Proposed Research Model for Students' Acceptance of M-learning Services among Malaysian Higher Education

Naji Shukri Alzaza[1], **Abdul Razak Yaakub**[2]

[1] *College of Arts & Sciences, School of Computing, Universiti Utara Malaysia, najishukri@hotmail.com*
[2] *College of Arts & Sciences, School of Computing, Universiti Utara Malaysia, ary321@uum.edu.my*

ABSTRACT

Mobile learning (m-learning) is considered the next form of e-learning using mobile technologies to facilitate education for teachers and learners anywhere and anytime. Engaging the m-learning services in the Malaysian higher education could improve the availability of education. This study intends to develop a theoretical model for explaining and predicting student acceptance and use of m-learning services in the Malaysian higher education environment. Students' perspective is very important to investigate the use behavior of m-learning in the higher education environment. The proposed research model for students' acceptance of m-learning services is constructed base on literature review. The model expands the belief concept in Technology Acceptance Model (TAM2) and Innovation and Diffusion Theory (IDT) by including five more constructs that are perceived service quality, perceived Trust, facilitating condition, and cost of service. Findings of model's reliability show highly reliable.

Keywords: Mobile Learning Services, Mobile Learning Acceptance Model, e-learning

I. INTRODUCTION

Mobile services, and their internet based, have been widely emerged to daily life since 1999. Mobile technology has been widely used in many areas such as education, health, entertainment, marketing, and banking. The occasional and sustained usage of such services in the higher education environment could encourage students to keep in touch with their education environment. Although the benefit of mobile technology is enormous and it enables learning services to be used anywhere and anytime, the application and adoption of the m-learning services is still need to tackle the obstacles that are preventing students' motivation to use such technology and the university to utilize such technology widely. Furthermore, insufficient research on m-learning adoption results in a lack of a complete view of m-learning adoption (Liu & Han, 2010).

Engaging the m-learning services in the Malaysian higher education environment will improve the availability of education (Alzaza & Yaakub, 2011). This meets the priority of Malaysian higher education strategy to brand the education (Robertson, 2008). Moreover, Robertson (2008) highlighted that the number of international students in Malaysia had increased between 2006 and 2008 by 30 percent. Hence, these motivate researcher to study the students' acceptance of m-learning services in the higher education environment.

II. THEORETICAL FRAMEWORK AND HYPOTHESES

The theoretical constructs pertinent to this study are consumer (student) acceptance, adoption, and behavior prediction. Two of the well-established adoption and intention models, Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT), can help develop a solid theoretical foundation for this study. Williams (2009) concluded that Unified Theory of Acceptance and Use of Technology (UTAUT) model did not provide as much insight into m-learning environment as it had when applied to other technology contexts.

A. Technology Acceptance Model (TAM)

Theory of Reasoned Action (TRA), proposed by Ajzen and Fishbein (1980), is well-established model that has been used broadly to predict and explain human behavior in various domains (Wu & Wang, 2005). Based on TRA (Wu & Wang, 2005), TAM was designed to explain the determinants of user acceptance of a wide range of end-user computing technologies (Davis, 1986).

The original TAM consisted of perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (BI), and actual system use (AU). PU and PEOU are the two most important determinants for system use. The ATU directly

predicts users' BI which determines AU. PEOU refers to the degree to which a user believes that using a particular service would be free of effort while PU is defined as the degree to which an individual perceives that using a particular system would enhance his or her job performance (Davis, 1989). However, PEOU and PU are the key beliefs leading to user acceptance of information technology (Liu & Han, 2010).

Venkatesh and Davis (2000) proposed an extension, TAM2, which included social influence processes (subjective norm, voluntarism, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and PEOU), but it omitted ATU due to weak predictors of either BI or AU.

