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Towards Student-Centred Learning: Factors Contributing to the Adoption of E-Learn@USM

Ng See Kee[1], Bahiyah Omar[2] and Ramli Mohamed[3*]
[1,2,3]School of Communication, Universiti Sains Malaysia, 11800 USM, Penang
[*]ramli@usm.my, ramli@usainsgroup.com

Abstract

In 2009, Universiti Sains Malaysia (USM) launched E-Learn@USM, an electronic system for delivering and sharing learning materials as well as engaging lecturers and students in online discussions. Rather than replacing the traditional face-to-face classroom method, the role of E-Learn@USM is to foster student-centred learning, which is lauded for its effectiveness in the educational setting. The current study aims to examine factors contributing to the adoption of E-Learn@USM among USM students. The factors are categorised into individual factors (personal innovativeness, self-efficacy and attitude), organisational factors (university, administrator and instructor supports), and technological factors (relative advantage, compatibility, complexity, trialability and observability). These factors were selected based on the Diffusion of Innovations Theory and on previous studies on adoption within the innovation-diffusion framework. Using multistage cluster sampling, a survey was conducted on a total of 495 students sampled from a large population of undergraduate students at USM. The results of the hypothesis testing revealed significant relationships between all factors (except for complexity) and the adoption of E-Learn@USM. Five significant predictors – attitude, university support, trialability, relative advantage and self-efficacy – were identified.

Keywords: e-learning, Diffusion of Innovations Theory, adoption, student-based learning

Introduction

The advent of technology and the widespread use of the Internet have had a significant impact on people's daily routines, especially among the younger generations. University students usually fall under the category of heavy Internet users based on time spent on the Internet (Nielson, 2011). University students' growing interest in engaging themselves in "media-based lifestyles" has led to the growth of new learning styles in which technology is used in education (Rogers, Beneš and Bertoline, 2006).

Over the last two decades, educational institutions worldwide have begun to adopt the Internet as a means of managing their learning systems (Jennings and Collins, 2008). The learning process is supported electronically. The term "e-learning" is used to describe this form of electronic learning. E-learning is the process of delivering learning content via computer-mediated communication media (Choy, 2007). It refers to "instructional content or learning experiences delivered or enabled by electronic technology" (Merrill et al., 2001). Its adoption could take the form of online learning as a replacement for face-to-face classroom settings. It could also take the form of a supplementary approach, in which face-to-face classroom settings are combined with the use of technology (Chen, 2009).

In Malaysia, the use of technology in education began in 1972. It began with the adoption of education television (ETV) in schools and later expanded by encouraging the distribution of learning materials through educational radio, interactive multimedia courseware, books and cassettes (Rozhan, 2006). The advent of the Internet has brought about the introduction of e-learning as a web-based platform for training and learning (Goi and Ng, 2009; Govindasamy, 2001) in the Malaysian educational system.

Online courses offer blended pedagogy which refers to the practice of combining print-based learning materials with face-to-face tutorials and online discussions (Kaur and Zoraini Wati, 2004). Universiti Sains Malaysia (USM) was the first local university to introduce distance learning in the 1970s (Ijab et al., 2004). Since then, numerous local educational institutions have adapted e-learning as an integral component of their learning strategies. There were shortcomings in the early

introduction of e-learning such as a lack of technological support and motivational encouragement that caused dissatisfaction among students in the e-learning environment (Fook et al., 2005); yet, the diffusion of e-learning has flourished in Malaysia and continues to do so.

E-learning thrives because it can offer solutions for problems related to teacher-centred learning in traditional face-to-face classroom settings. The problems include untimely access to learning resources due to delays in the delivery of study materials and lack of regular, effective and immediate communication between instructors and students (Nihuka and Voogt, 2012). E-learning provides solutions to these problems by facilitating student-centred learning, an approach in education that focuses on students' needs, abilities, interests and learning styles. In student-centred learning, the students play an active role, while teachers play the role of learning facilitators. This approach reshapes the transmission of information by permitting interactive multimedia visualisation, simulation of information and the creation of educational networks outside of classroom walls (Park, Lee and Cheung, 2007). Studies show that student-centered learning enhances learning (e.g., Rovai and Jordan, 2004), increases understanding of practical issues (e.g., Lee et. al., 2004) and provides an effective platform to assist students in producing solutions to real-life problems (e.g., Lau and Mak, 2005).

