"Get Ready to Mobile Learning": Examining Factors Affecting College Students' Behavioral Intentions to Use M-Learning in Saudi Arabia

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ABSTRACT

Mobile learning is a new innovation in the educational technology environment which has received a great deal of attention over the last few years. This paper aims at examining the main factors affecting the adoption intention of Mobile Learning (M-Learning) on the basis of the Unified Theory of Acceptance and Use of Technology (UTAUT) given the significance and power of such a theory in the field of Information Systems (IS). To this end, this paper follows a quantitative approach in which a survey questionnaire was developed and utilized as the main instrument for data collection. The questionnaire was distributed to a random sample of 300 undergraduate and postgraduate students in Saudi Arabia and 215 valid questionnaires were received. The results of this research show that Performance Expectancy is the main factor affecting students' adoption intention to use M-Learning in the future. This is followed by Effort Expectancy and Social Influences factors respectively. Nonetheless, the results also show that Facilitating Conditions has no significant effect on the intention to use M-Learning. Further, the findings show that the developed model explains 62.4% of the variance in the adoption intention to use M-Learning. The results of this study are considered fruitful for decision makers in higher education as they reveal important aspects that decision makers need to carefully deliberate when implementing M-Learning solutions.

Keywords: Mobile Learning, (M-Learning), Unified Theory of Acceptance and Use of Technology, UTAUT, Adoption Intention, Saudi Arabia, KSA.

INTRODUCTION

In recent years, the rapid growth of investments in Information and Communication Technologies (ICTs) in Saudi Arabia has led to remarkable changes in people's daily lives. Expenditures on IT infrastructure are expected to grow in the next couple of years (CITC, 2010). The integration of ICT technologies into different aspects of today's societies has become crucial. Mobile devices are one of these technologies that have offered people functionalities exceeding those of desktop computers. The ubiquity of mobile devices and the fast Internet connections have provided people with the advantage of being connected anytime/anywhere. Recent studies have shown that mobile penetration in Saudi Arabia has reached about 186% in 2010 (CITC, 2010). Therefore, mobile devices have become an integral part in the day-to-day life activities of Saudi society and such devices are now utilized in different sectors such as banking, commerce, health and education.

Education is one of the most important areas and has been the subject of a great deal of concern on the part of

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Received on 6/6/2013 and Accepted for Publication on 9/1/2014.

the Saudi government. The government allocated a budget of 154.7 billion dollars for education in 2011 (Allam, 2011). E-learning is one of the Saudi e-government initiatives and has been given a particular focus by the Ministry of Higher Education. The government of Saudi Arabia has been investing heavily in the concept of e-government and the last IT report showed that IT expenditures in Saudi Arabia amounted to 7.2 billion US dollars in 2010 (CITC, 2010). Indeed, education in Saudi Arabian universities has shifted slowly from traditional learning to distance learning (d-learning) and electronic learning (e-learning). However, Mobile Learning (M-Learning) as a new technology is still in its development stage in Saudi Arabia. Therefore, there is a clear need to investigate the adoption of M-Learning from the perspectives of students in higher education for a successful implementation of M-Learning in Saudi Arabia in the future.

Despite the fact that any decision relating to integrating technology into education is often made at a higher level, it is the students' intentions to adopt the new technology that make for a successful implementation. Therefore, knowing how and why individuals adopt new technology has been of interest to many researchers. Moreover, it is essential to understand the reasons why some students adopt a particular technology and reject another (Straub, 2009). Research into technology adoption, in general, has been used to investigate the factors that affect users' intentions to adopt or reject a specific technology. Investigations are usually conducted through the use of adoption models to design a model/framework that helps in identifying the factors that influence users' adoption of any new innovative technology. Such theories have been widely used in developing adoption models or frameworks for different technologies such as e-banking, e-health, e-commerce, m-banking and e-learning. Yet, there is no one particular comprehensive model/framework that has been developed for M-Learning from the learners' perspective. Kennedy et al. (2008) stated that "If universities are serious about enhancing learning through the use of innovative technologies, much needs to be done to demonstrate how this might take place". Clearly, strategies for adopting e-learning represent a major issue for educational institutions (Keegan, 2003). Therefore, this research aims to investigate the key factors that influence students' adoption of M-Learning in the Arab countries, specifically in Saudi Arabia. To fulfill the aim of this study, this paper employed the Unified Theory of Acceptance and Use of Technology (UTAUT). The aim of this study is deemed significant as we believe that the results of this study would help decision makers in formulating successful strategies for M-Learning adoption.

The remaining of this paper is organized as follows. The next section discusses reviews from relevant literature about M-Learning definitions, advantages, and limitations. The second part of the literature review section presents previous research in the domain of M-Learning adoption. This is followed by the research model and hypotheses. Section 4 describes the research method employed in this study. Data analysis and results are presented in section 5, while in section 6 we discuss the results along with their implications. Finally, in Section 7, the conclusions of this research are presented and future research avenues are offered.

