean, 2008).

However, recalling the e-learning related literatures which study the impact of perceived quality on intention to use e-learning, some scholars believe that perceived quality is not a key factor leading to intention to use. Nevertheless, the promotional effects, which arise from the indirect impact of perceived quality, cannot be ignored (Wixom and Todd, 2005; Roca et al., 2006; Wang and Wang, 2009; Udo, Bagchi and Kirs, 2011). Although many scholars believe that perceived quality only has an indirect or mediating effect on intention to use, from the system users' point of view, whether users will use e-learning or not often depends on certain quality factors, such as ease of use, richness and practical-

ity of the systems. This view is supported by some research findings (DeLone and McLean, 1992; DeLone and McLean, 2002; Martínez-Torres et al., 2008). Based on the preceding discussion, perceived quality is proposed to have certain effects on intention to use e-learning but this impact is still questioned by some scholars. Therefore, the first hypothesis is:

H1: Perceived quality has a positive effect on intention to use e-learning.

2.2.2 Perceived Support

In the past researches, seldom perceived support is studied independently. Due to a huge number of various support factors, some scholars consider studying part of them as environmental or contextual factors (Wu and Hwang, 2010). In this study, perceived support will be systematically explored. This construct is measured with three dimensions, including managerial support, job support and organizational support. Managerial support is concerned with the degree to which the users perceive that their supervisors or managers give them opportunities for acquiring new knowledge, skills and ability through e-learning. Job support refers to the degree to which the users perceive that work is designed to facilitate the attainment of knowledge, skills and ability. Organizational support represents the degree to which users perceive the support through their organizational policies, such as rewards and promotion (Cheng et al., 2012).

Also, IS relevant literature shows that perceived support has an important impact on intention to use. Extrinsic motivation formed by perceived support can urge the users to use e-learning, meanwhile, enhancing the users' intention to use regardless of their gender, age, previous usage experience, and working experience (Cho et al., 2009; Wu and Hwang, 2010; Cheng et al., 2011). Additionally, Cheng et al. (2012) indicate that managerial support, job support and organizational support are key motivations for employees to adopt e-learning systems. Based on the above discussions, perceived support is critical to enhance intention to use. Accordingly, the following relationship is proposed:

H2: Perceived support has a positive influence on intention to use e-learning.

2.2.3 Perceived Benefits, Users' Anxiety and Self-efficacy

In the past literature regarding users' attitudes, scholars mostly focused on perceived usefulness and perceived ease of use. Many researches find that these two factors have a significant effect on intention to use. However, perceived usefulness and perceived ease of use belong to users' extrinsic motivation. Only studying extrinsic motivation and ignoring intrinsic motivation would undermine the explanatory power of an IS model for users' intrinsic decision-making and intention to use (Venkatesh et al., 2003). Hence, this study includes both intrinsic and extrinsic motivation to explore their impact on users' perception. Liaw et al. (2007) found that understanding and identifying the learner's attitude towards e-learning is extremely important when designing effective e-learning systems. In numerous previous researches, users' attitude is explored through a large number of intrinsic and extrinsic factors, for example, motivation, beliefs, anxiety, self-efficacy, interaction, effort expectancy, performance expectancy, perceived fun, perceived usefulness, and adaptation etc. (Davis, 1989; Venkatesh and Davis, 2000; Venkatesh et al., 2003; Liaw et al., 2007; Martínez-Torres et al., 2008; Ozkan and Koseler, 2009).

Based on a literature review, in this study, the relationship between intention to use e-learning and users' attitude, together with two aspects of extrinsic and intrinsic motivation, will be studied. Extrinsic motivation takes perceived benefits as the main variable, of which the dimensions include perceived ease to use (Davis, 1989; Roca et al., 2006; Wang and Wang, 2009; Lin, 2011), perceived usefulness (Davis, 1989; Roca et al., 2006; Wang and Wang, 2009; Cho et al., 2009; Lin, 2011) and perceived fun (Martínez-Torres et al., 2008; Ozkan and Koseler, 2009). The main con-

structs of intrinsic motivation are users' anxiety (Sun et al., 2008; Ozkan and Koseler, 2009) and self-efficacy (Sun et al., 2008; Ozkan and Koseler, 2009; Wang and Wang, 2009; Cho et al., 2009; Zhang et al., 2012, Saba, 2012), among which the users' anxiety, and the occurrence of a user's trepidation and confusion due to e-learning systems, hampers user's intention to use. It is also the negative construct of this model.