The benefits of e-learning have been increasingly acknowledged. USM is not lagging behind in adopting this technology; it introduced E-Learn@USM in the first semester of the 2009/2010 academic session. It is important to note that some schools such as the School of Computer Sciences and the School of Distance Education, have used their own-customised e-learning tools. The School of Distance Education began to use its own customised-in-house Learning Management System (LMS) called Interactive Distance Education Application (IDEA) for distance education students in 2003 (Muhammad Hasmi and Karia, 2005; Hanafi, 2006). The system was then upgraded from a home-grown electronic portal to Moodle, and its full migration occurred in 2005 (Issham et al., 2009). In addition to the School of Distance Education, the School of Computer Sciences has also administered its own e-learning portal. The introduction of E-Learn@USM in 2009 aimed to provide a single platform for all schools in USM to use a uniform system.

Although the use of E-Learn@USM has been facilitated and encouraged by the university, statistical data reveal a slight decrease in the use of E-Learn@USM among students in the second year of implementation. There was also a slight decrease in its adoption in the 2010/2011 academic session [Centre for Knowledge Communication and Technology (CKCT), 2011]. The present study seeks to examine factors contributing to the adoption of E-Learn@USM. This study argues that personal innovativeness, self-efficacy and attitude play crucial roles in the adoption of E-Learn@USM. Individual factors alone, however, are not sufficient. The adoption of E-Learn@USM also relies on organisational factors. Thus, this study argues that university, instructor and administrator supports are relevant in determining the adoption of E-Learn@USM. Finally, the study claims that the role of technological factors – relative advantage, compatibility, complexity, trialability and observability, as espoused by Rogers (2003) – are also crucial in the adoption of E-Learn@USM. Hence, the relationships between these factors were examined to gain an understanding of the diffusion and adoption of E-Learn@USM.

Diffusion of Innovations Theory

Everett M. Rogers proposed the Diffusion of Innovations Theory in 1960 (Wilson and Stacey, 2004). Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003: 11). The messages are mainly about new ideas. There are four main elements of diffusion: innovation, communication channels, time and a social system.

Innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003: 12). Thus, "newness" is considered to be a subjective perception. The exchange of new ideas is important to reach mutual understanding (Rogers, 2003). This exchange involves communication between sources and receivers through communication channels (Sahin, 2006) involving four elements: (1) innovation, (2) an individual or other unit of adoption that has knowledge or experience using the innovation, (3) another individual or other unit that does not yet have knowledge of or experience with the innovation, and (4) a communication channel connecting the two units (Rogers, 2003).

Rogers (2003) considers time to be one of the strengths in diffusion research. Rogers identifies the significance of time in three aspects: the innovation-decision process, the innovativeness of individual or other units of adoption and the rate of adoption in a system. First, the innovation-decision process involves knowledge, persuasion, decision, implementation and confirmation (Rogers, 2003). The process requires ample time for individual or other units of adoption to go through the innovation-decision process – though he or she might reject the adoption of an innovation. Second, the innovativeness of the individual or other units of adoption depends on the classification of adopter categories i.e., innovators, early adopters, early majority, late majority and laggards. For instance, innovators tend to actively seek information on new innovations. They possess a high degree of certain characteristics (such as interpersonal networks and mass media exposure) compared to late majority and laggards (Rogers, 2003). Third, the rate of adoption relates to "the relative speed with which an innovation is adopted by members of a social system" (Rogers, 2003: 23).

The theory also highlights the role of the social system in the diffusion process. Rogers defines a social system as "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 2003: 23). Individuals within a social system can be in many forms, such as individuals, informal groups, organisations and/or subsystems. Each individual possesses unique characteristics, such as personal innovativeness, self-efficacy and attitude that determine individual's level of adoption of an innovation.

Individual Factors

Users' characteristics play crucial roles in the adoption of an innovation. The innovation, in the case of this study, is e-learning. One of the relevant characteristics identified is personal innovativeness: an individual's willingness to try out any new information technology (Agarwal and Prasad, 1997: 206) and "the degree to which an individual (or other unit of adoption) is relatively early in adopting new ideas than other members of a system" (Rogers, 2003: 267). Studies (e.g., Lu, Yao and Yu, 2005; Van Raaij and Schepers, 2008; Park et al., 2006) show that personal innovativeness is one of the personality traits that can explain technology adoption.