2. Literature Review

2.1. Background: Mobile Learning

A necessary starting point is admitting that M-Learning has no universally common definition (Kukulska-Hulme, 2009) despite the fact that there are some attempts to define this new concept. For example, Quinn (2000) simply defined M-Learning as e-learning through mobile devices. Sharples (2006) agrees with this definition and defines M-Learning as an extension of e-

learning. In line with that, Traxler (2005) defines M-Learning as "any educational provision where the sole or dominant technologies are handheld or palmtop devices". M-Learning has not just been defined from a technological perspective, but also it has been looked at from a pedagogical perspective. For example, O'Malley et al. (2005) viewed M-Learning as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies". The e-learning guild (2007) also defines M-Learning as "any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediated through a compact digital portable device that the individual carries on a regular basis, has reliable connectivity, and fits in a pocket or purse". Based on the above discussion, we can simply define M-Learning as a new learning delivery mode which enhances the way that content is offered to students through the use of mobile technologies.

Indeed, M-Learning offers important benefits and advantages to the learning process. M-Learning helps to improve learners' literacy and numeracy skills as it encourages both independent and collaborative learning experiences. M-Learning can also be used to determine areas where learners need help and support. Further, M-Learning helps to break down resistance to the use of ICT and can help bridge the gap between mobile phone literacy and ICT literacy. Mobile technologies in teaching and learning offer mobility features for individuals to share ideas and access information from anyplace using any portable learning devices (Seppälä and Alamäki, 2003; Rosman, 2008). Using mobile technologies in education contributes to collaboration and communication of practice (Stead, 2005). Similarly, Barke et al. (2005) highlight the value of learning through mobile technologies such as their impact on motivation, communication, social interaction, collaboration, and mobility. Several authors have looked at the effects of mobile phone features such as the convenience of portability instead of students having to carry heavy resources and text books to facilitate learning and communication (Naismith et al., 2006; Rosman, 2008). Mobile phones are personal as well as shared technologies, which offer rich potential for both individual and collaborative learning (Naismith et al., 2006). Mobile technologies can also reduce the physical distance between learners and teachers and thus enhance communication and learning (Fozdar and Kumar, 2007). In addition, mobile technologies improve the educational activities such as note taking, collaborative simulations and access to e-books (Rosman, 2008). Mobile technologies have the ability to support effective face-to-face communication in a formal learning environment, and moreover to offer such management applications to improve an individual's organizing skills in learning (Park, 2011). The learners and teachers with mobile devices would not be restricted to wire-based communication in the mobile learning environment (Huang et al., 2008).

Yet, M-Learning still has several limitations and drawbacks. Mobile technologies have encountered usability problems (Park, 2011). Kukulska-Hulme (2009) classify these problems into four groups including physical attributes, software application limitations, network connection, and physical environmental issues such as: small screen size, not enough memory, short battery life, difficulty of adding applications, lack of built-in functions, the different usage between application and circumstances, lack of user competence, speed and reliability network and problems with using mobile devices outdoors such as when it is raining, screen brightness, privacy and

personal security, possible radiation from devices using radio frequencies. Rosman (2008) adds input capabilities, limited processing power, smaller screen size as examples of such quite traditional challenges of M-Learning devices. Several authors hold the view that screen size, battery life, the fact that the power of an embedded web browser is not adequate or that the software does not integrate well are main limitations of M-Learning (Huang et al., 2008). Mobile technologies also have some limitations in the classroom such as the opportunities they provide for cheating and the interruption of lessons (Rosman, 2008). M-Learning therefore has both pedagogical considerations and technological limitations (Park, 2011). Considering the course suitability to M-Learning is the main pedagogical issue (Keegan, 2003). The high cost of owning such higher end mobile technologies is the main problem in developing countries which works to limit its popularity (Fozdar and Kumar, 2007).

2.2. Related Work: M-Learning Adoption

M-Learning became the focus of interest in the early 2000s and the need for studying M-Learning adoption has become correspondingly keener. Indeed, there is a huge bank of research in the field of IS that examines the adoption of novel technologies. Often, the main aim of such studies is to explore the influential factors on human behavior when it comes to technology acceptance and use. For their investigations, researchers usually employ well-established adoption models and theories as theoretical and conceptual bases. This includes Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), Technology Acceptance model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), Diffusion of Innovation (DOI) (Rogers, 2003), and Theory of Planned Behavior (TPB) (Ajzen, 1991).

It is evident in the related literature that only a paucity of research into M-Learning adoption can be found. One exception is the study of Haung et al. (2007) which integrates TAM with perceived enjoyment from the motivational model and perceived mobility value as an external variable of perceived usefulness to explain and predict the acceptance of M-Learning using data collected from students in two universities in Taiwan. The findings show that perceived usefulness and perceived ease of use positively and significantly influence students' attitude towards M-Learning and in turn Attitude positively and significantly affects intentions to use M-Learning. Results also indicate that individual differences have a great impact on user acceptance and that the perceived enjoyment and perceived mobility can predict user intentions of using M-Learning. Further and also built on TAM, Liu et al. (2010) developed a conceptual model to examine factors affecting the adoption intention of M-Learning. Their findings indicate that perceived usefulness and personal innovativeness have significant influence on M-Learning adoption intention. They have also found that personal innovativeness is a predictor of both the perceived ease of use and perceived usefulness. By extending TAM but through the inclusion of subjective norm and individual differences, Wei-Han Tan (2011) developed a conceptual model to examine factors affecting the adoption intention of M-Learning in Malaysia. Their results indicate that perceived usefulness, perceived ease of use, and subjective norm are positively associated with intention to adopt mobile learning. Further, gender factor did not show significant effect on intention towards mobile learning usage in their study. Also by extending TAM through including M-Learning self-efficacy, relevance for students' major, system accessibility, and subjective norm, Park et al. (2012) developed a conceptual model and collected data from

288 students in one Korean university to explore the factors affecting the adoption intention of M-Learning. Their results indicate that M-Learning students' attitude was the most important construct in explaining the causal process in the model, followed by relevance for students' major and subjective norm, respectively.

