The Relationship between System Characteristics and User Motivation toward the Use of an e-Learning System among Engineering Students of Universiti Malaya

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ABSTRACT

The determination of the antecedents of the use of an e-learning system is imperative to ensure its successful adoption and continuance of usage. This study investigates the relationship between the two constructs, namely system characteristics (system functionality, infrastructure and technical support) and user motivation (perceived ease of use and perceived usefulness) towards the use of Universiti Malaya's e-learning system among engineering students. A specially-developed questionnaire was used to elicit responses with items adopted from previous related studies. Items structure analysis of the questionnaire revealed high reliability. A sample of 70 engineering students of Universiti Malaya were involved as the respondents. A series of multiple regression analysis was conducted to establish the interrelationship between the variables within the constructs and their influence towards system usage. The findings indicate that system functionality played a very strong part in influencing both the perceived usefulness ($\beta=0.099$, $p<0.001$) and perceived ease of use ($\beta=0.762$, $p<0.001$). The results for infrastructure and technical support indicate that both variables have no influence on the perceived usefulness and perceived ease of use. When the intrinsic and extrinsic motivation were evaluated in terms of their effect on the use of the system, the findings revealed that only intrinsic motivation (perceived ease of use) has a positive and direct effect on the use of the system ($\beta=0.070$,

p<0.001) but not on extrinsic motivation (perceived usefulness). The implications of the findings on the successful adoption and continuance of the usage of the e-learning system will be discussed.

Keywords: e-Learning System, System Characteristics, User Motivation

INTRODUCTION

An e-Learning system is deployed with the aim of improving the efficiency and effectiveness of teaching and learning processes and to provide value in terms of creating an engaging learning environment. One of important aspects of such system deployment are the acceptance, adoption and utilisation of such systems by the students and instructors. The deployment involves substantial financial requirements and human resources and the failed adoption of the system would lead to financial losses and dissatisfaction among stakeholders. Hence, discovering the antecedents to explain and predict the successful acceptance and adoption of e-learning systems among students and instructors are vital.

In the research on the adoption and acceptance of e-learning systems, the most utilised model is the Technology Acceptance Model (TAM) proposed by Davis (1989) which was subsequently improved to include other constructs (Davis & Venkatesh, 1996). TAM posits that perceived usefulness and perceived ease of use are the two determinants that strongly influence attitudes towards the use and the intention of use which, in turn, influence the actual usage of the system (Ramayah & Jantan, 2004). TAM is very influential in predicting and explaining the technology acceptance in many applications and acclaimed for its parsimony.

Much research has attempted to improve the TAM and two research paradigms have emerged (Godoe & Johansen, 2012; Nyoro et al, 2015). One paradigm is system specific. This includes system functionality (Dishaw & Strong, 1989) and support system (Sáncheza & Huerosb, 2010). This paradigm assumes that the attributes of the system characteristics affect the user's perception which, in turn, affects the extent of usage of the system.

The other paradigm is user specific which focuses on latent personality dimensions. In this paradigm, the focus is on the individual's personality which assumes that the personality dimensions such as intrinsic and extrinsic motivation (Ramayah et al, 2003), optimism, innovativeness, discomfort and insecurity (Thompson, 1998), including subjective norm (Chau & Hu, 2001) influences the acceptance, adoption and subsequent use of the system.

This research proposes that system specific and user specific are interrelated, which, in turn, affects the actual system usage (SU). The system characteristics consists of three variables namely System Functionality (SF), Infrastructure (Inf) and Technical Support (TS). The user characteristic is the user motivation which consists of the students' intrinsic motivation (perceived ease of use, PEoU) and extrinsic motivation (perceived usefulness, PU). Figure 1 shows the proposed research model.
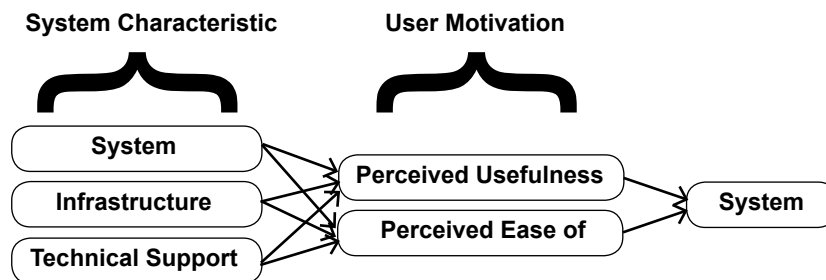