The individual's capability or self-efficacy in using a technology is another important characteristic that can determine the individual's adoption of the technology. Bandura (1986: 391) defines self-efficacy as "people's judgements of their capabilities to organize and execute courses of actions required to attain designated types of performances" (as cited in Compeau and Higgins, 1995). Put simply, self efficacy is a belief in one's capability to perform a specific task. In the e-learning context, self-efficacy can be defined as "a student's self-confidence in his or her ability to perform certain learning tasks using a learning management system" (Abbad, Morris and De Nahlik, 2009: 5). Surendra (2001) found a significant relationship between computer knowledge and the adoption of an innovation (as cited in Sahin, 2006). How an individual utilises an innovation contributes to the adoption of technology (Sahin, 2006), and this has become an important variable throughout the innovation-decision process.

In addition, the user's attitude towards an innovation is another factor contributing to the adoption of technology. Rogers and Jain (1968) highlight the role of attitude in understanding technology adoption, especially in the educational setting. Ajzen (1988) describes attitude as a "complex conundrum of feelings, desires and fears that create a state of readiness to act within a person" (as cited in Abukhzam and Lee, 2010: 62). Attitude refers to the positive or negative feelings towards an object. Previous studies, such as those by Carswell and Venkatesh (2002) and Fuller et al. (2007), claim that the user's attitude is the main determinant in technology adoption. Rogers (2003) perceives that compared to the late adopters, the earlier adopters are among the groups with a more favourable attitude towards changes.

Organisational Factors

The university support is considered a "top-down adoption effort" in propagating the adoption of e-learning. In a study of technology adoption at educational institutions, top management support is divided into two components: the support of the university and the support of instructors (Cheung and Huang, 2005). Eneh (2010) claims that the university plays a role in ensuring students adopt the innovations during their early introduction. A number of studies indicate the importance of adequate resources to provide for the development of the system (Cheung and

Huang, 2005; Igbaria, Guimaraes and Davis, 1995; Lee and Kim, 2007). The resources consist of the technology readiness, availability of technological systems, economic readiness and awareness of the skills and knowledge acquired by the individuals who are involved in e-learning systems (Psycharis, 2011). The role of university support is crucial, as it may speed up or slow down the adoption at each stage of the innovation-decision process.

Cheung and Huang (2005) examine the role of instructors as a source of top management support alongside the university support. The university provides resources, while instructors serve as role models for potential adopters to put an innovation into practice. Rogers (2003) defines the role of a champion as "a charismatic individual who throws his or her weight behind an innovation, thus overcoming indifference or resistance that the new idea may provoke in an organization" (Rogers, 2003: 414). He further emphasises that "the presence of an innovation champion contributes to the success of an innovation in an organization" (Rogers, 2003: 414). In the case of this study, instructors or lecturers are the innovation champions. Selim (2007) and Cheung and Huang (2005) highlight the important role of lecturers in generating an effective e-learning experience. Meanwhile, Rogers (2003) argues that potential adopters do not use the technology due to the lack of support from anti-innovation champions.

Another type of organisational support is administrator support. Rogers (2003) emphasises that the role of the champion does not only refer to powerful individuals within an organisation but can also comprise individuals who possess the ability to manage the actions of other individuals. Grover (1993) strongly believes that administrator support can foster the implementation of an innovation or technology (as cited in Lee and Kim, 2007). Goodyear et al. (2001) claim that this is because administrators provide services such as learners' registration, security, record keeping and training as well as technical support (as cited in Wilson and Stacey, 2004). Eneh (2010) perceives that administrator assistance in terms of support and training is likely to be more useful and practical among late adopters. The lack of administrator support will impede the implementation of a technology (Selim, 2007).

Technological Factors

The Diffusion of Innovations Theory consists of five attributes or characteristics of innovations: relative advantage, compatibility, complexity, trialability and observability (Rogers, 2003). Each attribute carries its own characteristics towards an innovation.

First, the superiority of an innovation must be acknowledged. Relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003: 229) or "superior to existing substitutes" (Bennett and Bennett, 2003: 56). An innovation must work better than the existing options so that individuals are persuaded to believe that an innovation brings advantages and benefits to some extent (Duan et al., 2010). Second, an individual is more likely to adopt an innovation if it is compatible with the individual's needs. Compatibility is defined as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003: 240). This is essential to reduce uncertainties. Rogers (2003) argues that an individual may not be aware of an innovation until change agents convince him or her to recognise the innovation as a need. By contrast, innovations that are incompatible with individual norms and values will not be accepted and adopted as quickly as the compatible innovations (Duan et al., 2010).

