

Pre-Service Teachers' Acceptance and use of Mobile Learning in Malaysia

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Abstract

Mobile technology coupled with Internet accessibility has increased not only how we communicate but also how we might engage in learning. The ubiquity of mobile technology, such as smart phones and tablet devices, makes it a valuable tool for accessing learning resources on the Internet. The unified theory of acceptance and use of technology (UTAUT) model has been used in previous studies to investigate how different forms of technology have been used and accepted. This paper reports on mobile technology use and acceptance using the UTAUT model as a theoretical framework to examine how a group of Malaysian pre-services teachers' utilised mobile technology for their learning. The study found that performance expectancy, effort expectancy, social influence, attitude toward technology and self efficiency are all significant determinants of behavioural intentions to use mobile devices for learning. The researchers conclude that the result of their study has far-reaching implications for educational providers to understand how students' use mobile technologies as a key component of their university studies.

Keywords

Mobile learning, m-learning, pre-service teachers, technology, UTAUT

Introduction

The current paper reports on a recent study that investigated the factors that influenced pre-service teachers' acceptance and use of mobile learning. The study focused on the unified theory of acceptance and use of technology (UTAUT) model proposed by Davis, Bagozzi and Warshaw (1989) and Venkatesh, Morris, Davis and Davis (2003). The study used the UTAUT model as a theoretical framework to investigate behavioural intentions and level of acceptance for pre-service teachers' to use mobile devices for their learning at one Malaysian university. The purpose of the study was to investigate and examine the behaviour intention of pre-service teachers in acceptance of using mobile technology for learning, which is often called m-learning.

Literature review

Mobile technological devices such as mobile phones, smart phones, tablets, pads, notebooks and laptops make access to the Internet, resources, and information available to students anywhere at any time (Wang, 2007; Wang, Wu, & Wang, 2009; J-F, Pullen, & Swabey, 2014). Innovations in mobile devices enable students and teachers to access academic and social applications such as a content management system for course study materials and Skype for peer-to-peer course discussions. Mobile technologies allow students and staff to have the opportunity to access their lectures and other course group members by email, video networking (e.g. Skype), and additional Internet supported resources and course documents etcetera (Donaldson, 2011).

M-learning users interact with educational information resources while away from their regular place of learning such as a classroom or a desktop computer. Mobile learning empowers students and teachers to manage their extra time to complete their coursework or assignments while travelling or working away from the university campus (Virvou, & Alepis, 2005).

Providing mobile academic resources is not enough to convince students. Hu and colleagues (2003) believe that the user resistance to technology is still considerable with the growing role of information technology in academia. Information technology acceptance models such as TAM and UTAUT are one way to examine the variables affecting student use of mobile devices. The current study aims to apply UTAUT as the theoretical framework. This study addresses the call for further validation of UTAUT (Straub, 2009) and determines the validity of the added constructs self efficiency, attitude toward and anxiety used by (Venkatesh et al., 2003).

Using the unified theory of acceptance and use of technology (UTAUT) model proposed by Venkatesh et al. (2003) the study analysed pre-service teachers' technology intention behaviours, acceptance and use of technology for mobile learning accessibility. The UTAUT model supposes four fundamental constructs (variables), including *performance expectancy*, *effort expectancy*, social influence related to *behaviour intention*, and facilitating conditions as direct determinants of *usage behaviour* (Virvou, & Alepis, 2005). UTAUT is a power predictive model that relies on constructs from a number of behavioural theories developed to predict technology use. It is a combination of eight competing technology acceptance models, including: 1. Theory of Reasoned Action (TRA), 2. Technology Acceptance Model (TAM), 3. Motivational Model, 4. Theory of Planned Behaviour (TPB), 5. Combined TAM-TPB, 6. Model of PC Utilization, 7. Innovation Diffusion theory and 8. Social Cognitive Theory (Louho, Kallioja, & Oittinen, 2006). The UTAUT is a more developed version of the TAM model (Louho et al., 2006). This latter model places significant attention on technology acceptance such as information systems (Davis et al., 1989), library information systems and user use (Kim, Ju, Park, Kim, Lee, Yi, & Seo, 2009).

The UTAUT theory seeks to explain intentions to use an information system and subsequent use behaviour. Based on the theory, performance expectancy, effort expectancy, social influence, and facilitating conditions are primary determinants of information system usage intention and usage behaviour (Venkatesh et.al. 2003). Yu-Lung, Tao and Yang (2007) state that the UTAUT model combines into four core determinants.