As user attitude is an important driver of intention to use, regardless of the users' relevant experience (Lin, 2011), users will decide to use e-learning under extrinsic and intrinsic motivations. Many scholars have proved that the impact of extrinsic motivation on intention to use is significant (Davis, 1989; Roca et al., 2006; Wang and Wang, 2009) while the effect of intrinsic motivation is also confirmed by relevant research findings. Based on these arguments, the effect of intrinsic and extrinsic motivation can be deeply explored through perceived benefits, users' anxiety and self-efficacy. This leads to hypotheses:

H3: Perceived benefits have a positive influence on intention to use e-learning

H4: Users' anxiety has a negative influence on intention to use e-learning

H5: Self-efficacy has a positive influence on intention to use e-learning.

2.2.4 Intention to Use and E-learning Impact

Intention to use indicates the subjective probability that one will use something. The stronger the intention to use, the more possible that use behavior will take place. In the TAM model, the positive effect of intention to use on use behavior is proved to be significant. However, the D&M model believes that "intention to use" is an attitude while "use" is a behavior. Due to the difficulties in interpreting multi-dimensional aspects and the complex causal relationship of "use", intention to use is suggested to be a worthwhile alternative measure (DeLone and McLean, 2003). From the above discussion, these two variables, whether explored separately or in combination, have relevant correlative impact. This study mainly emphasizes the influence of antecedents on intention to use.

The second important aspect of this paper is the effectiveness resulting from the impact of intention to use. The e-learning impact caused by intention to use is also one of the specific indicators used to measure the success of IS implementation. Regarding the e-learning impact, in addition to individual impact, which is widely studied, a deep exploration of organizational impact is essential (DeLone and McLean, 1992). In the previous researches on e-learning related issues, organizational performance, individual learning effect and user satisfaction have been mostly adopted to measure the system's success. However, a unilateral measure seems too simple. E-learning performance measurement should be more widely studied. Initially, the D&M model believes that there is a causal relationship between individual and organizational impacts arising from IS because individual achievement will directly influence organizational performance (DeLone and McLean, 1992). With the development of the D&M model, IS success is more comprehensively studied. Individual and organizational impacts are combined into net benefits, which becomes the comprehensive measure for IS success (DeLone and McLean, 2002). Individual impact measures the degree to which IS influences the capacity and efficiency of an organizations' representatives or key users while organizational impact measures the degree to which IS influences organizational performance and the ability to make improvements. Therefore, it can be hypothesized:

H6: Intention to use e-learning has a positive influence on e-learning impacts.

Based on defined motivation, objectives and the literature review, this paper studies the relationship between various variables including the antecedents of intention to use e-learning (perceived quality, perceived support and perceived attitude)

and the e-learning impact arising from intention to use; from which we can conclude which factors contribute to promoting e-learning use. The dimensions of each antecedent (perceived quality, perceived support, perceived benefits, user's anxiety and self-efficacy) are separately hypothesized to have an effect on intention to use (H1-H5) and the relationship between intention to use and e-learning impact is also proposed (H6).

3. Research Methodology

3.1 Scale Development

The hypotheses are examined with data collected from questionnaire surveys. There are seven variables in this framework: perceived quality, perceived support, users' anxiety, self-efficacy, perceived benefits, intention to use e-learning and e-learning impact. According to the literature review and operational definitions (Table 1), scale items are designed. This study uses the Likert 5 point scale where 1 reflects "strongly disagree" and 5 reflects "strongly agree". The original questionnaire was first reviewed by a senior researcher and 10 PHD students of Yuan Ze University. Then it was revised accordingly to make the text for the scale items more comprehensible and acceptable.

The first construct, perceived quality with three dimensions of systems quality, information quality, and service quality, is measured with items mainly from Roca et al. (2006). Roca et al.'s (2006) research is also aimed at e-learning systems in school education sections. However, different e-learning systems have different characteristics and functions, for example, our e-learning systems don't have predicted results but their information is up-to-date enough for the study purposes. They also have visually appealing materials and so on. Furthermore, DeVellis (2003) suggested not using reverse items in the questionnaire to avoid the respondents difficult to judge. Therefore, this study screened and replaced some of the original items with more appropriate ones for the questionnaire. Finally, there are a total of 9 scale items regarding to perceived quality.

