

e-LEARNING AT UNIVERSITI MALAYA: DETERMINANTS OF SATISFACTION OF USE AMONG ENGINEERING STUDENTS

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ABSTRACT

This study was conducted to investigate the variables associated with satisfaction of use of the SPeCTRUM e-learning platform of Universiti Malaya among engineering students. Two domains were investigated, namely, student characteristics (computer attitude, perceived usefulness and computer self-efficacy and system characteristics (system functionality, infrastructure and technical support). A questionnaire, specially developed using items adopted from previous related studies, was used to elicit responses. Item-structure analysis of the questionnaire revealed high reliability. The sample was 70 engineering students of Universiti Malaya. The findings revealed that system functionality ($\beta=0.649$, $p<0.001$), perceived ease of use ($\beta=0.242$, $p<0.05$) and attitude to use ($\beta=0.150$, $p<0.05$) were found to be strong predictors and determinants of satisfaction of use. Computer self-efficacy ($\beta=-0.101$), infrastructure ($\beta=0.067$) and technical support ($\beta=0.014$) were not significantly related to satisfaction of use. The total variance explained was 88.7% suggesting a good model of fit. Implications of the findings in terms of the intervention required to ensure the satisfaction of use are discussed.

Keywords: e-Learning, Satisfaction, Student Characteristics, System Characteristics

INTRODUCTION

The Learning Management System (LMS) has been widely utilised by many higher education institutions (HEIs) all over the world as part of the academic delivery system to enhance and support conventional teaching and learning. With an LMS, a lecturer can deliver, manage, track and record the learning activities undertaken by the students. The LMS also supports various pedagogical approaches such as blended/hybrid learning. Using the embedded functionalities of the system, the instructional contents can be effectively delivered in various formats such as html, docs, ppt, pdf, etc and the students can undertake various learning activities such as collaboration, quizzes, survey, reflection, etc. anytime and anywhere. The system also supports various interactive contents such as those in flash format as well SCORM format, developed utilising various rapid authoring tools, for convenience. Currently, it is reported that the most widely and popular LMS are the open source “Moodle” with 73.8 million users and the proprietary “Blackboard” with 23 million users (Capterra, undated).

Universiti Malaya (UM) implemented its central LMS based on open source “Moodle” under the brand name SPeCTRUM in 2010. This central LMS is utilised by all the faculties campus wide. The system is linked synchronously with the university back-end database (students’ information system and course catalogue) allowing automatic update of the database. The database enables each individual course being delivered to the students to be managed centrally by lecturers and administrators. Each academic year, a total of more than 4,000 courses offered by the university are automatically integrated within the system for the convenience of 1,780 lecturers and almost 14,000 students. The central deployment of the LMS is under the purview of Academic Development Centre (ADeC) with the technical assistance from the University’s Information Technology Centre.

Continuous evaluation of the LMS is imperative to ensure the effectiveness of the instructional delivery while at the same time enabling the continuous development of the LMS (Wyles, 2004). The perspective of user satisfaction has garnered immense interest as it provides the indicator of success of the system deployment. Many researchers have utilised user satisfaction as a common and single dependent variable to evaluate the success of the system deployment (Ilias et al., 2009; Wu et al., 2010, Bin et al., 2010).

Alsabawy et al. (2013) stated that user satisfaction can be taken as a significant measure when evaluating the success of system deployment as the user satisfaction has high degree of face validity, aided by the availability of reliable instruments and the poor quality of other measures. In the study of the continuous use of e-service, Liao et al. (2007) concluded that the user satisfaction was the main determinant of the users' behavioral intentions of service usage continuance.

Researchers have shown that many attributes contribute to the satisfaction of system use. A study by Verdegem and Verleye (2009) found that several factors were considered fundamental to creating such satisfaction in the use of e-service which include infrastructure, access, awareness, attitude, content, usability, technical aspects and user friendliness. Arbaugh (2000) deployed user satisfaction as a single dependent variable and examined the factor affecting satisfaction in Internet-based courses and found that the flexibility of medium, the ability to develop an interactive course environment and the ease of use were the main factors influencing the satisfaction of use. Other studies found perceived usefulness, perceived ease of use, quality of interaction, learning strategies and computer self-efficacy affecting the user satisfaction of the e-learning system (Lee & Hwang, 2007). In the user satisfaction study of blended learning, Wu et al (2010) found cognitive, technological and social factors affecting user satisfaction.