Birch and Irvine (2009) inquired about pre-service teachers' acceptance of Information and Communications Technology (ICT) in Canada. Their study revealed that a 70% variation in user intentions could be attributed to the four UTAUT variables. In the study of Birch and Irvine (2009) the role of the UTAUT variables were considered and the final regression model accounted for 27% variation in user intentions with the UTAUT variable of *effort expectancy* being a vital predictor of behaviour intention. In other words, people will use the technology if it does not require a significant effort on their part to use the technology.

In another study, Teo (2007) investigated the relationships between variables associated with factors that affect technology acceptance in Singapore. Perceived helpfulness, orientation towards computer use, and computer self-efficacy were found to have had a direct effect on pre-service teachers' technology acceptance. Moreover, another study by Al-Ruz and Khasawneh (2011) distinguished easiness of performance, technological complexity, and facilitating requirements influencing technology acceptance indirectly; this again indicated that ease of technology use affects users' decisions to use a form of technology.

Technology implementation in education has been found to enhance learning in the formal classroom setting (Ely, Pullen, Kennedy, Hirsch, & Williams, 2014). However, mobile technology can be applied as a link between the formal and informal learning platforms as learning takes place in the formal environment as well as outside of the classroom (Cox, 2013; Stern, & Mifsud, 2013). Herrington, Oliver and Herrington (2008) argued that changes in learning environments have generated favourable conditions for the pedagogical application of mobile technologies within the formal educational setting. With the ubiquity of mobile technologies and their potential for implementing learning in higher education, the current study seeks to better understand how a group of pre-service teachers' use mobile learning.

The possible influence of mobile devices on higher education and their impact on lifelong learning opportunities is still unclear and is an evolving field of study (Kukulska-Hulme, 2007). Jazihan, Mohd Ayub and Luan (2013) stated that most Malaysians possess mobile phones as reported by the Malaysian Communication and Multimedia Commission (MCMC) in a 2010 survey. It is, however, not known whether these mobile devices serve a social communication purpose as well as to assist with the learning needs of pre-service teachers. In one Malaysian study Abdullah, Sedek, Mahat and Zainal (2012) reported that university students often use their mobile phones for personal communication rather than for educational learning purposes.

Many studies involving acceptance of mobile learning have been carried out in developed countries such as United States, Canada and Australia but there is dearth of such studies about pre-service teacher's acceptance and use of mobile learning in developing nations such as Malaysia. As such the current study sought answers on how pre-service teachers used their mobile phones for learning and what affected their use of mobile phones for learning related purposes. Utilising the UTAUT model developed by Venkatesh et al. (2003), as shown in Figure 1, this paper reports on a cohort of Malaysian pre-service teachers acceptance and use of m-learning.

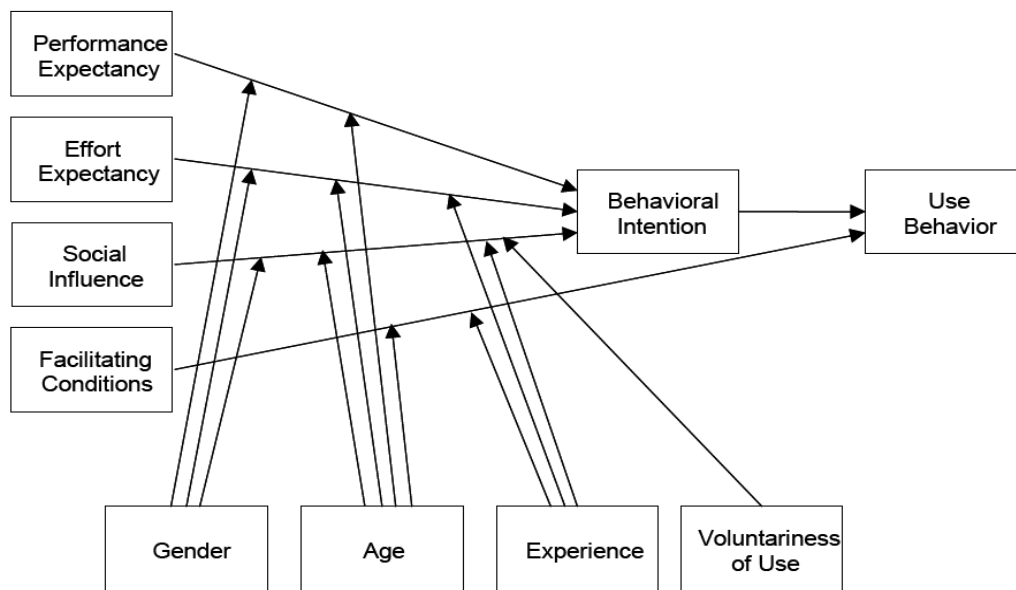


Figure 1 UTAUT model (Venkatesh, et al., 2003)

Method

In this research, the target population is all first year pre-service teachers of School of educational studies Universiti Sains Malaysia. The population is as shown in the table 1.