Perceived support formed by the dimensions of organizational support, management support, and job support is measured with items from Cheng et al. (2012), which are modified and reduced to nine. Perceived benefits with the dimensions of perceived usefulness, perceived ease of use and perceived fun adapt measures from Martínez-Torres et al. (2008) and Wang and Wang (2009). After scanning to remove the items with similar content, there are only nine scale items left for this construct. Measures for user's anxiety and self-efficacy are constructed in accordance with the existing scales from Sun et al. (2008) and Wang and Wang (2009). Measures for intention to use e-learning are constructed by modifying the existing related items from Wang and Wang (2009). There are four items in total. E-learning impact, with the dimensions of individual impact and organizational impact, is based on Gable et al.'s (2008) items, six items in total.

Table 1: Constructs and Operational Definition of Dimension

Constructs	Dimensions	Operational definitions
Perceived quality	System quality	The quality characteristics of e-learning system's hardware, software and functions perceived by users.
	Information quality	The quality characteristics of the e-learning system outputs, (management reports and web pages) that users perceive.
	Service Quality	The quality characteristics of the support users receive from the IS/ IT department
Perceived support	Managerial support	The degree to which the users perceive that their supervisors or managers give them opportunities for acquiring new knowledge, skills and ability through e-learning.
	Job support	The degree to which the users perceive that work is designed to facilitate the attainment of knowledge, skills and ability.
	Organizational support	The degree to which users perceive the support through their organization's policies, such as rewards and promotion
Perceived benefits	Perceived ease of use	The degree to which users believe that using e-learning is free of effort
	Perceived usefulness	The degree to which users believe that using the e-learning system will help them to fulfill their tasks.
	Perceived fun	The degree to which users perceive using an e-learning system enjoyable in its own right.
Users' anxiety		The degree to which users feel confused due to the e-learning system
Self-efficacy		The users' confidence and judgment ability that enables them to complete the e-learning course.
E-learning Intention to use		The degree to which users intend to use an e-learning system
E-learning Impact	Individual Impact	The measurement of the degree to which IS influences the capacity and efficiency of an organization's representatives or key users
	Organizational Impact	The degree to which IS influences organizational performance and the ability to make improvements

3.2 Sampling and Analysis Method

The targeted e-learning systems in this study are web-based learning systems and the authors used the web-based learning systems of the Institute of Technology for the survey. The system has been considered as the primary one for creating and digitizing online courses in the college since 2006. The sample includes students of the Business Administration Department who receive continuous education in this college. They all have experience of using e-learning systems. A random sample of 300 students participated in the survey. The survey lasted for 6 weeks, from 29th April to 10th June 2013 and was conducted using paper questionnaires in the college. 300 papers and online questionnaires were distributed. 206 valid responses were received (excluding 23 invalid and incomplete responses). The valid response rate for the total sample is 69%.

Table 2 presents the demographic profile of the sample population, among which 49% of the respondents were male and 51% were female. In addition, 85% of the respondents were between 21 and 50 years

old. The respondents' jobs were mainly in the military and government (35%) and financial sector (28.2%). More than 69.9% of the respondents had more than 1 year of usage experience.

In this paper, Structural Equation Modeling (SEM) with AMOS 21.0 is used. A measurement model and the structural model of SEM were used for analysis. Firstly, confirmatory factor analysis (CFA) was used to investigate the relationship between observed and latent variables and ensure correct variable measurements. This was followed by a path analysis to explain the potential causal relationship between the variables, namely structural model validation. Finally, testing basis fit, overall model fit and internal model fit were used to evaluate the goodness of fit for the model.