On the other hand and based on UTAUT, Wang et al. (2009) investigated the determinants of M-Learning acceptance. Facilitating conditions was not considered in their model, but perceived playfulness and self-management of learning were both included to extend UTAUT. The study also aimed to discover if there exist either age or gender differences in the acceptance of M-Learning, or both. Their findings indicate that performance expectancy, effort expectancy, social influence, perceived playfulness, and self-management of learning were all significant determinants of behavioral intention to use M-Learning. They also found that age differences moderate the effects of effort expectancy and social influence on M-Learning use intention, and that gender differences moderate the effects of social influence and self-management of learning on M-Learning use intention. Also built on UTAUT, Jairak et al. (2009) aimed to assess the acceptance of M-Learning in higher education in Thailand. Their results indicate that only effort expectancy and social influences affect students' intention to use M-Learning. They have also found that performance expectancy, effort expectancy and social influences affect students' attitude towards M-Learning which in turns affects their adoption intention. Recently and on the basis of the theory of Planned Behavior (TPB), Cheon et al. (2012) investigated the readiness of students to use mobile learning in higher education using a sample of 177 college students in USA. A decomposed conceptual model was developed and structural equation modeling techniques were utilized for data analysis. The results indicate that attitude, subjective norm, and perceived behavioral control positively influence students' intention to use M-Learning in higher education.

The above review reveals that the number of studies tackling the adoption of M-Learning is relatively small and especially in developing countries. It is also clear that the majority of the previous studies utilized TAM as a foundational model and little research has employed UTAUT, TPB, or any other related theory in the context of technology adoption and diffusion of M-Learning. Thus, the current study is expected to contribute heavily to the existing body of knowledge given that UTAUT model is utilized to examine the adoption of an emergent technology; i.e., M-Learning in a developing country.

3. Research Model and Hypotheses Development

To examine the factors affecting the adoption intention of M-Learning, the Unified Theory of Acceptance and Use of Technology (UTAUT) is utilized in this study. UTAUT is a comprehensive model that was developed by Venkatesh et al. (2003). The model aims to explain users' acceptance and usage of technology. UTAUT was actually developed by integrating eight models in the domain of technology adoption, acceptance, and diffusion: TRA, TAM, Motivational Model (MM), TPB, The Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Diffusion of Theory (DOT) and Social Cognitive Theory (SCT). The UTAUT model consists of four main determinants of intention and usage of technology: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Moreover, the model takes into consideration the moderating effects of gender, age, experience, and voluntariness of use in relation to the four main determinants. According to Venkatesh et al. (2003), Performance Expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance". Effort Expectancy is defined as "the degree of ease associated with the use of the system". Social Influence is defined as

"the degree to which an individual perceives that important others believe he or she should use the new system". Facilitating Conditions is defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system". Moreover, behavioral intention, in the context of this study, can be described as the willingness and motivations of college students to use mobile learning technologies.

UTAUT is considered to be one of the latest models in the theory of technology acceptance. This model was proposed as a theoretical advancement over the existing adoption and diffusion theories (Dwivedi et al., 2011). As mentioned earlier, this model synthesized elements across eight well-known technology acceptance models to achieve a unified view of user acceptance (Venkatesh et al., 2003). In addition, since its original publication in 2003, researchers are increasingly employing UTAUT to explain IS/IT adoption and diffusion in general (e.g. Al-Gahtani et al., 2007; Anderson et al., 2006; Carlsson et al., 2006; Venkatesh et al., 2012). Indeed, the UTAUT model has been used to explain the factors affecting the adoption of different technologies such as mobile services and devices adoption (e.g. Al-Hujran and Migdadi, 2013; Knutsen, 2005; Park et al., 2007), e-government adoption (e.g. AlAwadhi and Morris, 2008; Carter et al., 2012; Gupta et al., 2008), and rarely in the M-Learning context (Wang et al., 2009). However, as UTAUT was originally developed to explain employee technology acceptance and use in the organizational context, it is important to explore how it can be extended to other contexts such as M-Learning where the use of technology is voluntary (Venkatesh et al., 2012). The comprehensiveness, reliability and validity of the UTAUT have encouraged us to validate this model in the context of M-Learning in a developing country. The model used for this study is presented in Figure (1).