Another characteristic of an innovation that can affect its adoption is complexity, "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003: 257). Complexity includes obstacles and difficulties experienced by an individual in his or her attempts to adopt an innovation. Lee and Kim (2007) measure complexity by examining the extent and depth of the knowledge needed to understand an innovation or its uses. Lynch (2002) also states that people may be intimidated by the complexity of an innovation and may therefore be afraid to adopt it (as cited in Bennett and Bennett, 2003). Many studies (e.g., Rogers, 2003; Zvanut et al., 2011) expect negative relationships between complexity and adoption of an innovation.

The fourth characteristic is trialability, defined as "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003: 258). Put simply, it is "the possibility to practice the innovation before the

actual use" (Abukhzam and Lee, 2010: 67). Potential adopters can learn through the experience of assessing an innovation before they attempt to adopt it, thereby, reducing their uncertainties. Related to trialability is the ability to see the outcomes from the experience. Rogers calls this observability or "the degree to which the results of an innovation are visible to others" (Rogers, 2003: 258). Observability can also be described as "the benefits that can be perceived from innovation" (Abukhzam and Lee, 2010: 7) or "the ease with which the technology can be observed, imagined and described to the potential user" (Bennett and Bennett, 2003: 56). Role modeling and peer observation are among the key factors that encourage the adoption and diffusion of an innovation. The positive and visible results of technology adoption among adopters will potentially boost the adoption rate among other potential adopters.

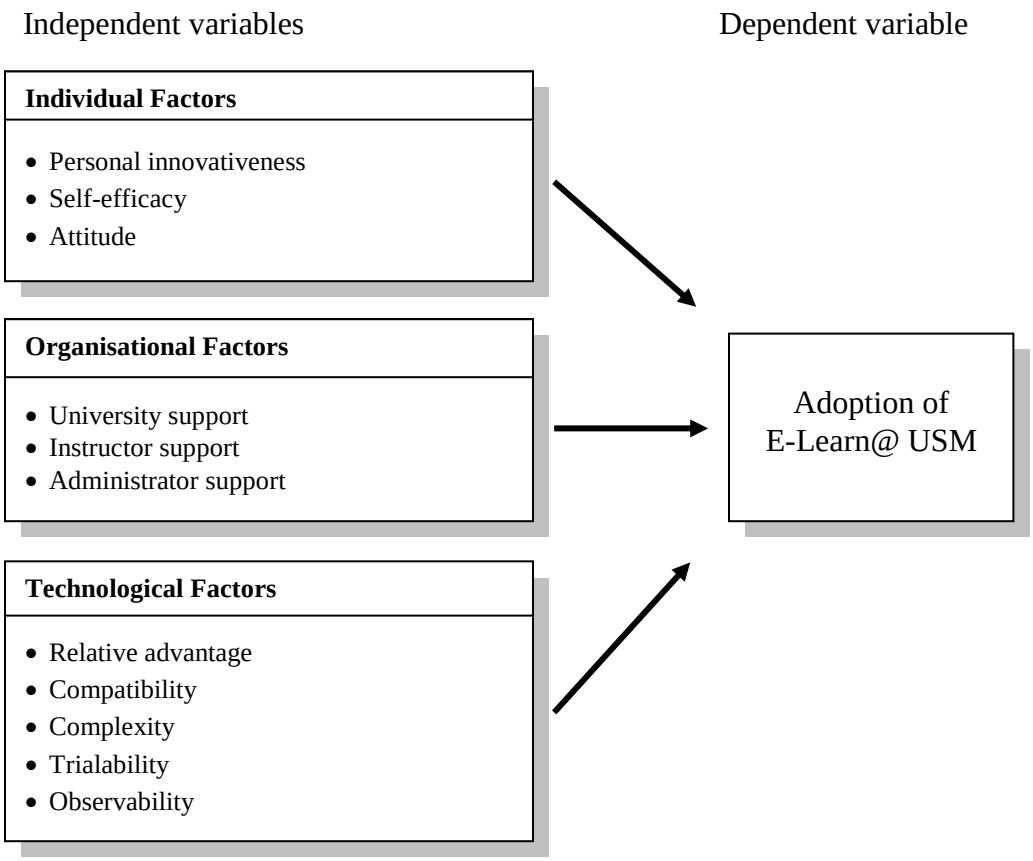

Figure 1 Theoretical framework of the study

Research Questions

RQ1: Are there significant relationships between individual factors (personal innovativeness, self-efficacy and attitude) and the adoption of E-Learn@USM?