Table 2: Profile of the Respondents

Items		Frequency	Percentage (%)
Gender	Male	101	49.0
	Female	105	51.0
	Total	206	100.0
Age	Under 20	7	3.4
	21-30	107	51.9
	31-40	46	22.3
	41-50	24	11.7
	51-60	19	9.2
	61 and above	3	1.5
	Total	206	100.0
Job	Military and government	72	35.0
	Financial sector	58	28.2
	Services	33	16.0
	Others	43	20.8
	Total	206	100.0
Years of using systems	Under 1 year	62	30.1
	2 - 3 years	74	35.9
	4 years and above	70	34.0
	Total	206	100.0

4. Research Analysis and Results

4.1 Measurement Model

Anderson and Gerbing (1988) suggested that if there is high correlation among the dimensions of the first order structure, a common factor of two second-order structures should exist. Kline R.B. (2005) considered that conditions for the high-order model identification are (1) each second-order dimension needs to have at least three first-order dimensions; and (2) each first-order dimension must have at least two indicators. As the sub-dimensions of perceived quality, perceived support, perceived benefits and e-learning impact all have high correlation for each structure, the authors established a second-order model for these variables. In order to construct a more accurate measurement model, Doll et al. (1994) suggested conducting a comparative analysis for the first-order and second-order structures, which enables the construction of an accurate model. Then, the structure with the indexes that are a better fit can be adopted for CFA. According to the result of the comparative analysis (Table 3), the second-order structure was proven to possess a better model fit. Consequently, it was used to conduct the subsequent analysis.

To conduct confirmatory factor analysis and model fit test, maximum likelihood (ML) was used to estimate the model's parameters. The result shows the estimates of non-standardized factor loadings, standard errors, t-value, p-value, standardized factor loadings and SMC (R-square) for each scale item. Overall, all standardized

factor loadings are greater than 0.70 and the p-values are significant. Except for the fact that the standardized factor loadings of PS6 (0.509; $R^2 = 0.259$) are too low, the rest are under ideal conditions. Additionally, among the fit indexes shown in Table 4 (Normed chi-square ($\chi 2/df$) = 2.473, GFI = 0.685, AGFI = 0.640, RMR = 0.058, RMSEA=0.085, TLI=0.853, CFI=0.865, IFI=0.867), only Normed chi-square and RMSEA fit the cut-off criteria, while others indicated a poor fit. Therefore, a method of revising the model by examining the standardized factor loadings and modification indices (MI) was found.

Table 3: Fit Indexes of Comparative Model

CFA model	$\chi 2/d.f$	GFI	AGFI	TLI	CFI	RMSEA
First order	4.150	0.672	0.600	0.744	0.791	0.124
Second order	2.057	0.809	0.760	0.918	0.930	0.072

Table 4: Fit Indexes of Measurement Model

Fitness indices	Criteria		Fit indexes of original model	Fit indexes of modified model
$\chi 2/d.f$	$1< \chi 2/d.f <3$		2.473	2.057
GFI	GFI >0.8	Acceptable fit	0.685	0.809
	GFI >0.9	Acceptable fit		
AGFI	AGFI >0.8	Acceptable fit	0.640	0.760
	AGFI >0.9	Acceptable fit		
RMR	RMR <0.05		0.058	0.049
RMSEA	RMSEA <0.05	Good fit	0.085	0.072
	0.05< RMSEA <0.08	Mediocre fit		
	0.08 < RMSEA <0.10	Acceptable fit		
TLI(NNFI)	NFI >0.9	Acceptable fit	0.853	0.918
CFI	CFI >0.9	Acceptable fit	0.865	0.930
IFI	IFI >0.9	Acceptable fit	0.867	0.931
AIC	The smaller the better		2283.804	889.706
BIC	The smaller the better		2676.493	1189.215
ECVI	The smaller the better		11.141	4.340

Firstly, since most of the items' standardized factor loadings are greater than 0.70, while the loadings of PS6 are low and its reliability is also poor (0.509; $R^2 = 0.259$), this item should be removed. Secondly, examining the MI in the AMOS report, changes were made to the items with excessive covariance. The covariance residuals of PQ1, PQ6, PQ9, PS1, PS6, PS7, PB3, PB4, PB9, ANX1, EUI1, EUI2, EI1 and EI5 were all too high. However, according to the principle of independence for residuals, the excessive covariance residual cannot establish relevant links. Thus, these items were removed to improve the model fit. Testing the modified model, standardized factor loadings were in the range between 0.7 to 0.969 and R^2 was between 0.582 to 0.939. The fit indexes are Normed chi-square ($\chi 2/df$) = 2.057, GFI = 0.809, AGFI = 0.760, RMR = 0.049, RMSEA = 0.072, TLI = 0.918, CFI = 0.930, IFI = 0.931, which show good model fit. Finally, a competitive model with fit indices was established to verify the most proper model between the original one and the modified ones (Table 4). The fit indexes of the modified model (AIC = 889.706, BIC = 1189.215, ECVI = 4.340) are smaller than the original one (AIC = 2283.804, BIC = 2676.493, ECVI = 11.141). Hence, the modified model is obviously better.