B. Innovation Diffusion Theory (IDT)

IDT is another well established theory for user adoption; it is proposed by Rogers (1962, 1983, 1995, 2003). Innovation diffusion is achieved through users' acceptance and use of new ideas or things (Zaltman & Stiff, 1973). Rogers (1995) stated that an innovation's relative advantage, compatibility, complexity, triability and observability were found to explain 49 to 87 percent of the variance in the rate of its adoption.

i. *Relative advantage* is the degree to which an innovation is perceived as being better than the idea it replace.

ii. *Compatibility* is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters.

iii. *Complexity* is the degree to which an innovation is perceived as relatively difficult to understand and use. In general, more complex, or less well understood innovations are more difficult to adopt.

iv. *Triability* is the degree to which an innovation may be experimented with on a limited basis. Adoption becomes much easier if adopter can try an innovation on a small scale.

v. *Observability* is the degree to which the results of an innovation are visible to others. The rate of adoption increases with visibility.

These characteristics are used to explain the user adoption and decision making process (Wu & Wang, 2005). However, several researches (Agarwal & Prasa, 1998; Tornatzky & Klein, 1982) have suggested that only relative advantage, compatibility and complexity are

consistently related to the rate of innovation adoption.

C. Combination of Tam2 and IDT Models

Based on TAM and IDT models, the base model for studying student acceptance of m-learning services is displayed in Figure 1. Empirical studies have suggested that TAM be integrated with other acceptance and diffusion theories to improve its predictive and explanatory power (e.g. (Hu, Chau, Sheng, & Tam, 1999; Wu & Wang, 2005)). By including the compatibility (C) construct of IDT, the model is able to address the social context in which m-learning takes place. C is evaluated by assessing the innovation's compatibility with existing values and beliefs, previously introduced ideas, and potential adopters' needs (Rogers, 2003). Like PEOU, C is suspected to have a significant impact on PU. The rationale behind this assumption is that if a student finds using an m-learning service compatible with his or her needs and lifestyle, the student will consider the m-learning services useful.
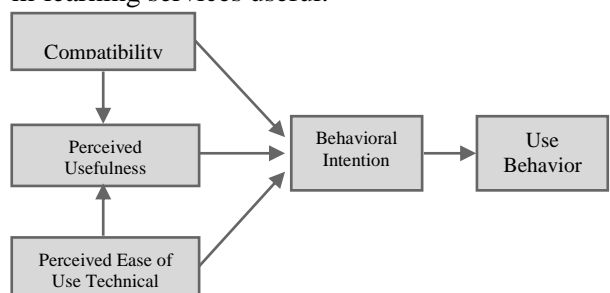

Figure 1. Based Model for Student Acceptance of m-learning

It also needs to be noted that although initial acceptance of an m-learning service is important, the student's continuance in using the m-learning service is equally, if not more, important. As an extension to the TAM research, the number of studies has addressed the important issue of Information System (IS) continuance in the recent few years. Adopting the Expectation-Confirmation theory, Bhattacherjee (2001) empirically proved that the decision of IS continuance was influenced by the user's satisfaction with the IS, which was a direct result of the confirmation or disconfirmation of the user's expectation. By the same token, students who will potentially discontinue using an m-learning service can be identified based on their confirmation/satisfaction and usage level of the m-learning service during the initial adoption.

The strong theoretical and empirical support for TAM and IDT ensures the validity of the base

model in electronic commerce domain; however, the base model possesses a weakness inherited from TAM. While TAM has been very successful in predicting the potential user acceptance, it provides little assistance in the design and development of systems with a high level of acceptance. One remedy for this weakness is to identify the determinants of PU, PEOU, and BI to supply system designers with meaningful solutions (V. Venkatesh & Davis, 1996). These determinants can also be used to help identify the student's confirmation and satisfaction level of an m-learning service, which has significant implications on predicting the student's continuance of usage. Hence, the next step in this study is to identify a list of students' acceptance factors that m-learning services need to focus on. The factors outlined in the next section will be incorporated in the final research model and will be tested for validity.