Table 1

Teaching Area of Specialization of First Year Pre-service Teachers

S/n	Area of Specialization	Number
1	Bachelor of Art Education	194
2	Bachelor of Science Education	113

3	Special Education	78
4	Teaching English as a Second Language (TESOL)	51
	Total	436

Note. Adapted from *School of Educational Studies Malaysia University* (2014)

A sample of 100 respondents was taken from the population using a stratified random sampling technique. Gay and Airasian (2002) stated that there is little point in sampling the entire population for smaller populations, N=100 or fewer (p. 139). The researchers selected the sample proportionately from each of the strata population. 50 respondents were selected from the Art education strata, 25 respondents were equally selected from the Science and Special education strata respectively. The TESOL group was used for pilot testing of the survey instrument.

Survey instrument

The paper used a modified UTAUT questionnaire (survey). The instrument was developed by Venkatesh et al. (2003) and validated by Wang et al. (2009). The UTAUT instrument has been used by numerous researchers and is composed of questions adapted from previous information systems surveys to measure the constructs included in the model (Anderson, & Schwager, 2004; Venkatesh et al., 2003; Wang, 2007; Wang, & Shih, 2008) as shown in Figure 1. The researchers adapted the UTAUT instrument developed by Venkatesh et al. (2003) to make the questions more relevant to the context of mobile learning and the participant population (e.g., the word “system” replaced with “mobile learning” and converting an English language survey into a Malay language one). Similar modifications of the UTAUT instrument have been carried out by other researchers indicating that the validity of the original instrument has been maintained in subsequent population adaptations (Anderson, & Schwager, 2004; Wang, & Shih, 2008).

The UTAUT questionnaire has two parts. The first part covers the demographic details of the respondents. It consists of questions about a respondent’s gender, age, ownership of a device and economic status. The second part of the UTAUT survey looks at factors which influence mobile phone usage: performance expectancy, effort expectancy, social influence, facilitating conditions, self- efficacy, computer anxiety, attitude towards technology, and behaviour intentions. The modified UTAUT survey used a 1 to 5 Likert scale with 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Disagree. The instrument was found to be reliable by Marchekwas, Liu and Kostiwa (2007) with a Cronbach’s alpha value of 0.70. Since the research instrument was adapted for the present study, the need arose to validate the instrument again. The modified instrument was found very reliable with a Cronbach’s Alpha value of 0.87.

The questionnaire was administered to respondents in their university classrooms by the researcher (Abadoo) who was not one of their teachers. The administration of the

instrument was carried out in 2014 within the School of Educational Studies, Malaysia University. The researcher waited and collected the answered questionnaire from the respondents before they finished class. This occurred to ensure a 100 per cent return rate.

Data analysis

The following methods were employed to analyse the data collected from this study. The responses from the pre-service teachers were scored to arrive at each respondents score on the research variables. The data was coded in a codebook and later entered into the SPSS software package for statistical analysis. Descriptive statistics of the study were undertaken to ascertain percentages of responses and are presented in tables in this paper. Additional analysis was conducted using inferential statistics such as an Independent t-test, one-way analysis of variance (ANOVA) and regression analysis.

RESULTS

Data obtained from this study are presented in two subsections; Section (1) displays descriptive data such as percentage and simple statistical descriptive values, Section (2) shows analytical data of related variables. The data was analysed using SPSS (version 20).

Descriptive Statistics

In this section, the descriptive statistics of different variables are discussed. Table 2 shows that 74% of respondents were female and 26% male. As can be seen, 68% of respondents were aged between 21-30 years of age, and 28% between 18-20 years of age and 4% between 31-50 years of age. Moreover, most respondents have a smart phone (63%) followed by a mobile phone (27%) and 8% have both a mobile phone and a pad (this was either an iPad or another tablet device). Finally, the highest percentage of respondents (59%) used a mobile phone for connection to the Internet whilst 29% of respondents used a laptop for their Internet connection.