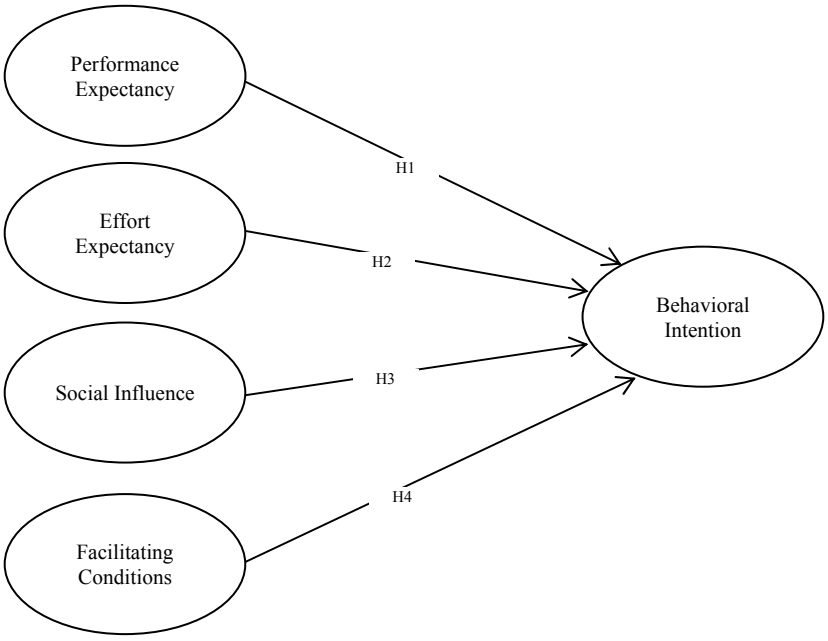

Figure 1. Research Model

Note: (Dependent Variable: Behavioral Intention to use M-Learning)

As pointed out earlier, UTAUT postulates that four core constructs (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) are influencing users' acceptance and usage behavior. This study adapts these constructs and definitions from Venkatesh et al. (2012) to the M-Learning acceptance and use context. In this study, performance expectancy is defined as the degree to which the use of M-Learning services will provide benefits to students in performing learning activities; effort expectancy is the degree of ease associated with students use of M-Learning services; social influence is the extent to which students perceive that important others (e.g., faculty members, family, and friends) believe that they should use M-Learning services; and facilitating conditions construct refers to students' perceptions of the resources and support available to them in using M-Learning services.

Generally speaking, before adopting or using any technology, users need to build their behavioral intentions (Datta, 2011). This study, therefore, has examined the influence of the core UTAUT constructs on students behavioral intention to use M-Learning services and has not considered the usage behavior construct at this stage. In addition, as illustrated in Figure (1), in the original UTAUT, a facilitating conditions construct is hypothesized to directly influence the technology use in an organizational context. However, in the consumer context, which is similar to the context of this study, Venkatesh et al. (2012) argued that facilitating conditions will act more like perceived behavioral control in the theory of planned behavior (TPB) and will influence the usage behavior and behavioral intention (e.g., Al-Debei et al., 2013). Recently and based on UTAUT, some studies found a significant relationship between facilitating conditions and behavioral intention (Dwivedi et al., 2011). Thus, in this study we follow this assumption and hypothesize that facilitating conditions directly and positively influences behavioral intention.

Based on the above discussion and the assumptions of the original UTAUT, the following hypotheses are proposed in this study:

H1. Performance expectancy positively and significantly influences behavioral intentions to use M-Learning.

H2. Effort expectancy positively and significantly influences behavioral intentions to use M-Learning.

H3. Social influence positively and significantly influences behavioral intentions to use M-Learning.

H4. Facilitating conditions positively and significantly influences behavioral intentions to use M-Learning.

4. Research Methodology

4.1. Data Collection and Measurement Scales

This is a quantitative study that utilized the survey questionnaire as the main instrument for data collection. Hence, a self-completion, well-structured questionnaire was developed based on previous literature and was then distributed to a random sample and participation was completely voluntary. To get the random sample, one of the researchers of this study obtained a list of classes for both undergraduate and postgraduate levels from the registration department at Al-Faisal University in Saudi Arabia, Abha given that he was working there as a faculty member. Then, a number of these classes were chosen randomly so as to distribute the survey questionnaire. Indeed, random sampling is a useful method to get unbiased results (Hair et al., 2006). A total of 300 questionnaires were randomly distributed to both undergraduate and postgraduate students, and 219 questionnaires were returned. Thus, the response rate was

(73%). Amongst the 219 returned questionnaires, only four questionnaires were excluded due to multiple skipped questions and missing values. In total, 215 responses (n = 215) were valid and usable for data analysis.

Given that M-Learning is new in the context of Saudi Arabia, respondents to this questionnaire can be characterized as potential early adopters of this innovation. The constructs of interest in this study are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), and Behavioral Intention (BI). The developed questionnaire in this study adapted validated questionnaire items from previous literature. The items to measure these constructs were adopted from Venkatesh et al. (2003) and Venkatesh et al. (2012). All items were measured using a five-point Likert-type scale, ranging from "strongly agree" to "strongly disagree". Table (1) lists the questionnaire items.