Figure 1: The Research Model Incorporating the System Characteristics and User Motivation

User Motivation

User motivation is the psychological feature that arouses an individual to act towards a desired goal. Motivation can be categorised into two different types namely, extrinsic and intrinsic motivation. Extrinsic motivation is a construct that refers to doing something because it leads to separable outcomes such as specific goals or rewards. As such, extrinsic motivation influences individual behaviour due to reinforcement value of outcomes (Ji-Won Moon & Young-Gul Kim, 2001). On the other hand, intrinsic motivation is defined as the doing of an activity because

it is inherently satisfying, interesting and enjoyable rather than for some separable consequence. As such, intrinsic motivation refers to performance of an activity undertaken for no apparent reinforcement other than the process of performing the activity (Ramayah et al, 2003).

In TAM research, perceived ease of use is usually considered a form of intrinsic motivation whereas perceived usefulness is considered extrinsic motivation (Ramayah et al, 2003). Many have found that user intrinsic motivation and extrinsic motivation are key drivers and determinants to actual system usage (Chen et al, 2000; Davis et al, 1992).

Perceived Usefulness

Perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her performance" (Davis, 1989). Research has shown that the perceived usefulness is strongly correlated to the actual use of the system (Ramayah et al, 2003, Wu et al, 2010). In the context of e-Learning system usage, students who find that the system is useful are more likely to use it to support learning processes. Thus, we hypothesize that:

H1. Perceived usefulness (extrinsic motivation) has a significantly positive and direct effect on the usage of the e-learning system.

Perceived Ease of Use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989). Researchers have found that perceived ease of use was directly related to the use of the system (Ramayah et al, 2003, Tselios et al, 2013). In the context of e-Learning system usage, a system that is perceived as easy to use will influence the usage of the system. If the e-learning system is perceived to be difficult to use, it is less likely to be used by the users. Thus, we hypothesize that:

H2: Perceived ease of use (intrinsic motivation) has a significantly positive and direct effect on the usage of the e-learning system.

System Characteristics

The characteristics of the e-learning system and how these characteristics relate to perceived ease of use and perceived usefulness have received considerable interest among researchers (Pituch & Lee, 2006; Kian Sam Hong et al., 2005). In this study, we propose that system characteristics consist of three constructs, namely, system functionality, infrastructure and technical support.

System Functionality

In terms of the relationship between system functionality and perceived ease of use (intrinsic motivation), a study by Pituch and Lee (2006) show the system functionality of the e-learning system is highly correlated with perceived of use. However, the study of Kian Sam Hong et al. (2005) showed otherwise. In terms of system functionality and perceived usefulness, studies by Pitch and Lee (2006) and Kian Sam Hong et al. (2005) revealed that system functionality was not related to perceived usefulness. We propose that system functionality has a positive and direct effect on the perceived of use and perceived usefulness. As such, we hypothesize that:

H3: System functionality has a significantly positive and direct effect on perceived ease of use (intrinsic motivation) of the e-learning system.

H4: System functionality has a significantly positive and direct effect on perceived usefulness (extrinsic motivation) of the e-learning system.

Infrastructure

Infrastructure of the e-learning system includes the level of access to the Internet provided by the institution both during class time as well as outside class time. We propose that good access to the learning materials and learning activities will lead the students to perceive that the e-learning system is easy to use. As such, we hypothesize that:

H5: Infrastructure has a positive and direct effect on perceived usefulness of the e-learning system.

H6: Infrastructure has a positive and direct effect on the perceived ease of use of the e-learning system.

Technical Support

Technical support comes in the form of help desks, phone hotlines for complaints and suggestions or any other form of   technical support with the aim of providing the assistance for any technical problems faced by instructors and students. A study by Sáncheza and Huerosb (2010) revealed that technical support has a positive effect on the perceived ease of use and perceived usefulness of the e-learning system. We propose that a high degree of efficient technical support will lead to a high degree of perceived ease of use (intrinsic motivation) as well as perceived usefulness (extrinsic motivation). As such, we hypothesize that:

H7: Technical support has a positive and direct effect on perceived usefulness of the e-learning system.