User satisfaction has also been used to gauge the level of acceptance of the technology. Wu et al. (2010) highlighted that the extent of the user satisfaction can also be integrated for the purpose of gauging the acceptance level of technology deployed. A study by Lin and Chen (2012) and Ahmad (2015) utilised the Technology Acceptance Model (TAM) in order to determine the factors influencing the continuance of usage of the e-learning system and the user satisfaction. TAM has widely been used in the field of management and engineering in predicting technology adoption by end users (Nyoro et al., 2015; Abdul Jalil et al., 2015).

In this study, we propose that the student characteristics and system characteristics have a positive effect on the satisfaction of use of the SPeCTRUM e-learning system. The framework of this study is shown in Figure 1. The framework incorporated six independent variables (three

variables from student characteristics and three variables from system characteristics) and the study involved investigating to what extent these variables were associated with the single dependent variable namely the Satisfaction of Use (SoU). Student characteristics consist of Computer Self-efficacy (CSE), Attitude to Use (AtU) and Perceived Ease of Use (PEoU). System characteristics consist of System Functionality (SF), Technical Support (TS) and Infrastructure (Inf).

This proposed model that modified the TAM and introduced the system characteristics and student characteristics is very significant one. The authors found no literatures that have reported system characteristics and student characteristics within the TAM especially pertaining to the use of an e-learning system. As such, this article would make an important contribution to filling a research gap given the critical importance of system characteristics as well as the student characteristics as the determinants and predictors to successful deployment of an e-learning system to the institution.

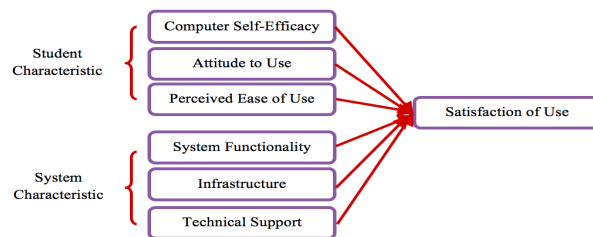


Figure 1: The Proposed Framework of the Study

Based on the above research framework and the proposed relationship between the independent variables and dependent variable, the following six hypotheses were put forward:

- H₁: Computer self-efficacy will have a positive impact on the satisfaction of use of the SPeCTRUM
- H₂: Computer attitude will have a positive impact on the satisfaction of use of the SPeCTRUM

- H₃: System functionality will have a positive impact of the satisfaction of use of the SPeCTRUM
- H₄: Perceived ease of use will have a positive impact of the satisfaction of use of the SPeCTRUM
- H₅: Infrastructure will have a positive impact of the satisfaction of use of the SPeCTRUM
- H₆: Technical support will have a positive impact of the satisfaction of use of the SPeCTRUM

The results of this study are important as they provide insights into the crucial determinants that would entice the engineering students to use SPeCTRUM and enhance their learning satisfaction. Comprehending the essentials of what determines student learning satisfaction could help ADeC, UM into developing effective strategies and interventions to create new opportunities and values for engineering students and instructors when using SPeCRUM.

METHODOLOGY

A total of 49 items was developed for this study's questionnaire. Each item was accompanied by a 7-point Likert scale, with 7 as most agreeable and 1 the least agreeable. The questionnaire was divided into two sections. The first section was to collect information about the profile of the respondents, whereas the second section was used to collect data on the seven constructs used in this study.

The reliability analysis showed that Cronbach's alpha coefficient obtained for all the constructs were well above the 0.7 acceptance level, indicating high internal consistency and sufficiently reliable measurement (See Table 1). The questionnaire was put online and distributed to all engineering students enrolling in six engineering courses, namely KMEM4110 - Electronics and Microprocessor, KEEE4336 - Artificial Intelligence, Fuzzy Logic & Neural Networks, KXEX1144 - Basic Engineering Calculus, KEEE4281 - Thesis, KEET4281- Thesis and

KEEW4281 – Thesis offered by the Department of Electrical Engineering, UM for semester II 2014/2015 academic session.