Table1.Summary of Measurement Scales

Construct	Item	
Behavioral Intention (BI)	BI1	I intend to use M-Learning in the future.
	BI2	I expect that I would use M-Learning in the future.
	BI3	I plan to use M-Learning in the future
Performance Expectancy (PE)	PE1	I find M-Learning services useful in my daily life.
	PE2	Using M-Learning services increases my chances of achieving things that are important to me.
	PE3	Using M-Learning services help me accomplish things more quickly.
	PE4	Using M-Learning to access educational resources increases my productivity (e.g. find information within shortest time frame).
	PE5	I find M-Learning useful in my daily life.
Effort Expectancy (EE)	EE1	Learning how to use M-Learning is easy for me.
	EE2	My interaction with M-Learning is clear and understandable.
	EE3	I find M-Learning easy to use.
	EE4	It is easy for me to become skillful at using M-Learning.
Social Influence (SI)	SI1	People who are important to me think that I should use M-Learning.
	SI2	People who influence my behavior think that I should use M-Learning.
	SI3	People whose opinions that I value prefer that I use M-Learning.
Facilitating Conditions (FC)	FC1	I have the resources necessary to use M-Learning.
	FC2	I have the knowledge necessary to use M-Learning.
	FC3	M-Learning is compatible with other technologies I use.
	FC4	I can get help from others when I have difficulties using M-Learning.

4.2. Sample Profile

The descriptive statistics of the sample showed that 48.4% of the respondents were male and 51.6% were female. Respondents aged between 18-24 years formed the largest age group and represented 43.72% of the sample, whilst respondents aged between 25-30 years represented 35.35% of the sample. Also, 15.35% of the respondents aged between 31-35 years. Respondents aged between 36-40 years represented only 4.18% of the sample. Finally, 1.40% of the respondents aged above 40 years. In terms of their education, the majority respondents (i.e., 75.35%) are pursuing their undergraduate degrees, whilst those pursing their postgraduate degrees represented only 24.65% of the sample. The details are shown in Table (2).

Table 2. The Sample's Profile

Measure	Item	Frequency	Percentage (%)
Gender	Male	104	48.4
	Female	111	51.6
Age	18-24	94	43.72
	25-30	76	35.35
	31-35	33	15.35
	36-40	9	4.18
	Above 40	3	1.40
Education	Undergraduate	162	75.35
	Postgraduate	53	24.65

5. Results of the Study

5.1. Reliability and Validity

Prior distributing the questionnaire instrument, the questionnaire was validated by three colleagues who are experts in the domain of mobile technologies and electronic learning. Additionally, four students (two pursing undergraduate degrees and two pursing their postgraduate degrees) were asked to fill the questionnaire as a pilot study. Students were asked to give comments on the clarity of terminologies, format of the questionnaire along with its simplicity and length. In addition to these two issues, experts were also asked to give comments on the accuracy and ability of questions and items to measure the constructs included in the study. Experts were also asked to provide comments about the research model and the overall study. Both experts and students offered important comments and suggestions and stressed on the importance of such a study in this period of time. The questionnaire in its final form was updated and revised following the comments and suggestions that we received from experts and students. Thus, content validity is established in this research. As for reliability and internal consistency of measurement scales, Cronbach's Alpha (α) measure was used. The Cronbach's Alpha of all scales included in this study ranged between 0.83 and 0.92; which indicate good reliabilities of the scales (Hair et al., 2006). Hence, both content validity and reliability are satisfactorily met in this study (See Table 3).

Table 3. Reliabilities, Means, and Standard Deviations

Construct	Cronbach's Alpha (α)	Mean	Standard Deviation
Performance Expectancy (PE)	0.90	3.7250	1.01199
Effort Expectancy (EE)	0.92	3.7700	1.02261
Social Influence (SI)	0.83	3.8512	1.04099
Facilitating Conditions (FC)	0.84	3.5469	0.87269
Behavioral Intention (BI)	0.92	3.8133	1.04662

5.2. Normality Test

Data should be normally distributed in order to run regression analyses successfully. To make sure that such a prerequisite for regression analyses is satisfactorily met, Jarque-Bera (i.e. Skewness-Kurtosis) test was employed. A value that is ranged between ±2.58 at ($p \leq 0.01$) for each of Skewness and Kurtosis is considered acceptable to ensure that data is normally distributed using Jarque-Bera test (Hair et al., 2006). The results obtained from Jarque-Bera test (see Table 4) confirmed that all constructs are normally distributed as Skewness-Kurtosis values were all found to be ranged within the acceptable limits (i.e. ±2.58). Hence, normality is assured as a prerequisite for regression analyses.

Table 4. Normality Test

Construct	Skewness	Kurtosis
Performance Expectancy (PE)	-0.551	-0.405
Effort Expectancy (EE)	-0.477	-0.699
Social Influence (SI)	-0.824	-0.193
Facilitating Conditions (FC)	-0.356	-0.296
Behavioral Intention (BI)	-0.544	-0.602

*Significant at ($p \leq 0.05$)

5.3. Multicollinearity Test

Testing for multicollinearity is significant given that constructs with high collinearity pose a problem to regression analyses. Indeed, there should not be a significant level of multicollinearity amongst the constructs included in the study so as to run regression analyses successfully. Multicollinearity can be measured using Variance Inflation Rate (VIF) and Tolerance values. To make sure that multicollinearity is not a likely threat to regression analyses, the VIF value for each construct needs to be lower than 5 and its Tolerance value should be greater than 0.20 (Hair et al., 2006). As shown in Table (5), the VIF values for all constructs are below 5 and their corresponding Tolerance values exceed the limit of 0.20 and thus multicollinearity is not a likely threat to the parameter estimates in this study.