RQ2: Are there significant relationships between organisational factors (university support, instructor support and administrator support) and the adoption of E-Learn@USM?

RQ3: Are there significant relationships between technological factors (relative advantage, compatibility, complexity, trialability and observability) and the adoption of E-Learn@USM?

RQ4: Which factors significantly predict the adoption of E-Learn@USM?

Methodology

Data were collected using a cross-sectional survey, with a total of 495 respondents sampled from the population of USM students. Respondents were selected using multistage cluster sampling involving the complete list of schools and courses in the main campus of USM, Penang. The sampling involves four stages of clustering the USM population into streams, schools, courses and subjects.

First, the population of USM students was grouped into clusters – the three main streams, which are Sciences, Arts and Hybrid. The sampling frame involved a complete list of schools and courses from each cluster rather than a complete name list of undergraduate students within the population. Second, this study selected only one school from each cluster to participate in this survey. The first, second and third year students from each school were considered to be the samples of the population. Third, one course from each year was selected by referring to the list of courses. Each course from each school can be considered homogenous strata from its school. A self-report questionnaire was used as the instrument of study. Most of the questions were in structured form. Table 1 summarises the questions and measurements for each variable of the study.

Table 1 Summary of measurements for the variables of the study

Variables	No. of items	Adopted from	Measurement	Alpha value
Personal innovativeness	3	Agarwal and Prasad (1997)	5-point Likert scale	α = .892
Self-efficacy	5	Marakas et al. (1998) Bennett and Bennett (2003)	5-point Likert scale	α = .905
Attitude	7	Bennett and Bennett (2003) Park et al. (2007) Moss et al. (2010)	Semantic indexes	α = .919
University support	5	Lee and Kim (2007) Cheung and Huang (2005)	5-point Likert scale	α = .895
Instructor support	5	Cheung and Huang (2005) Selim (2007)	5-point Likert scale	α = .934
Administrator support	3	Cheung and Huang (2005)	5-point Likert scale	α = .858
Relative advantages	5	Duan et al. (2010)	5-point Likert scale	α = .877
Compatibility	5	Duan et al. (2010)	5-point Likert scale	α = .920
Complexity	4	Duan et al. (2010)	5-point Likert scale	α = .904
Observability	4	Duan et al. (2010)	5-point Likert scale	α = .836
Trialability	3	Duan et al. (2010)	5-point Likert scale	α = .938
Adoption	2	Liao and Lu (2008)	5-point Likert scale	α = .921

An open-ended question was also employed to determine the average time spent on E-Learn@USM per day. This study also utilised semantic differential indexes, which provide two opposite positions representing the polar extremes for each dimension (Baxter and Babbie, 2004), to examine students' attitudes towards the adoption of E-Learn@USM. The respondents were also asked demographic questions such as age, race, gender and field of study.

Results and Discussion

A large number of respondents in this study were female, and approximately half of the total respondents were Malays (see Appendix A). As shown in Table 2, the majority of the respondents (99.4%) have adopted E-Learn@USM. However, the intensity of usage, measured in terms of time spent on E-Learn@USM per day, was only moderate. The measure for the intensity of usage was determined by obtaining equal percentiles from the distribution of scores on time spent using

E-Learn@USM. Using two cut points, the distribution of scores on time spent was divided into three levels: low, medium and high. In addition, the majority of the respondents were categorised as late majority and early majority using the Technology Adoption Lifecycle. The innovators, early majority and laggards of E-Learn@USM adoption represented only a small fraction of USM students (see Appendix B).

Table 2 Distribution of respondents according to overall usage and intensity of E-Learn@USM usage

Variables	Percentage (%)
Overall usage of E-Learn@USM	
Yes	99.4
No	0.6
Intensity of E-Learn@USM usage	
Low (<10 min)	36.6
Medium (10-30 min)	49.5
High (>30 min)	13.9

(n = 495)

This study explored relationships between variables. On the one hand, this study employed correlation analysis to show the existence of relationships. Zero-order correlation (or Pearson *r* correlation) was used to examine the direct relationship between two variables without controlling for the effects of other variables; the effects of other variables were not removed using this analysis.