H8: Technical support has a positive and direct effect on the perceived ease of use of the e-learning system.

The importance of this study is that the proposed model has modified TAM to include the system characteristics consisting of three variables namely the System Functionality, Infrastructure and Technical Support. The authors found no literatures that have reported such system characteristics incorporating the three variables within TAM especially pertaining to the use of an e-learning system. The authors believe that this study can make an important contribution to filling a research gap given the critical importance of system characteristics that they can serve as critical predictors to successful deployment of an e-learning system in the institution.

METHODOLOGY

A dedicated questionnaire was developed for this study. For the purpose of development of the questionnaire, a number of prior relevant studies were reviewed to ensure that a complete list of measures were included that would sufficiently explain the model proposed. Measures for the perceived ease of use and perceived usefulness were taken from research related to the Technology Acceptance Model (TAM) (Davis, 1989, Venkatesh & Davis, 2000). The measures for system functionality, support system and infrastructure was captured and adopted from Habibah et al (2015). The measures for system usage was adopted from Ahmad Hanizar (2015).

The survey questionnaire consisted of two parts. The first part elicited the subject's demographic information and the second part elicited the subject's perception of each variable in the model. All items in the second part were measured via a 7-point scale ranging from 1 (least agreeable) to 7 (most agreeable). In total, there were 6 variables with 44 items that were used in this study.

The reliability analysis showed that Cronbach's alpha coefficient obtained for all the variables were well above the acceptance level indicating they were within the measurement model. It also indicated good internal consistency and that the measurement was sufficiently reliable. (See Table 1). The questionnaire was administered to the subjects via online environment using the convenience sampling technique. The subjects were students enrolled in several courses offered by the Department of Electrical Engineering, Universiti Malaya (UM) for the 2nd semester 2014/2015 academic session.

Table 1: Reliabilities of the Variables

Variable	Number of items	Cronbach's Alpha
System Functionality	8	0.931
Infrastructure	4	0.644
Technical Support	5	0.945
Perceived Usefulness	11	0.967
Perceived Ease of Use	8	0.941
System Usage	8	0.931
Total	44	0.973

A total of 102 responses were collected. 32 responses were incomplete and had to be discarded. This left 70 valid responses for the statistical analysis, and a valid response rate of 68.7% of the initial sample. The analysis involved looking at the data demographically as well undertaking a multivariate analysis involving correlation and multiple-regression analysis in order to test the research hypotheses.

RESULTS AND DISCUSSION

Descriptive Analysis

Table 2: Demographic Profile

	Frequency (n=70)	Percentage (100%)
Gender		
Male	41	58.6
Female	29	41.4
Race		
Malay	47	67.1
Chinese	17	24.3
Indian	3	4.3
Others	3	4.3
Course		
KMEM4110	21	30.0
KEEE4336	9	12.9
KXEX1144	36	51.4
KEET4281	3	4.3
KEEE4281	1	1.4
Current CGPA		
1.00 - 2.00	11	15.7
2.00 - 2.50	2	2.9
2.50 - 3.00	10	14.3
3.00 - 3.50	35	50.0
3.50 - 4.00	12	17.1

Number of hours a week using SeLP		
Less than 1 hour	21	30.0
1-2 hours	19	27.1
2-3 hours	19	27.1
3-4 hours	6	8.6
more than 4 hours	5	7.1

The demographic profile of the respondents is presented in Table 2. From the table, it can been seen that 58.6% of the respondents were male whereas 41.4% were female. All of the respondents owned a laptop for the purpose of learning. In terms of the level of achievement, most of the respondents (67%) were good students, with a CGPA>3.0. Most of the respondents (70%) accessed the e-learning system regularly of more one hour per week.

Correlation and Regression Analysis

The purpose of this study is to investigate the relationship between the variables within the two main constructs and their relationship to the usage of the system as hypothesized. For that purpose, three multiple regression analysis were conducted. The first analysed the relationship between the perceived ease of use and perceived usefulness towards the system usage.

The second analysis was used to investigate the relationship between the variables within the construct of system characteristics (system functionality, infrastructure and technical support) towards extrinsic motivation (perceived usefulness).

The third analysis looked at the relationship between the same variables within the construct of system characteristics but toward intrinsic motivation (perceived ease of use).