Table 5.Multicollinearity Test

Construct	VIF	Tolerance
Performance Expectancy (PE)	2.805	0.357
Effort Expectancy (EE)	2.491	0.401
Social Influence (SI)	2.437	0.410
Facilitating Conditions (FC)	2.510	0.398
Behavioral Intention (BI)	2.731	0.366

5.4. Correlation Analysis

Bivariate Pearson Correlation analysis was conducted to test for both convergent validity and discriminant validity. As shown in Table (6), the values of Average Variance Extracted (AVE) are all above 0.50. This means that a good convergent validity is obtained (Fornell and Larcker, 1981). Moreover and as shown in Table (6), each construct's AVE is larger than the squared correlation between each pair of constructs and thus discriminant validity is assured (Fornell and Larcker, 1981).

Table 6. Convergent and Discriminant Validity

Constructs	PE	EE	SI	FC	BI
PE	1.00				
EE	0.742**	1.00			
SI	0.653**	0.646**	1.00		
FC	0.689**	0.617**	0.736**	1.00	
BI	0.743**	0.709**	0.657**	0.618**	1.00

** Correlation is significant at p≤0.01

5.5. Hypotheses Testing

After making sure that all required prerequisites are satisfactorily met, regression analyses can be run successfully and there is no need to use non-parametric tests. We first employed a multiple regression analysis in which all independent variables (i.e. Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions) were regressed on the dependent variable (i.e. Behavioral Intention).

Table 7. Multiple Regression Analysis

R^2	Adjusted R^2	F Value	P Value
0.634	0.624	62.751	0.000***

***Significant at p≤0.001

Dependent Variable: **Behavioral Intention to use M-Learning**

The results, showed in Table (7), indicate that Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions altogether explain about 62.4% of the difference in the intention to use M-Learning in the future. The F Value is equal to (62.751) and hence is significant at (p≤0.05) and this assures that there is a relationship between the independent variables and the dependent one. As in Figure 2, it was found that "Performance Expectancy" ($\beta = 0.380$, $p \leq 0.001$), "Effort Expectancy" ($\beta = 0.269$, $p \leq 0.001$) and, "Social Influence" ($\beta = 0.202$, $p \leq 0.01$) are significantly and positively related to "Behavioral Intention" of M-Learning (Adjusted $R^2 = 0.624$). Thus, H1, H2, and H3 are supported. However, results show that "Facilitating Conditions" ($\beta = 0.046$) is not significant at $p \leq 0.001$, $p \leq 0.01$, or $p \leq 0.05$ levels. Hence, H4 is not supported.

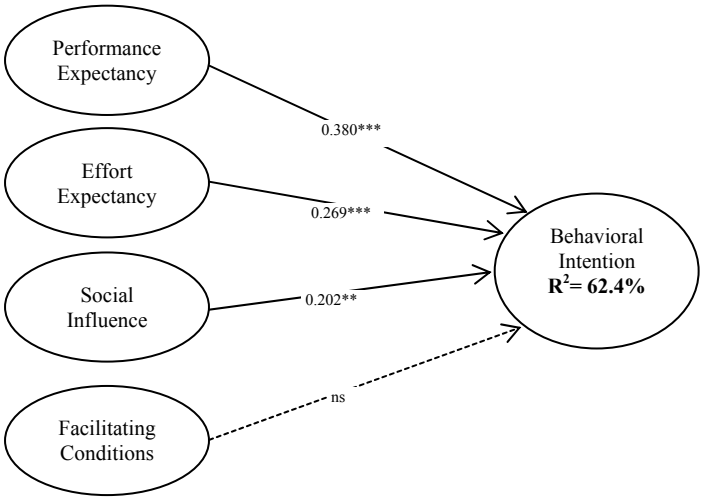

Figure 2. Research Results
** $p \leq 0.01$; *** $p \leq 0.001$; ns = not significant

We also utilized the stepwise multiple regression to determine the degree of importance of each independent variable in the regression model in explaining behavioral intention to use M-Learning in the future. As shown in Table 8, Performance Expectancy came first and explains 54.9% of the difference in the behavioral intention to use M-Learning in the future. Effort Expectancy was second in rank and explains together with Performance Expectancy about 60.2% of the difference in the behavioral intention to use M-Learning in the future. Social Influences was the last in rank and explains together with Performance Expectancy and Effort Expectancy about 62.5% of the difference in the behavioral intention to use M-Learning in the future. Facilitating Conditions was excluded from the stepwise regression analysis as it was not found to be significant in the former multiple regression analysis as shown in Table (7).