The result of the correlation analysis (Table 3) shows that all variables except complexity had a positive and significant relationship with the adoption of E-Learn@USM. The study found no significant relationship between complexity and adoption. This lack of relationship could mean that students did not perceive E-Learn@USM as a difficult system. A decrease in complexity, however, was not associated with an increase in adoption. Table 3 shows that the strength of the significant relationships ranged between small and moderate. Attitude (r = .419), self-efficacy (r = .336), university support (r = .421), relative advantage (r = .381) and compatibility (r = .366) were among the variables that demonstrated moderate relationships with the adoption of E-Learn@USM. Meanwhile, the remaining variables possessed low relationships with the adoption of

E-Learn@USM. Although the relationships could not be considered strong correlations, this study established the existence of relationships between the variables of the study (with the exception of complexity) and the adoption of E-Learn@USM.

Table 3 Correlations between individual, organisational and technological factors with E-Learn@USM adoption

Variables	Adoption of E-Learn@USM	
	r(p)	r^2
Individual factors in the adoption of E-Learn@USM		
Attitude	**.419** (.000)**	**.1756**
Self-efficacy	.336** (.000)	.1129
Personal innovativeness	.244** (.000)	.0595
Organisational factors in the adoption of E-Learn@USM		
University support	**.421** (.000)**	**.1772**
Instructor support	.260** (.000)	.0676
Administrator support	.246** (.000)	.0605
Technological factors in the adoption of E-Learn@USM		
Relative advantage	**.381** (.000)**	**.1452**
Compatibility	.366** (.000)	.1340
Observability	.299** (.000)	.0894
Trialability	.295** (.000)	.0870
Complexity	.018 (.345)	.0003

n = 495, *p < .05, **p < .001

On the other hand, regression analysis can provide a clearer and more accurate indication of the relationship between variables. This is because zero-order correlation analysis can only indicate that one variable

correlates to the other, while regression analysis can explain the ability of various factors to predict a dependent variable. With regression, the extent to which each predictor explains the dependent variable can be assessed, with the influence of other variables held constant. Therefore, the results deduced from correlation analysis were only indicative of relations for further analysis and comparison.

Table 4 shows the results of multiple regression analysis on three models according to three main factors (i.e., individual, organisational and technological). Each model was represented by the factors that were used to predict the adoption of E-Learn@USM. Overall, the three models were significant to predict the adoption of E-Learn@USM. Model 1 (individual factors) has a slightly higher contribution (20.8%) than the other models. Model 3 explained 18.8% of variance in the adoption of E-Learn@USM which was slightly higher than the 17.3% variance explained by Model 2. One of the technological factors, that is complexity, was excluded in this analysis because it showed an insignificant result (r = .018, p = .345) and the relationship was expected to be negatively correlated with the adoption of E-Learn@USM.

In Model 1, attitude (β = .337, p = .000) and self-efficacy (β = .172, p = .001) were found to be significant predictors of the adoption of E-Learn@USM, with attitude standing out as the strongest predictor. The relationship between personal innovativeness and the adoption of E-Learn@USM was insignificant. University support (β = .407, p = .000) was found to be the only significant predictor in Model 2. The other two types of supports – instructor and administrator supports – were insignificant. In Model 3, only one technological factor, observability, had no significant relationship with adoption. Relative advantage (β = .227, p = .000), compatibility (β = .180, p = .001) and trialability (β = .134, p = .006) significantly predicted the adoption of E-Learn@USM.