Table 3. Intercorrelation matrix of the main variables

Dimension	SF	Inf	TS	PEoU	PU	SU
SF	1.000					
Inf	0.362**	1.000				
TS	0.681**	0.395**	1.000			
PEoU	0.755**	0.380**	0.491**	1.000		
PU	0.831**	0.265*	0.575**	0.665**	1.000	
SU	0.843**	0.221	0.557**	0.646**	0.850**	1.000

The result of the correlation analysis between all the variables are shown in Table 3. From the table, it can be seen all the variables were significantly correlated with system usage except for infrastructure.

The results of three multiple regression analysis are shown in Table 4. The first analysis managed to explain 73% of the variance in the use of the system. The second analysis explained 58.7% variance in the perceived ease of use and the third analysis explained 69.3% variance in the perceived usefulness.

Table 4: Regression Analysis of the Model

Dependent Variable	R-Square (R^2)	Independent Variable	Beta (β)	Standard Error of β	*t*-Statistics	Level of Significance
PEoU	0.587	SF	0.762	0.127	6.982	**p<0.001**
		Inf	0.137	0.083	1.575	p>0.05
		TS	-0.082	0.105	-0.743	p>0.05
PU	0.693	SF	0.829	0.099	8.816	**p<0.001**
		Inf	-0.047	0.064	-0.621	p>0.05
		TS	0.028	0.081	0.293	p>0.05
SU	0.734	PEoU	0.145	0.070	1.713	**p<0.001**
		PU	0.754	0.078	8.934	p>0.05

Note: Beta is the standardised regression coefficient

User Motivation and System Use

As can be seen from the table, intrinsic motivation (perceived ease of use) is positively related (β=0.145, p<0.001) to system usage but not extrinsic motivation (perceived usefulness) (β=0.754). Thus, hypothesis H2 is supported but not hypothesis H1. Our results for the relationship between the intrinsic motivation and system usage is in agreement with Pituch and Lee (2006) and Ramayah et al. (2003).However, our result for the relationship between extrinsic motivation and system usage contradicts with Pituch and Lee (2006) and Ramayah et al. (2003). Both studies found that perceived usefulness was highly significant in explaining and predicting system usage.

System Functionality and User Motivation

In terms of the correlation between the system characteristics with user motivation, the results show that system functionality is positively related to perceived ease of use (β=0.762, p<0.001) as well as perceived usefulness (β=0.829, p<0.001) Thus, H3 and H4 are supported. This indicates that the system functionality plays a dominant role in determining the user intrinsic and extrinsic motivation. These findings are consistent with Pituch and Lee (2006) and validates the importance of attending to system functionality when deploying an e-learning system. The system functionality is a strong determinant and predictor of the student's intrinsic and extrinsic motivation which, in turn, would influence them to adopt, accept and use the system.

Infrastructure and User Motivation

We proposed that the system infrastructure will have a positive and direct relation to user motivation (intrinsic and extrinsic) which, in turn, will affect the system usage. The results show that infrastructure has no direct impact both on the perceived ease of use (β=0.137) and perceived usefulness (β=-0.047). This result suggests that the infrastructure is the least important variable to consider when deploying an e-learning system as there is no correlation between infrastructure and the usage of the system.

Technical Support and User Motivation

We proposed that the system infrastructure will have a positive and direct relation to user motivation (intrinsic and extrinsic) which, in turn, will affect the system usage. The results show that infrastructure has no direct impact both on the perceived ease of use (β=0.137) and perceived usefulness (β=-0.047). This contradicts Sancheza & Huerosb (2010) who found that technical support is positively correlated to both perceived usefulness and perceived ease of use.

SUMMARY

This study was conducted to investigate the relationship between user motivation to the actual use of the system. At the same time, the relationship between the variables within the construct of system characteristics and user motivation were also investigated. The results revealed that intrinsic motivation played an influential role in determining the actual system use but not extrinsic motivation. In terms of system characteristics, system functionality was found to be a strong determinant of user motivation, both intrinsic and extrinsic, to use the system. Infrastructure and technical support play no significant role in influencing user motivation. Hence, this study has found certain significant variables do impact on the successful implementation of an e-learning system, which should be considered by the institution that is keen on recouping its financial outlay and human resources tied up with such an enterprise.

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