According to Hair et al., (2009), the measurement model should meet the fol-

lowing conditions for gaining convergent validity: (1) factor loadings are greater than 0.7; (2) composite reliability (CR) is greater than 0.7; (3) the average variance extracted (AVE) is greater than 0.5; and (4) the squared multiple correlation coefficient (R^2) is greater than 0.5. As shown in Table 5, the factor loading for each of the items is greater than 0.7, the results for CR are all greater than 0.85, AVE is also greater than 0.5, and R^2 is more than 0.6. Thus, the measurement model has good convergent validity.

Table 5: Convergent Validity for the Measurement Model

Construct	Dimension	Items	Loading	R^2	CR	AVE
Perceived Quality (PQ)	System quality	PQ2	.763	.582	.941	.728
		PQ3	.908	.825		
	Information quality	PQ4	.896	.802		
		PQ5	.861	.741		
	Service quality	PQ7	.903	.815		
		PQ8	.777	.604		
Perceived Support (PS)	Managerial support	PS2	.914	.835	.970	.845
		PS3	.945	.893		
	Job support	PS4	.862	.743		
		PS5	.922	.850		
	Organizational support	PS8	.910	.828		
		PS9	.961	.923		
Perceived benefits (PB)	Perceived ease of use	PB1	.937	.878	.960	.801
		PB2	.945	.892		
	Perceived usefulness	PB5	.824	.679		
		PB6	.843	.711		
	Perceived fun	PB7	.915	.837		
		PB8	.901	.811		
Users' Anxiety (ANX)		ANX2	.969	.939	.948	.902
		ANX3	.929	.863		
Self-efficacy (SE)		SE1	.823	.677	.872	.694
		SE2	.816	.667		
		SE3	.860	.739		
Intention to use e-learning (EUI)		EUI3	.934	.872	.911	.837
		EUI4	.895	.802		
E-learning Impact (EI)	Individual impact	EI2	.904	.818	.943	.805
		EI3	.883	.779		
	Organizational impact	EI5	.833	.694		
		EI6	.963	.927		

Finally, based on Hair et al.'s (2006) suggestions, a correlation matrix was used to assess discriminant validity. Table 6 shows the correlation matrix, of which the diagonal value 1 is replaced with individual AVE, and the other values are the square of the correlation coefficients. If AVE is greater than the square of the correlation coefficients of the correspondent horizontal row and vertical column, it means that the model possesses discriminant validity.

As good convergent and discriminant validity are possessed, the measurement model also has construct validity. Since the composite reliability of each dimension is greater than 0.80, the model has a high

degree of reliability and good internal consistency.