Table 2
Descriptive Results

Variable	Frequency (N)	Percent %
Male	26	26
Female	74	74
Gender	Total	100
	18-20	28

Age	21-30	68	68
	31-40	3	3
	41-50	1	1
	Total	100	100
Device Ownership	Mobile phone	27	27
	Smart phone	63	63
	Pad/Pocket pc/tablet	2	2
	Both Mobile Phone & Pad	8	8
	Total	100	100
Connect to Internet by	Smart phone	59	59
	Tablet	4	4
	Pad	3	3
	Notebook	5	3
	Laptop	29	29
	Total	100	100

Inferential Statistics

Table 3 shows the results related to the One-Way ANOVA, which was used for measuring the difference of acceptance of mobile learning according to the demographic variables. It also illustrates that there is no significant difference in acceptance of mobile learning according to age, mobile device ownership, salary and device for connecting to the Internet ($p>0.05$).

Table 3

Results of One-Way ANOVA

Independent Variable	Mean	F	df	Sig
18-20	12.07	1.582	3	.199

Age	21-30	10.79			
	31-40	10.66			
	41-50	12			
	Mobile phone	10.85	.989	3	.401
	Smart phone	11.46			
	Pad/ Pocket pc/tablet	11			
	Both: mobile phone/pad	9.87			
Salary	Below 1500	11.3	1.67	3	.179
	1500-2000	13.2			
	2001-2500	9			
	2501-3000	10.66			
Device for connecting to Internet	Smart phone	11.44	.570	4	.685
	Tablet pad	10			
	Notebook	11.33			
	Laptop	10.68			

An independent sample t-test (Table 4) indicates that there is no significant difference between male and female in acceptance of mobile learning ($p > 0.05$). In terms of the UTAUT variables, Table 5 indicates whether the variables were significant for this cohort of pre-service Malaysian students.

Table 4

T-test Result for Gender

Variable	Dependent	Gender	SD	t	Sig
Acceptance of Mobile Learning		Male	2.45	.604	.547

Female 2.77

Table 5

Linear Regression

Independent Variable	R	Adjusted R square	Beta	F	Sig
Performance Expectancy	.248	0.052	0.248	6.41	0.013
Effort Expectancy	0.375	0.132	0.375	16.02	0.000
Social influence	0.217	0.037	0.217	4.82	0.03
Attitude toward using technology	0.338	0.105	0.338	12.62	0.001
Facilitating conditions	0.113	0.003	0.113	1.27	0.262
Self-efficacy	0.233	0.045	0.233	5.64	0.019
Anxiety	0.147	0.012	-0.147	2.15	0.145

The findings from Table 5 indicate that there is a significant and positive relationship between performance expectancy and acceptance to use mobile devices for learning by pre-service teachers (Beta= 0.248, $p < 0.05$). Performance expectancy can describe 5.2% changes in acceptance use of mobile learning. Similarly, there is a significant and positive relationship between effort expectancy and acceptance to use mobile learning by pre-service teachers (Beta= 0.375, $p < 0.05$). Effort expectancy can describe 13.2% of the change in acceptance and use of mobile learning.

Results from Table 5 also indicate that there is a significant and positive relationship between social influence and acceptance to use mobile learning (Beta= 0.217, $p < 0.05$). In fact, social influence can describe 3.7% of the change in acceptance to use mobile learning. Additionally, the relationship between positive attitude toward using technology and acceptance to use mobile learning by pre-service teachers was positive and significant (Beta= 0.338, $p < 0.05$). Moreover, positive attitude toward using technology can describe 10.5% of the change in acceptance to use mobile learning.

There is not a significant relationship between facilitating condition and acceptance to use mobile learning by pre-service teachers ($p > 0.05$, 0.233) nor was there a positive and significant relationship between self-efficacy and acceptance to use mobile learning

(Beta= 0.233, $p < 0.05$). Furthermore, self-efficacy explains 4.5% of the change in acceptance to use mobile learning.

The last row of Table 5 is related to the relationship between anxiety and acceptance to use mobile learning by pre-service teachers, which found that there was not a significant relationship between the two ($p > 0.05$). Effort expectancy has a significant relationship with acceptance of mobile learning (Beta= .275, $p < 0.05$). Moreover, effort expectancy describes 12.5% of change in acceptance of mobile learning by pre-service teachers to use mobile devices for their learning.