Table 1: Reliabilities of the Variables

Variable	Number of item	Cronbach's Alpha
Functionality	8	0.931
Perceived Ease of Use	11	0.967
Satisfaction	6	0.868
Computer Self Efficacy	7	0.908
Infrastructure	4	0.644
Technical Support	5	0.945
Computer Attitude	8	0.852
Total	49	0.976

A total of 102 responses were collected using convenience sampling but after careful analysis and discriminating processes, a total of 70 responses were finally used in the analysis. The analysis involved looking at the demographic data descriptively as well undertaking the multivariate analysis involving correlation and multiple-regression analysis in order to answer the research questions.

RESULTS AND DISCUSSION

Descriptive Analysis

The results of the demographic analysis of the respondents are shown in Figure 2 until Figure 6. Most of students involved in the answering the online questionnaire were those of the first year enrolling in KXEX1144 course and followed by final year students enrolling in KMEM4110 course (Figure 2). Figure 3 shows that there were more male respondents (58.6%) compared to female respondents (41.4%). A substantial proportion of the students (67.0%) spend at least 1 hour a week accessing SPeCTRUM (Figure 4). There were also a large number of good students with CGPA of more than 3.00 (67%) (Figure 5).

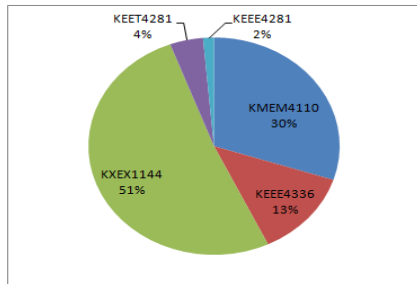


Figure 2: The Distribution of Samples According to Courses Enrolled

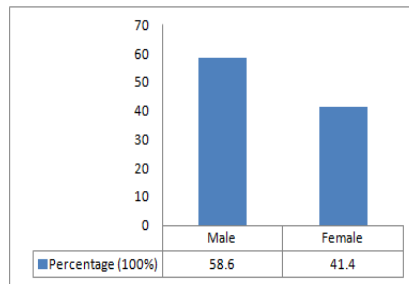


Figure 3: The Distribution of Samples According to Gender

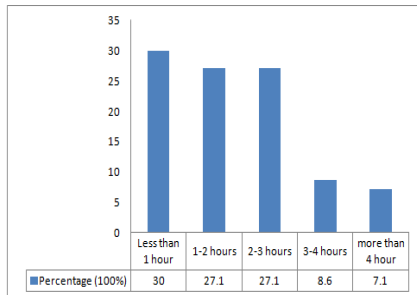


Figure 4: The Distribution of Samples According to Number of Hours in a Week using SPeCTRUM

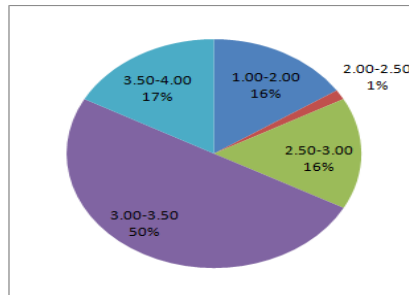


Figure 5: The Distribution of Samples According to Current CGPA

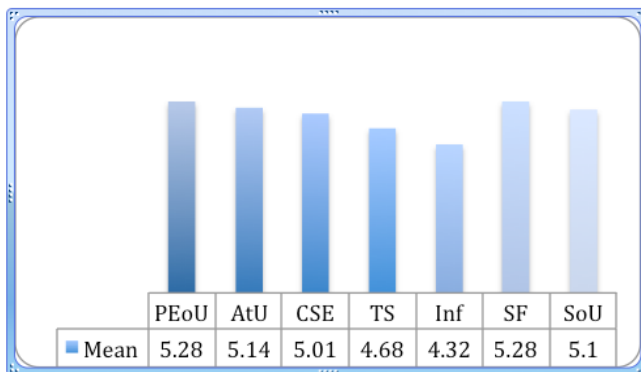


Figure 6: Means of the Variables

Figure 6 shows the mean scores of each of the variables. Most variables recorded a high mean score of more than 4.0. The lowest mean score were for the infrastructure, technical support and computer self-efficacy.