Table 6: Discriminant Validity for the Measurement Model

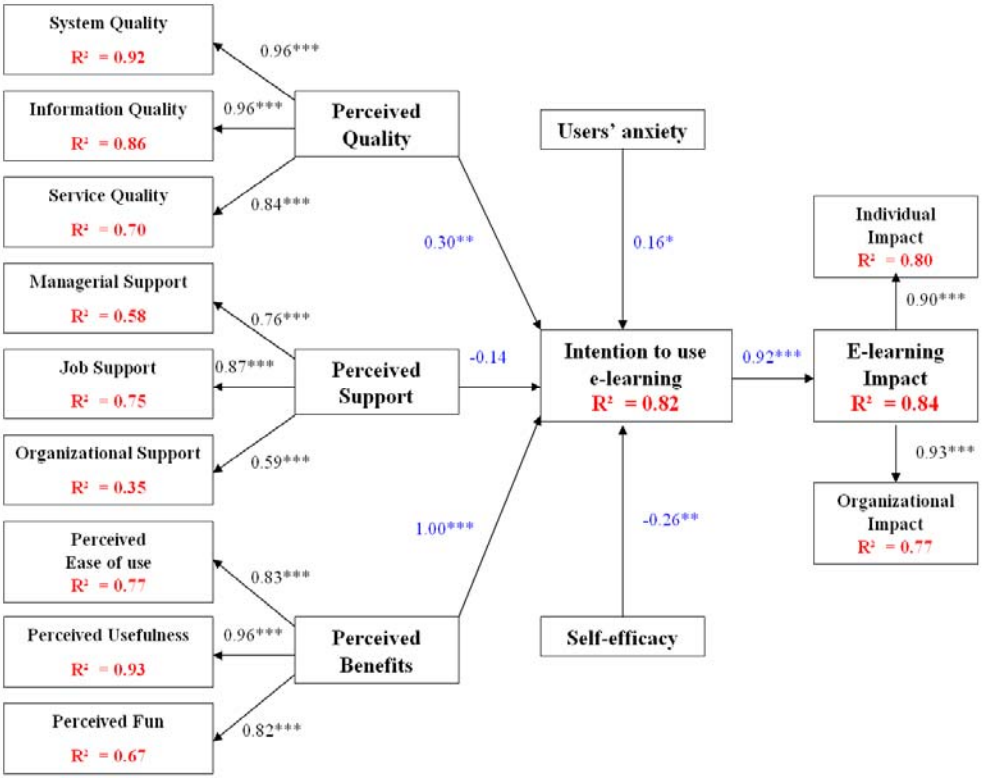
Construct	Mean	Std	PQ	PS	PB	ANX	SE	EUI	EI
PQ	3.680	0.868	0.728						
PS	3.520	0.951	0.430	0.845					
PB	3.700	0.858	0.610	0.600	0.801				
ANX	2.340	0.955	0.110	0.030	0.200	0.902			
SE	3.570	0.769	0.390	0.280	0.550	0.130	0.694		
EUI	3.510	0.887	0.550	0.340	0.670	0.050	0.240	0.837	
EI	3.660	0.865	0.550	0.740	0.780	0.130	0.340	0.750	0.805

Note. The diagonal values indicate the AVE.

4.2 Structural Model

After examining the measurement model through CFA and goodness-of-fit testing, a structural model and path analysis were established to determine the causal relationship among the variables. Firstly the overall fit of the structural model was examined. All fit indexes achieve a good fit (Normed chi-square ($\chi 2/df$) = 2.071, GFI = 0.807, AGFI = 0.759, RMR = 0.051, RMSEA = 0.072, TLI = 0.917, CFI = 0.929, IFI = 0.929), which means that the model also has good fit. A path diagram is drawn to explain the causal relationship among the variables (Figure 1). The results of the path analysis show that the higher the perceived quality, the more it will have a significant positive impact on the intention to use e-learning (regression coefficient = 0.30, $p < 0.01$). This result supports H1. The proposed relationship between perceived quality and intention to use e-learning is proved, which is in line with Roca et al.'s (2006) findings. Also, it clarifies that perceived quality has a direct impact on intention to use e-learning. Perceived support doesn't affect intention to use e-learning as the relationship between perceived support and intention to use e-learning is insignificant (regression coefficient = -0.14, $p=0.257$). Hence, H2 is not supported. This result fits Cheng et al.'s (2012) findings, which indicates that perceived support (managerial support, work support and organizational support) has an indirect influence on the intention to use e-learning. Perceived benefits have a highly significant positive effect on intention to use e-learning (regression coefficient = 1.00, $p < 0.001$), which not only confirms the hypothesized relationship in H3, but also meets many perceived benefit related findings (Roca et al., 2006; Martínez-Torres et al., 2008; Wang and Wang, 2009; Lin, 2011).

There is a significant positive relationship between users' anxiety and intention to use e-learning (regression coefficient = 0.16, $p < 0.05$), while self-efficacy has a significant negative effect on intention to use e-learning (regression coefficient = -0.26, $p < 0.001$). Thus, H4 and H5 are not supported. These results occur probably because e-learning systems are usually combined with certain courses that are compulsory for learners to undertake and complete. Under this circumstance, a contradictory situation is produced. Saba (2012) also mentioned that, "This negative finding may be explained by the mandatory nature of the e-learning systems". Finally, there exists a highly significant positive correlation between intention to use e-learning and e-learning impact (regression coefficient = 0.92, $p < 0.001$), which asserts that the intention to use e-learning will enhance the e-learning impact, including both individual impact and organizational impact. In addition to supporting H6, it also meets DeLone and McLean's (2002) findings.