Discussion

Acceptance use of mobile learning was important amongst nearly all first-year pre-service teachers in this study. According to the multi regression analysis, as shown in Table 5, the effort expectancy factor has a significant effect on acceptance of the use of mobile learning among these pre-service teachers. The following sections present findings of particular interest. The liner regression analysis found that all variables had a significant effect on acceptance use of mobile learning except for facility condition and anxiety where there was not significant effect on depended variable in this study.

Performance expectancy and mobile learning acceptance

The study found that there is a concrete and significant relationship between performance expectancy and mobile learning. In other words, the acceptance of mobile learning between individuals is higher since they perceive mobile learning to be advantageous at any time, any place, and on any device.

Self-efficacy and mobile learning acceptance

Outcomes of the study revealed that there is a definite and significant relationship between self-efficacy and mobile learning. In addition, a study conducted in Jordan by Al-Ruz and Khasawneh (2011) supports the results of the current study. Jazihan et al. (2013) found that the technology self-efficacy is the most significant factor with the greatest direct effect on technology integration. In addition, a study by Teo (2007) showed that there was a significant correlation between technology acceptance and self-efficacy in Singapore, indicating similar findings to the current study.

Attitude toward using technology and mobile learning acceptance

The consequences of this study indicate that there is a specific correlation between these two factors. Moreover, the study by Teo (2007) showed that there is a significant relationship between perceived usefulness, orientation towards computer use and technology acceptance in Singapore, which appears to be the same with the Malaysian students.

Anxiety and mobile learning acceptance

Venkatesh et al. (2003) considered anxiety and found that there was not a significant relationship between the two variables but this study's Beta results (Table 5) showed

that there is a negative relationship between anxiety and mobile learning acceptance. In other words, if the pre-service teachers feel less stress in the use of mobile technology, they are more likely to use mobile devices for their learning.

Social influence and mobile learning acceptance

The results of this study showed a positive and significant relationship between social influence and mobile learning acceptance. Social influence is the level in which users perceive that others expect them to employ the new information tools (Davis et al., 1989; Venkatesh et al., 2003). According to the UTAUT model determinants such as teachers, parents, and peers will fully affect younger students' intention to accept and use mobile devices for academic purposes.

Facility condition and mobile learning acceptance

The results reported in this study show that there is no notable relationship between facility and learning acceptance. However, the results of Teo's (2007) study showed that facilitating the use of mobile technology influenced technology acceptance indirectly.

Effort expectancy and mobile learning acceptance

Effort expectancy is the level of ease individuals feel with the use of technology. The findings of this study indicated that there is a significant and positive relationship between effort expectancy and mobile learning acceptance by pre-service teachers. Subsequently, the result of the multiple regression analysis revealed that the effort expectancy is the most important factor with 12% of the variance in mobile learning acceptance. The results of a similar study by Birch and Irvine (2009) in Canada support the findings from our research.

Pre-service teachers' acceptance and use of mobile devices for learning should have an influence on future curriculum design at the University of Malaysia, as we now know that mobile learning is popular and students will use it. Pre-service teachers' showed that the level of behaviour intention towards using mobile devices for learning was high and that a large percentage of them are familiar with technology and own Internet capable mobile devices meaning that the next step is to design learning resources that are mobile enhanced. However, in the context of pre-service teachers, our study confirms the ability of the UTAUT's independent variables performance expectancy, effort expectancy, social influence, facilitating conditions, and the additional construct attitude toward, anxiety and self-efficacy in predicting pre-service teachers' behavioural intent to use mobile learning the challenge now is to capitalise on that mobile learning enthusiasm.

Implication of Study

In conclusion, the acceptance and use of mobile learning can affect future curriculum design as pre-service teachers can affect how mobile technologies are used and perceived in an educational setting. The researchers recommend further investigating in this area with several different populations and sample size, as there is limited literature

about pre service teachers' acceptance of the use of mobile learning in a Malaysian context.

Conclusion

There is no significant difference in the acceptance of mobile learning based on demographic constituents such as age and gender. According to the multi regression analysis, the effort expectancy factor has significant effect on acceptance use of mobile learning among pre-service teachers. Although in linear regression analysis, it was found that all variables had a significant effect on acceptance and use of mobile learning except for facility condition and anxiety that have not significant effect on depended variable in this study.

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