III. RESEARCH MODEL FACTORS

M-learning needs to tackle the obstacles that are preventing students' motivation to use such technology. This study takes the CSF approach to identify the key areas where things must go right for the m-learning to flourish. Identifying CSFs is a well-accepted practice that allows businesses to focus on a limited number of areas in which satisfactory results ensure successful competitive performance (Digman, 1990).

A. Perceived Service Quality

Perceived service quality is a recurring research issue for IS discipline. Service quality is crucial to its success. Perceived service quality is defined as the discrepancy between what customers (students) expect and what customers (students) get. It is also acknowledged as one of the measures of IS success (Pitt, Watson, & Kavan, 1995). Currently, m-learning courses and products are mostly sold as a kind of education products, such as in USA and China. M-learning users therefore gain a role as consumers as well. For customers perceived quality of products or services impacts customer's intentions to use them. Perceived quality is defined by Zeithaml (1988) as "the consumer's judgment about a product's overall excellence or superiority". Quality research tends to be most important stream of services research.

Service quality has an affects users' acceptance intention. Furthermore, it has a positive causal relationship between the perceived overall service quality and a user's satisfaction towards a web portable (Liu & Han, 2010). Chiu, Hsu, Sun, Lin, and Sun (2005) and Liaw (2008) found that perceived quality is a significant predictor of perceived satisfaction with e-learning.

Gefen and Devine (2001) found that service quality effectively reduces the effects of perceived risk, cost to switch and relative price, thus creates more attention for m-learning usage. However, the quality of m-learning delivered would affect the perceived quality of services as a whole (Liu & Han, 2010).

Therefore, the perceived service quality is an important determinant of students' attitude towards using m-learning.

B. Perceived Trust

A number of studies suggest that the reason why many people have not yet used online services is due to the lack of trust in online businesses (L. Chen, Gillenson, & Sherrell, 2004; D. Gefen, 2000; Hoffman, Novak, & Peralta, 1999). However, user trust can be defined as feeling secure and confidence about relying on service. In the mobile services environment trust get an important factor for user to accept it (Kaasinen, 2007). Moreover, it has a positive influence on the development of positive user intention to use (L. Chen, et al., 2004). Gefen (2000) found that familiarity, which was defined as an understanding of what, why, where, and when other parties do what they do, also contributes to trust in e-commerce situations.

Moreover, Prior research suggested that trust can be built up through interactions. In the context of m-learning, the influencing factors for students' lack of trust in wireless technology are found to be personal information privacy and data security concerns. According to a survey conducted in 1999, privacy is the number-one consumer issue facing the Internet (Benassi, 1999).

However, if m-learning is not able to effectively demonstrate its commitment to superior data security technologies, few students will feel comfortable entrusting the m-learning services with their sensitive information. Information exchange in a trustful environment is an essential part of electronic commerce (L. Chen, et al., 2004). Student trust can only be inspired if the risks associated with wireless connection are reduced to a level that is tolerable to students.

The theory of perceived risk has been applied to explain consumer's behavior in decision making since the 1960s (J. W. Taylor, 1974). The definition of perceived risk has changed since online transactions became popular. In the past, perceived risks were primarily regarded as fraud and product quality. Today, perceived risk refers to certain types of financial, product performance, social, psychological, physical, or time risks when consumers make transactions online (Forsythe & Shi, 2003).

C. Facilitating Condition

Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. This definition captures concepts embodied by three different constructs: perceived behavioral control, facilitating conditions, and compatibility (Viswanath Venkatesh, Morris, Davis, & Davis, 2003). Each of these constructs is operationalized to include aspects of the technological and/or organizational environment that are designed to remove barriers to use. Taylor and Todd (1995) acknowledged the theoretical overlap by modeling facilitating conditions as a core component of perceived behavioral control in Theory of Planned Behavior (TPB)/DTPB. The compatibility construct from IDT incorporates items that tap the fit between the individual's work style and the use of the system in the organization.