Note: Path significance: *p<0.05; **p<0.01; ***p<0.001

Figure 1. Structural Model and Path Analysis

5. Conclusions

5.1 Discussion

This research finds that perceived quality and perceived benefits have a direct impact on intention to use e-learning while the relationship between perceived support, users' anxiety and self-efficacy has no influence on the intention to use e-learning as proposed. This finding may come from the mandatory nature of e-learning (Saba, 2012). Meanwhile, based on some research findings, it is believed that the effects of these three variables on intention to use e-learning are indirect. These relationships are in need of future research for clarification. Additionally, the influence of the intention to use e-learning on e-learning impact is significant, which confirms the suggestion that, to some extent, the intention to use can replace "use" behavior as a better alternative measure (DeLone and McLean, 2003).

5.2 Managerial Implications

The findings from this study confirm the importance of using e-learning for organizations. Using e-learning in the workplace can improve the staffs' individual and organizational performance. However, organizations should be careful when considering compulsory or optional policies for using e-learning systems. A mandatory nature may result in negative behavior intention and impact. In order to avoid the blind investment in new technology, managers can base their decision on quality factors so as to predict the success of the different e-learning systems. Due to organizations' limited resources, this finding is very meaningful. Additionally, organizations should pay attention to the intrinsic and extrinsic motivation of their staff to

enhance the e-learning system's effectiveness.

5.3 Conclusion

In theory, with research model development and analysis, this study identifies the correlation between various antecedents and the intention to use e-learning, and then explains how e-learning impacts on organizational and individual effectiveness. Adopting extrinsic motivation, intrinsic motivation, intention to use e-learning and e-learning impact into a comprehensive model, it is hoped that this study can provide more references to explore related literature on e-learning use. In practicality, it can be based on different motivational factors and effectiveness to determine whether it is suitable for organizations or individuals to adopt e-learning systems. Additionally, through this study, researchers can learn more about the critical factors of an e-learning platform's success, which can help to enhance and improve online learning (Saba, 2012). Moreover, organizations can avoid ignoring the actual effectiveness due to the blind pursuit of technological innovation (Porter, 2001).

5.4 Future Research

Although this study provides valuable insights, some potential limitations should be recognized. Firstly, the study relied on a sample of people who use e-learning systems to learn. Future research might enhance the sample size and increase the valid response rate. Secondly, there are a wide range of potential antecedents for the intention to use e-learning, and the limited theoretical and empirical research that has been conducted to date on factors that lead to the intention to use e-learning. Future research studies can widen their examination including other factors. Thirdly, the interpretations of issues pertinent to cross cultures and cross countries were not addressed in this paper and this could be a topic for future research.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processe*s, *50*(2), 197-211.

Anderson, J. C. and Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommendations tow-step approach. *Psychological Bulletin, 103(3)*, 411-423.

Chen, H. J. (2010). Linking employees' e-learning system use to their overall job outcomes: An empirical study based on the IS success model. *Computers & Education*, *55*(4), 1628-1639.

Cheng, B., Wang, M., Moormann, J., Olaniran, B. A., & Chen, N. S. (2012). The effects of organizational learning environment factors on e-learning acceptance. *Computers and Education, 58*(3), 885-899.

Cheng, B., Wang, M., Yang, S. J. H., Kinshuk, & Peng, J. (2011). Acceptance of competency-based workplace e-learning systems: Effects of individual and peer learning support. *Computers and Education, 57*(1), 1317-1333.

Chiu, C. M., Sun, S. Y., Sun, P. C., & Ju, T. L. (2007). An empirical analysis of the antecedents of web-based learning continuance. *Computers & Education*, *49*(4), 1224-1245.

Cho, V., Cheng, T. C. E., & Hung, H. (2009). Continued usage of technology versus situational factors: An empirical analysis. *Journal of Engineering and Technology Management, 26*(4), 264-284.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 318-340.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for dependent variable. *Information Systems Research, 3*(1), 60-95.