Table 8. Stepwise Multiple Regression Analysis

Order of Constructs in the Regression Model	Adjusted R^2	F Value	T Value	Beta	P Value
Performance Expectancy	0.549	182.109	4.980	0.396	0.000***
Effort Expectancy	0.602	113.773	3.450	0.272	0.001***
Social Influences	0.625	83.945	3.185	0.222	0.002**

***Significant at p≤0.001, ** Significant at p≤0.01

Dependent Variable: **Behavioral Intention to use M-Learning**

6. Discussion and Implications

This study investigated the factors affecting students' intention to use M-Learning on the basis of UTAUT—a well-known theory that has been broadly used to predict and explain user behavior in various domains. The main theoretical contribution of this work is in using the UTAUT model for the M-Learning context. This will extend the generalizability of UTAUT from an organizational context, where the use of technology is almost mandatory, to such a voluntary setting; i.e. students' adoption of M-Learning. In the organizational context, the intention to use is mainly formed based on performance considerations. However, in voluntary settings such as the context of this study, other drivers come into play (Venkatesh et al., 2012).

The empirical test of the model supports its validity in the M-Learning context. As Figure (2) illustrates, except for H4, all other hypotheses were significantly supported. Consistent with previous UTAUT literature (e.g., Chong et al., 2011; Carlsson et al., 2006; Iqbal and Qureshi, 2012; Nassuora, 2012; Venkatesh et al., 2012; Venkatesh et al., 2003), the findings of this study provided evidence that the UTAUT construct for performance expectancy (i.e. the expected benefits gained by using M-Learning) has a significant positive influence on the behavioral intention to use of M-Learning. As shown in Figure (2), the standardized coefficient (Beta value) for the performance expectancy is positive and significant ($\beta = 0.380$, $p \leq 0.001$). There is no surprise that the awareness about the expected benefits of using M-Learning such as convenience, efficient communication, and cost & time reduction have a significant impact on students' intentions to use the system. This result suggests that when educational institutions, such as universities, design and develop their M-Learning systems, they need to consider students expectations of M-Learning. In other words, they should develop their M-Learning services based on students' suggestions, to better meet their performance expectations. In addition, the content of M-Learning

should be compatible with different mobile devices along with their operating systems (Wang et al., 2009). Moreover, educational institutions should increase students' awareness about the expected benefits and advantages of using M-Learning systems.

The effect of effort expectancy on intention to use M-Learning was very similar to performance expectancy. Effort expectancy, which is similar to the ease of use construct in TAM, remains a significant and a strong predictor of behavioral intention to use M-Learning. As shown in Figure 2, the standardized coefficient (Beta value) for the Effort expectancy is positive and significant ($\beta = 0.269$, $p \leq 0.001$). Our findings support the existing literature on the topic that a system's ease of use has a direct influence on its level of usage (Chong et al., 2011; Carlsson et al., 2006; Iqbal and Qureshi, 2012; Nassuora, 2012; Venkatesh et al., 2012; Venkatesh et al., 2003). The intentions of students to use M-Learning services will therefore be negatively affected if the services are perceived to be too complicated and difficult to understand. If the use of M-Learning requires high physical and/or mental efforts, users may be discouraged from adopting the system. Thus, it is important for M-Learning providers to make a concerted effort to develop M-Learning systems that are friendly and easy to use. This indeed includes aspects related to interface design and navigation as well as input and output tools. This is particularly important when it comes to M-Learning given the acknowledged limitations in terms of screen size and processing power of mobile devices.

Consistent with recent research (e.g. Jairak et al., 2009; Wei-Han Tan et al., 2012; Venkatesh et al., 2012; Zhou and Wang, 2010), the findings of this study revealed that social influence positively influences student intention to use M-Learning systems. As Figure 2 illustrates, the standardized coefficient (Beta value) for the social influence is positive and significant ($\beta = 0.202$, $p \leq 0.01$). The use of M-Learning by faculty and peers can demonstrate its usefulness, ease of use, and can positively affect students' intention to use M-Learning (Donaldson, 2011). This implies that M-Learning service providers need to pay more attention to the effect of social influences. Thus, educational institutions should take advantage of earlier adopters of M-Learning systems, whose reviews and opinions may create positive word-of-mouth effects on the behavior of others and then attract more users (Zhou and Wang, 2010). If the surrounded environment is encouraging, students will feel more positive in trying out this new technology (Wei-Han Tan et al., 2012).

In this study, facilitating conditions construct did not have a significant direct effect on intention to use M-Learning. The positive but insignificant impact of facilitating conditions on behavioral intention was not surprising as literature shows inconsistent findings in regards to the impact of facilitating conditions on the adoption of technology as reported in the meta-analysis conducted by Dwivedi et al. (2011). The construct of facilitating conditions was originally suggested by Venkatesh et al. (2003) to be a primary predictor of actual usage and not behavioral intention. The idea is that facilitating conditions in terms of access, infrastructure, training, technical support, and other related issues would mainly affect the nature, type, and frequency of use and not the behavioral intentions of users. Previous studies indicated that in the context of developing countries, the influence of facilitating conditions on technology adoption is not direct (Datta, 2011). This is because, as it is well established in the literature, users of technology in developing countries are considered late adopters of innovative technologies such as M-Learning, whereas their opponents in the developed countries are considered early adopters of

technological innovations. However, we believe it is worthwhile investigating the impact of facilitating conditions on behavioral intention as some previous research has found such a relationship to be positive and significant (e.g. Carter et al., 2012) although it is in disparity with the original UTAUT model developed by Venkatesh et al. (2003). Hence, further investigations regarding the impact of facilitating conditions on behavioral intentions are vastly needed given the mixed results of such a relationship in the literature.