Table 4 Summary of multiple regression analysis including all theoretical variables (3 Models) in predicting adoption of E-Learn@USM

Theoretical variables	Adoption of E-Learn@USM		
	β(p) *Model 1* Individual factor	*β(p)* *Model 2* Organisational factor	*β(p)* *Model 3* Technological factor
Attitude	**.337 (.000)**		
Self-efficiency	**.172 (.001)**		
Personal innovativeness	.059 (.225)		
University support		**.407 (.000)**	
Administrator support		.041 (.417)	
Instructor support		–.012 (.828)	
Relative advantage			**.227 (.000)**
Compatibility			**.180 (.001)**
Trialability			**.134 (.006)**
Observability			.010 (.860)
R^2	.213	.178	.195
Adjusted R^2	.208	.173	.188
F	44.335	35.461	29.644
Sig.	.000	.000	.000
*exclusive of complexity			

n = 495, *p < .05, **p < .001

The current study further explained the overall regression model by combining all variables in one model. This was done to examine which factors significantly predict the adoption of E-Learn@USM. Complexity was again excluded from the analysis. The overall model was significant (p = .000). As shown in Table 5, the overall model (Adjusted R^2 = .263) contributed 26.3% of the variance in explaining the adoption of E-Learn@USM. The results showed that university support (β = .244, p = .000) was the strongest predictor of the adoption, representing 2.69% of the total variance in this model. After university support, the strongest predictors were attitude (β = .192, p = .000), trialability (β = .123, p = .010), relative advantages (β = .118, p = .022) and self-efficacy (β = .109, p = .031). Hence, there were five factors (i.e., attitude, university support, trialability, relative advantage and self-efficacy) that could be considered significant predictors of the adoption of E-Learn@USM.

Table 5 Overall model of multiple regression analysis including all theoretical variables in predicting E-Learn@USM adoption

Variables	Adoption of E-Learn@USM	
	β(p)	*sr²*
Attitude	**.192**	**.0219**
	(.000)	
Self-efficacy	**.109**	**.0069**
	(.031)	
Personal innovativeness	–0.028	.0005
	(.568)	
University support	**.244**	**.0269**
	(.000)	
Instructor support	–0.075	.0030
	(.157)	
Administrator support	–0.052	.0016
	(.299)	
Trialability	**.123**	**.0098**
	(.010)	
Relative advantage	**.118**	**.0079**
	(.022)	
Compatibility	.095	.0046
	(.078)	
Observability	–0.062	.0018
	(.262)	
R^2	.278	
Adjusted R^2	.263	
F	18.652	
Sig.	.000	
*exclusive of complexity		

n = 495, *p < .05, **p < .001

The findings showed that all relationships but one were accepted when they were tested using correlation analysis. The only insignificant relationship was the relationship between complexity and the adoption of E-Learn@USM. The results of regression analysis however, showed that only five relationships were significant. This study found that university support, attitude, trialability, relative advantages and self-efficacy were significant predictors to the adoption of E-Learn@USM.

This study determined that attitude was the strongest predictor of E-Learn@USM adoption. This significant finding was consistent with studies that discovered the positive role of attitude in the acceptance of

technology (Carswell and Venkatesh, 2002) and the intention to use e-learning (Park et al., 2007). University support was also found to significantly predict the adoption of E-Learn@USM. The role of university support in implementing the technology is that of financial and human resources provider to implement the technology itself. This finding is consistent with the findings of Lee and Kim (2007) who found a significant relationship between top management support and the implementation success of Internet-based information systems.

The relationship between trialability and adoption was also significant. This relationship shows the importance of providing access to e-learning on a trial basis so that students can experiment with the technology, which in turn can increase the rate of adoption. This provision however, would not be successful if the benefits of adopting e-learning could not supersede the existing learning system, as the current study also found that relative advantage can predict the adoption of E-Learn@USM. This finding is consistent with several studies (for example Zvanut et al., 2011; Abbad, Morris and De Nahlik, 2009) that found that relative advantage was a significant predictor in explaining the acceptance of e-learning. Finally, the relationship between self-efficacy and adoption was also significant. Hsu and Chiu's (2004) study also found a significant relationship between web self-efficacy and behavioural intentions to use electronic services. Therefore, harnessing students' capabilities in using e-learning is an important factor in increasing the adoption rate of E-Learn@USM.

Conclusions

This study has attempted to build a theoretical framework to explain the factors that potentially influence the adoption of E-Learn@USM. By analysing previous studies, this research has proposed and validated a predictive framework involving three main factors (individual, organisational and technological) that can predict the adoption of E-Learn@USM. The research findings revealed significant relationships between the factors, with the exception of the relationship between complexity and the adoption of E-Learn@USM. However, further analysis using multiple regression showed that only university support, attitude, trialability, relative advantage and self-efficacy were influential and significant predictors of the adoption of E-Learn@USM.