DeLone, W. H., & McLean, E. R. (2002). Information systems success revisited.

In Proceedings of the 35th Hawaii International Conference on Systems Sciences.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

Doll, W. J., Xia, W., & Torkzadeh, G. (1994). A confirmatory factor analysis of the end-user computing satisfaction instrument, *MIS Quarterly, 18(4)*, 453-461.

Fishbein, M., & Ajzen, I. (1975), *Belief, attitude, intention, and behavior: An introduction to theory and research. reading*, Mass.: Addison-Wesley, 1975.

Gable, G. G., Sedera, D., & Chan, T. (2008). Re-conceptualizing information systems success: The IS-impact measurement model. *Journal of the Association for Information Systems*, *9*(7), 377-408.

Hair, J.F.J., Anderson, R.E., Tatham, R.L., Babin, B.J., & Black, W.C.(2006). *Multivariate data analysis* (6th Ed). New Jersey: Prentice-Hall.

Hair, J.F.J., Anderson, R.E., Tatham, R.L., Babin, B.J., & Black, W.C.(2009). *Multivariate data analysis* (7th Ed). New Jersey: Prentice-Hall.

Kline, R. B. (2005). Principles and practice of structural equation modeling (2nd ed.). New York: Guilford.

Liao, C., Palvia, P., & Chen, J. L. (2009). Information technology adoption behavior life cycle: Toward a technology continuance theory (TCT). *International Journal of Information Management*, *29*(4), 309-320.

Liaw, S. S., Huang, H. M., & Chen, G. D. (2007). Surveying instructor and learner attitudes toward e-learning. *Computers and Education, 49*(4), 1066-1080.

Lin. K. M. (2011). E-learning continuance intention: Moderating effects of user e-learning experience. *Computers and Education, 56*(2), 515-526.

Martínez-Torres, M. R., Marín, S. L. T., Garca, F. B., Vazquez, S. G., Oliva, M. A., & Torres, T. (2008). A technological acceptance of e-learning tools used in practical and laboratory teaching, according to the european higher education area. *Behavior and Information Technology, 27*(6), 495-505.

Ozkan, S., & Koseler, R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computers and Education*, *53*(4), 1285-1296.

Petter, S., DeLone, W. H., & McLean, E. R. (2008). Measuring information systems success: Models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, *17*(3), 236-263.

Pituch, K. A., & Lee, Y. K. (2006). The influence of system characteristics on e-learning use. *Computers and Education, 47(2)*, 222–244.

Roca, J. C., Chiu, C. -M. & Martı´nez, F. J. (2006). Understanding e-learning continuance intention: An extension of the technology acceptance mode*. International Journal of Human- Computer Studies*, *64*(8), 683-696.

Saba, T. (2012). Implications of e-learning systems and self-efficiency on students' outcomes: A model approach. *Human-centric Computing and Information Sciences*, *2*(1), 1-11.

Sam S. Adkins (2012). The asia market for self-paced eLearning products and services: 2011-2016 forecast and analysis. *Ambient Insight Research*.

Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers and Education, 49(2)*, 396–413.

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. T., & Yeh, D. (2008). What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction*. Com-*

puters and Education, *50*(4), 1183-1202.

Udo, G. J., Bagchi, K. K., & Kirs, P. J. (2011). Using SERVQUAL to assess the quality of e-learning experience. *Computers in Human Behavior, 27*(3), 1272-1283.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204.

Venkatesh, V., Morris, M.G. Davis, G.B. & Davis, F.D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-78.

Wang, W. T., & Wang, C. C. (2009). An empirical study of instructor adoption of web-based learning systems. *Computers and Education*, *53*(3), 761-774.

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research, 16*(1), 85-102.

Wu, W., & Hwang, L. -Y. (2010). The effectiveness of e-learning for blended courses in colleges: A multi-level empirical study. *International Journal of Electronic Business Management, 8*(4), 312-322.

Zhang, Y., Fang, Y., Wei, K.-K. & Wang, Z. (2012). Promoting the intention of students to continue their participation in e-learning systems: The role of the communication environment. *Information Technology and People, 25*(4), 356-375.

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