7. Conclusions and Future Research

Integrating mobile technologies with learning and education processes is referred to as Mobile Learning (M-Learning). M-Learning is still considered as a new technological innovation worldwide. In some developing countries, like Saudi Arabia, where expenditures on IT infrastructure is huge, the idea of utilizing mobile technologies in education is not very far from reality. However, before such a technology is implemented, there is a pertinent need to supply decision makers in higher education with important details that would facilitate the implementation process and makes M-Learning a success. Thus, this study aimed at exploring the factors affecting the adoption intention of M-Learning. Prior knowledge about these factors would help decision makers in allocating resources to aspects those deemed highly relevant in encouraging students and others to adopt and use M-Learning solutions in the future.

On the basis of the Unified Theory of Acceptance and Use of Technology (UTAUT) and following a quantitative approach, important results have been reached in this study. It was found that performance expectancy is a direct predictor and an influential factor of adoption intention of M-Learning. The more M-Learning is perceived as a way in which students can improve their academic performance, the more are the students who are willing to adopt this technology. Another factor that was also found to be influential in this context is effort expectancy. This means that if students perceive M-Learning solutions as user-friendly, easy to be used, and free of effort, then their adoption intentions to use this technology would be greater. The construct of social influences was also found to have a positive significant impact on the adoption intention to use M-Learning. Accordingly, if the surrounded environment is encouraging (e.g. peers and faculty members), students will feel more positive in trying out M-Learning. On the other hand and in the context of this study, the construct of facilitating conditions was not found to have a significant impact on the adoption intention of M-Learning.

Indeed, this study does not come without limitations. This study focused only on students pursuing their undergraduate and postgraduate degrees. Other research that takes into consideration the views of faculty members is encouraged. The study is also limited in terms of sample as it only covers Al-Faisal University in Saudi Arabia, Abha. Hence, replicating such a study in other countries would be very fruitful in improving the generalizability of our findings. Further, examining the phenomenon of M-Learning from other perspectives by utilizing other theories such as Decomposed Theory of Planned Behavior (TPB) or by extending the original UTAUT theory with other important factors such as privacy, security, and culture would contribute to the existing body of knowledge in this domain. Examining the role those demographic variables (such as age and gender) can play in moderating the relationships between the independent variables and the dependent one (those shown previously in Figure 1) would also be fruitful and useful.

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الاستعداد للتعلم الإلكتروني باستخدام الأجهزة النقالة: العوامل المؤثرة في نية طلاب الجامعات لاستخدام التعلم الإلكتروني في المملكة العربية السعودية

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ملخص

يعد التعلم الإلكتروني باستخدام الأجهزة النقالة طفرة جديدة في وسط تكنولوجيا التعليم؛ مما جعلها محط انتباه الجامعات والمؤسسات الأكاديمية في السنوات الأخيرة. ويهدف هذا البحث إلى إختبار العوامل الأساسية التي تؤثر في نية استخدام التعلم الإلكتروني باستخدام الأجهزة النقالة على أساس النظرية الموحدة للقبول واستخدام التكنولوجيا، واهمية هذه النظرية في مجال انظمة المعلومات. ولخدمة هذه الغاية تم وضع استبانة واعتمدت اداة أساسية لجمع المعلومات، وتم توزيعها واعتمادها اداة على عينة عشوائية مكونة من 300 من طلبة البكالوريوس وطلبة الدراسات العليا في المملكة العربية السعودية. تم تعبئة واستلام 215 نسخة قابلة للتحليل في هذه الدراسة. اظهرت النتائج أن عامل تحسين الاداء هو الاكثر تأثيرا على استخدام الطالب للتعلم الإلكتروني باستخدام الأجهزة النقالة في المستقبل وبعد ذلك يأتي عاملان هما: سهولة الاستخدام والتأثيرات الاجتماعية. والتسهيلات المتاحة ليست لها اثر ذو دلالة احصائية في استخدام التعلم الإلكتروني باستخدام الأجهزة النقالة، بالإضافة إلى أن النموذج المطور فسر ما نسبته 62.4% في نية استخدام التعلم الإلكتروني باستخدام الأجهزة النقالة لدى طلبة الجامعات. تعد نتائج هذه الدراسة مفيدة وذات أهمية بالنسبة للمسؤولين وصناع القرار في التعليم العالي، إذ إنها تكشف عن الجوانب التي يحتاج صناع القرار مراعاتها خلال تطبيق التعلم الإلكتروني باستخدام الأجهزة النقالة.

الكلمات الدالة: التعلم الإلكتروني باستخدام الأجهزة النقالة، النظرية الموحدة للقبول واستخدام التكنولوجيا، نية الاستخدام، المملكة العربية السعودية.

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تاريخ استلام البحث 2013/6/6، وتاريخ قبوله 2014/1/9.