The empirical results of Venkatesh *et al.* (2003) study indicated that facilitating conditions do have a direct influence on usage beyond that explained by behavioral intentions alone. Moreover, their study found that there is no significant influence on behavioral intention to use. Consistent with TPB/DTPB, facilitating conditions are also modeled as a direct antecedent of usage.

D. Cost of Service

According to behavioral decision theory, the cost-benefit pattern is significant to both perceived usefulness and ease of use. Chen and Hitt (2002) pointed out that consumers must deal with non-negligible costs in switching between different brands of products or relative services in various markets. Transitioning from wired Electronic Commerce (EC) to MC implies some additional expenses. Equipment costs, access cost, and transaction fees are three important components (Constantinides, 2002)

that make MC use more expensive than wired EC. Furthermore, frustrating experiences, such as slow connections, poor quality, out-of-date content, missing links, and errors have infuriated online users. Unfortunately, consumers must pay for all these frustrations.

Undoubtedly, the anticipation is that these early investments will lead to a long-term stream of profits from loyal customers, and that this will make up for the expense. Otherwise, MC will not thrive because users can obtain the same information or results through alternative solutions (Wu & Wang, 2005).

Khalifa and Shen (2006) investigated the influence of services' price on potential adopters of m-commerce, they noted that m-commerce providers need to pay particular attention to their pricing strategy. Furthermore, Chiu and Wang (2008) found that cost of service has a major influence on students' learning behaviors adoption. Indeed, "adopters of m-commerce are highly sensitive to the issues of cost and privacy" (Khalifa & Shen, 2006).

IV. RESEARCH HYPOTHESES

The five potential CSFs are incorporated with the base model to form the final research model for this study (See Figure 2). This study intends to develop a theoretical model for explaining and predicting student acceptance and use of m-learning services in the higher education environment. The model adopts TAM's and IDT's belief - intention - behavior relationship. It hypothesizes that the use behavior of an m-learning (USE) is immediately determined by a student's behavioral intention to use (BI) (Viswanath Venkatesh, et al., 2003). Based on this, the following hypothesis is proposed:

H1: A student's behavioral intention to use an m-learning service has effect on use behavior of the m-learning services (BI → USE).

As Parthasarathy and Bhattacherjee (1998) found in their research, online service utilization ensured continuance in service adoption. Therefore, both intention to use and actual usage were employed to measure student acceptance of m-learning in this study for these reasons. The model expands the belief concept in TAM and IDT by including five more constructs: perceived service quality (SQ), perceived Trust (T), facilitating condition (FC), and cost of service (CS). The inclusion of perceived service quality represents the service-oriented aspect of m-learning, and the inclusion of perceived Trust

addresses a common concern of students about mobile technology and the Internet in general.
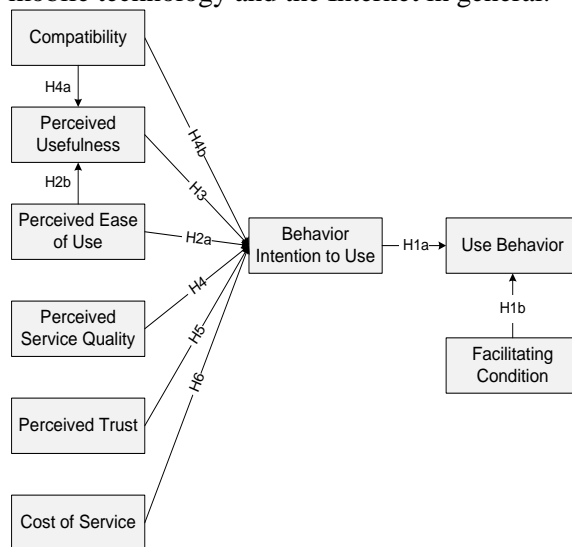

Figure 2. Proposed Research Model for Students' Acceptance of m-learning Services

The model proposes that PU, PEOU, C, SQ, T, FC, and CS form a student's attitude about an m-learning. Based on this, the following hypotheses are proposed:

H2a: A student's perceived ease of use of an m-learning service has a direct effect on behavioral intention to use the m-learning service (PEOU → BI).