Thus, it is necessary to analyse these significant predictors and suggest possible ways to improve the rate of adoption. This study found that the role of the university is central to the adoption of E-Learn@USM. Statistics provided by the E-Learn@USM secretariat revealed that full participation and engagement from lecturers in the system is still lacking. Thus, this study recommends that the university take further action, providing sufficient trainings and appropriate incentives to ensure full participation across all schools in the USM. The findings also showed the influential role of positive attitude in accelerating the rate of adoption. This finding indicates the need to boost positive attitudes towards E-Learn@USM among its users, including both students and lecturers.

To increase the rate of E-Learn@USM usage among students, efforts should be mobilised to make the system more attractive. The findings show that there were significant relationships between the qualities of E-Learn@USM – relative advantage, compatibility, observability and trialability – and its adoption. Hence, the facilities of the E-Learn@USM system must be properly maintained and upgraded periodically. This maintenance must include short-term and long-term strategies to enhance the current systems. It is important to note that trialability and relative advantage were considered significant predictors of adoption in the current study. This study, therefore, recommends the formation of a one-stop centre – a kiosk type of system – to assist users in trying the system and experiencing its benefits. The centre can play an important role in providing services and assistance which can eventually increase the rate of adoption.

Future research conducted on lecturers (as instructors of E-Learn@USM) could foster further understanding of adoption practices between different groups of users. The current study also recommends that future research include a longitudinal survey to gain deeper understanding of the adoption of E-Learn@USM.

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Appendix A Distribution of respondents according to gender, race, stream, schools and courses

Variables			Percentage (%)
Gender			
	Male		20.8
	Female		79.2
Race			
	Malay		55.6
	Chinese		38.4
	Indian		2.4
	Others		3.6
Stream			
	Science		37.1
	Art		29.9
	Hybrid		33.0
Schools & Courses			
	Mathematical Sciences		
		MAT 181	30.7
		MSG 285	4.8
		MSS 391	1.6
	Communication		
		YKT 102	21.2
		YBP 221E	5.5
		YFP 324	3.2
	Management		
		ATW 107	7.3
		ACW 264	18.0
		AMW 346	7.7

(n = 495)

Appendix B Distribution of respondents according to Individual Innovativeness Scale

	Category	Frequency	Percentage (%)
(1)	Innovators	4	0.8
(2)	Early adopters	20	4.0
(3)	Early majority	218	44.0
(4)	Late majority	250	50.5
(5)	Laggards / Traditionalists	3	0.6

(n = 495)

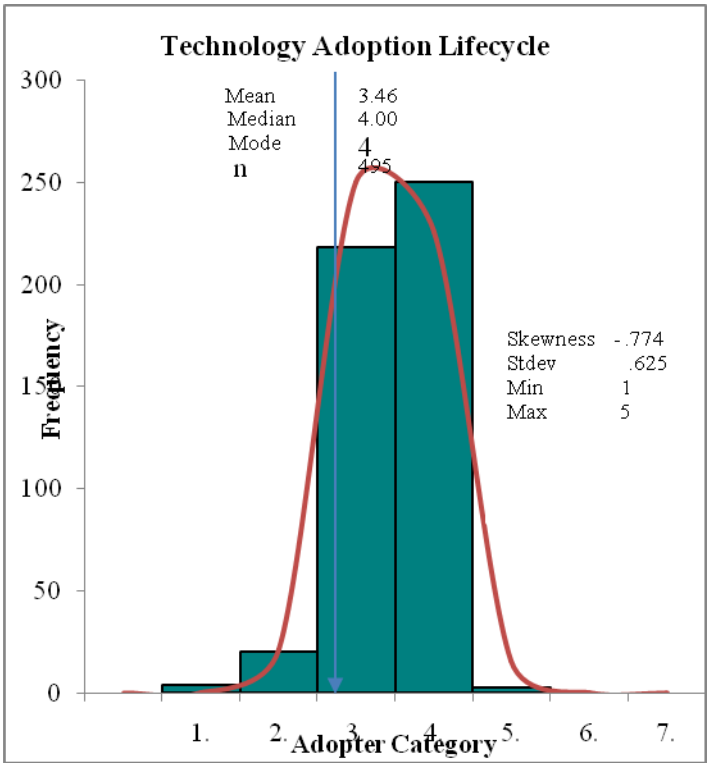

Figure 2 Technology Adoption Lifecycle based on E-Learn@USM adoption