Multivariate Analysis

The correlation analysis was carried out to test the measurement model. Results for correlation analysis is shown in Table 2. The Pearson product moment correlation suggested that all variables were significantly correlated to each other. In addition, the analysis did not indicate any problems in terms of multicollinearity among variables in the model.

Table 2: Correlation Analysis between the Dimensions

Dimension	PEoU	AtU	CSE	TS	Inf	SF	SoU
PEoU	1.000						
AtU	0.726**	1.000					
CSE	0.587**	0.586**	1.000				
TS	0.491**	0.579**	0.564**	1.000			
Inf	0.379**	0.446**	0.241**	0.482**	1.000		
SF	0.755**	0.750**	0.692**	0.681**	0.379**	1.000	
SoU	0.817**	0.786**	0.595**	0.627**	0.454**	0.909**	1.000

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

Regression analysis was conducted to examine the influence of the independent variables on the dependent variable and, at the same time, to test the hypotheses. The results are shown in Table 3.

Table 3: Regression Analysis against Satisfaction of Use

Dependent Variable	R-Square (R^2)	Independent Variable	Beta (β)	Standard Error of β	t-Statistics	Level of Significance
Stfn	0.887	PEoU	0.242	0.061	3.281	p<0.05
		AtU	0.150	0.078	2.037	p<0.05
		CSE	-0.101	0.053	-1.639	p>0.05
		TS	0.014	0.053	0.217	p>0.05
		Inf	0.067	0.042	1.288	p>0.05
		SF	0.649	0.085	7.310	p<0.001

Note: Beta is the standardized regression coefficient

The results of the regression analysis show a significant model explaining 88.7% of the variance in satisfaction of use. System functionality ($= 0.649$, $p < 0.001$) was found to be a significant predictor of satisfaction of use supporting H3 of the study. Perceived ease of use ($= 0.242$, $p < 0.05$), and attitude to use ($= 0.150$, $p < 0.05$) were found to be positively related to satisfaction of use. Thus, H4 and H2 of the study were supported respectively. Computer self-efficacy ($= -0.01$), infrastructure ($= 0.067$) and technical support ($= 0.649$) were, however, not supported.

This study found that system functionality was a strong predictor of satisfaction of use of the SPeCTRUM. This result is consistent with many previous studies (Shee & Wang, 2008; Ho & Dzung, 2010). If the system functionality of SPeCTRUM is able to fulfill the learning needs and enhance the knowledge and skills of the students, the students are more likely to be satisfied when using the system.

The perceived ease of use of the system was found to be strongly correlated to satisfaction of use. These are consistent with the studies (Tselios et al, 2013; Sun et al, 2008) that looked at the perceived ease of use and found that this variable was positively correlated with behavioral intention. Ease of use does influence usefulness and hence satisfaction of use but providing an easy way to use the learning platform is not sufficient. One should also be aware that, as students get more acquainted with the technology, they focus more on its instrumental values and the instructional contents and the appropriate learning design embedded in the system.

The result also demonstrated that attitude to use was also a strong determinant to satisfaction of use and consistent with Cakir and Solak (2014). Attitude is a construct that indicates a certain degree or possibility of adopting and undertaking certain actions and behaviours. As such, a favourable and positive attitude of students towards the e-learning system would suggest a greater probability that they will use it and lead to satisfaction of use.

It is interesting to note that computer self-efficacy, infrastructure and technical support did not have much impact on the satisfaction of use. This is consistent with Ramayah (2006) who found that computer self-efficacy did not influence the use of the digital library system. It is possible that the

students have already acquired the necessary skills and competency (higher mean values of computer self-efficacy) to use the system effectively, and consequently, they yielded a positive perception on the satisfaction of use yielding no significant correlation between these two variables. A similar explanation could also be put forward for the infrastructure and technical support. The provision of such facilities at UM is already at satisfactory levels in providing the access and technical support for the students to use the system.

SUMMARY

This study has identified the significant component of student and system characteristics on the satisfaction of use of SPeCTRUM e-learning system. The embedded system functionality, perceived ease of use of the system as well as the attitude to use of the students were the determinants to user satisfaction. As such, these variables can be used to explain and predict users' satisfaction on the use of the SPeCTRUM e-learning system deployed at UM.

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