H2b: A student's perceived ease of use of an m-learning service has a direct effect on perceived usefulness of the m-learning service (PEOU → PU).

H3: A student's perceived usefulness of an m-learning service has a direct effect on behavioral intention to use the m-learning service (PU → BI).

H4a: The compatibility has a direct effect on perceived usefulness of the m-learning service (C → PU).

H4b: The compatibility has a direct effect on behavioral intention to use the m-learning service (C → BI).

H6: A student's perceived service quality of m-learning service has a direct effect on behavioral intention to use the m-learning service (SQ → BI).

H7: A student's perceived Trust has a direct effect on behavioral intention to use the m-learning service (T → BI).

H8: the facilitating condition of m-learning service has a direct effect on actual use of the m-learning services (FC → USE).

H9: The cost of m-learning service has a direct effect on behavioral intention to use the m-learning service (CS → BI).

V.   METHODOLOGY

The instrument comprises four sections that are general information; using m-learning services; m-learning services acceptance factors; m-learning services. Some of the sections' items were generated from previous research and modified to fit the context of m-learning when necessary. New items were developed through a thorough literature review on the topics. Section A (General Information) was not containing any personal identifiable questions. The general information functions as a mechanism to collect users' demographic data and users' experience and knowledge with the mobile technology media. The general information used in this section is gender, age, education, current study program, own mobile device, mobile devise type, mobile applications experience, wireless connection used, mobile service provider. This section was adapted from Khalifa and Shen (2006), Karim *et al.* (2006), and Walton *et al.* (2005).

Section B contains questions to determine the m-learning services that often use in the higher education environment. The respondents were given a list of nine services that could be available at their universities. Participants were given a chance to add more mobile services that may use, other than the nine listed. A five point Likert scale type was used and students were required to state the extent to which services in their point of view were important or not important for them as students. The scale was started from 1= Lowly to 5= highly. Questions in this section were adapted from Karim *et al.* (2006).

Section C covers nine subsections that include the following: use behavior, behavior intention to use, perceived usefulness, perceived ease of use, compatibility, perceived service quality, perceived trust, cost of service, facilitating condition. All participants' answers for subsection should be based on the m-learning services that they have chosen in section B.

Subsection 1 contains questions that targeted at use behavior of m-learning services in the higher education environment. The respondents were given two questions. The first was whether the participant uses m-learning services frequently. A five point Likert scale type was used for the first question. Second question targeted at how

often use m-learning services. Respondents were given four frequent periods that are daily, weekly, monthly, and a few times a semester, then they asked to report the approximate number of times they used the m-learning services. Although both questions can be used to as alternative measures for usage; Igbaria, Zinatelli, Cragg, and Cavaye (1997) suggested that frequency provided a different perspective of usage from the actual number of times of use, hence they are both employed in this section to measure actual usage. Questions in this subsection were adapted from Chen *et al.* (2004) with modifications to make them suitable for m-learning services context.

Subsection 2 contains questions that targeted at behavioral intention to use m-learning services in the higher education environment. Four items were used to measure the behavioral intention of respondents towards using of m-learning services in their higher education environment. Questions in this subsection were adapted from Venkatesh *et al.* (2003) with modifications to make them suitable for m-learning services context.

Subsection 3 contains questions concerning the perceived usefulness to use m-learning services in the higher education environment. Six items were used to measure the respondents' perception towards usefulness to use m-learning services in their higher education environment. Questions in this subsection were adapted from Davis *et al.* (1989) with modifications to make them suitable for m-learning services context.

Subsection 4 contains questions targeted at the perceived ease of use m-learning services in the higher education environment. Six items were used to measure the respondents' perception that used m-learning services in their higher education environment and found them easy to use. Questions in this dimension were adapted from Davis *et al.* (1989) with modifications to make them suitable for m-learning services context.

Subsection 5 contains questions concerning the facilitating conditions of m-learning services in the higher education environment. Four items were used to measure the respondents' perception towards availability of the facilities needed for actual use of m-learning services in their higher education environment. Questions in this subsection were adapted from Venkatesh *et al.* (2003) with modifications to make them suitable for m-learning services context.

Subsection 6 contains questions targeted at the compatibility of m-learning services in the higher education environment. Three items were used to measure the degree to which using m-learning services is compatible with the most aspects of their education purposes and information seeking; their lifestyles, and their engaging in the higher education environment. Questions in this subsection were adapted from Chen *et al.* (2004) and Moore and Benbasat (1991) with modifications to make them suitable for m-learning services context.

Subsection 7 contains questions targeted at the perceived service quality of m-learning services in the higher education environment. Twelve items were used to measure the performance based of using m-learning services in the higher education environment. This subsection reflects five dimensions with which respondents use to evaluate service quality: tangibles, reliability, responsiveness, assurance, and empathy. Questions in this subsection were adapted from Chen *et al.* (2004) and Cronin and Taylor (1992) with modifications to make them suitable for m-learning services context.

Subsection 8 contains questions targeted at the perceived trust of using m-learning services in the higher education environment. Eight items were used to measure the information privacy aspect of perceived trust of using m-learning services in the higher education environment. This subsection reflects four dimensions of students' information privacy concerns: collection, errors, unauthorized secondary use, and improper access. Questions regarding students' security concerns are included to reflect the data security aspect of trust. Questions in this subsection were adapted from Chen *et al.* (2004) and Smith, Milberg, and Burke (1996) with modifications to make them suitable for m-learning services context.

Subsection 9 contains questions concerning the cost of using m-learning services in the higher education environment. Three items cover the cost of mobile device, access cost, and transaction fees; were used to measure the respondents' perception towards use of m-learning services in their higher education environment. Questions in this subsection were adapted from Wu and Wang (2005) with modifications to make them suitable for m-learning services context.

Section D contains questions to determine the m-learning services that would like to use in the higher education environment. The respondents

were given a list of nine services that may available at their universities. Participants were given a chance to add more mobile services that may use, other than the nine items listed in the questionnaire. A five point Likert scale type was used and students were required to state the extent to which services in their point of view were important or not important for them as students to use. The scale was started from 1= Lowly to 5= highly. Respondents were given a space to register their comments and opinions about m-learning services from their point of view. Questions in this section were adapted from Karim *et al.* (2006).

VI. RELIABILITY AND VALIDITY RESULTS

Most of the items used to measure the variables have been adopted from the literature. Even though the adopted measurements have been confirmed of its discriminate and convergent validity, it is felt necessary to re-examine the validity of these measures. This is because this study is undertaken in the Malaysian context which may be different from other countries. The existing literatures on adoption and diffusion of technology have been done in other countries, particularly in the euro-countries where the environment and culture are entirely different from Malaysia. The questionnaire was pilot tested with 33 students.

The Cronpach's Alphas of the measures were all comfortably above the lower limit of acceptability that is $\alpha >= .7$. Hence, all the measures were highly reliable (see Table 1).

Table 1. Reliability Coefficients for all the variables in the study

Variable	# of items	Reliability
Use Behavior	2	.777
Behavior Intention to Use	4	.918
Perceived Usefulness	6	.920
Perceived Ease of Use	6	.900
Perceived Service Quality	12	.908
Perceived Trust	8	.890
Cost of Service	3	.895
Facilitating Condition	4	.748

VII. CONCLUSION

Nowadays, m-learning services are interesting and very recent addition as a new vital platform for the higher education environment. Nevertheless, Student's perspective is very important to investigate the use behavior of m-

learning in the higher education environment. Combination of education channels and alternatives helps students to be in touch with their educational environment anywhere and anytime.

The present study suggests several factors as important determinants of the behavior intention to use m-learning in the higher education environment. The future work focuses on the hypotheses testing to evaluate the proposed theoretical model among Malaysian higher education students.

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