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Towards Acceptance M-Learning Approach in Higher Education in Saudi Arabia

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Abstract

Mobile learning (m-learning) is one of the most critical technological environment of distance learning in higher education institutes. The m-learning provides a widespread access to mobile devices networks and the possibility to learn regardless of time and place, unlike other learning services that depend on the location of the user. The research objectives of this study is investigate and determine the possibility of acceptance in m-Learning and examine the main factors that affect using m-Learning in higher education students in Saudi Arabia. The method tool is quantitative approach using questionnaire method to collect around 400 participants of universities students who are study in e-learning system in various collages in the universities. The survey was distributed electronically via self-selected and social network channels.

The study is applied Unified Theory of Acceptance and Use of Technology (UTAUT) framework. The framework focuses to determine the factors that influence the students' intention to use M-Learning via smart mobile devices. The numbers of distance learning in some Saudi universities are increased gradually in the last five years. Also, the Saudi electronic university in Saudi Arabic has been established 2011.

The smart phone devices are one of popular usage in Saudi audience and eMarketer reports, it was reached around 73% of publication of internet user to in Saudi Arabia and third global country for using the smartphone depending on the number of population. It is beneficial to determine the factor that influencing to accept of M-Learning in education field generally and in higher education in particular.

Keywords: M-learning, distance learning approach, Saudi Arabia, questionnaire survey, UTAUT

1. Introduction

The M-learning environment is represent one of the large technological environment to learn and increase the knowledge in the current decade. With the explosion of the information revolution, the online learning process has gained many opportunities to improve, both in research and in design appropriate mobile learning application. It could be argued that M-learning types are integrated tools which provide teaching aids for current and future era. This research is presented the fundamental definition of M-learning and measure the acceptance level for the higher educational student in the Saudi Universities. The education policy in Saudi Arabia is dictated by the government's policies which depend on the Islamic culture and regulations basis (MOHE, 2013). It makes sense, then, to consider strengthening M-learning provisions, especially in the higher education community, in a society where more than 70% of mobile subscribers are already using smart phone devices (eMarketer, 2015). Therefore, the M-learning will be helpful to promote the education policy in Saudi Arabia, which is based on the separation of gender in all levels of education, and the male and female can exchange and share information easily without breaking religious and cultural restrictions in the Saudi society.

Given the lack of previous research in this field in Saudi Arabia, the present study deals with a topic that might be both significant and helpful to the Saudi government. The Ministry of Higher Education can use this information to develop practical applications of M-learning as a developmental issue for the future and ongoing enhancement of students' skills and knowledge. The Saudi government can spread the culture of online learning

education by several methods, such as the establishment of distance education universities, which could accommodate large numbers of high school graduates resident in Saudi Arabia. This would further advance understanding and deployment of M-learning for anyone seeking to learn by connecting to the Internet using mobile devices. Besides that, the M-Learning could help the students who are interested to M-Learning for understand and figure out their actual requirements needed to accept and adopt the M-learning approach by students in the Saudi Arabian universities or academic institutes. The main question would be answered in this study is what are the factors that influence students' acceptance of M-learning in higher education in Saudi Arabia

2. Literature Review

M-learning is a relatively new phenomenon in contemporary education that follows the philosophy of e-learning but further extends it by introducing the concepts of mobility and flexibility. M-learning refers to any learning system that uses wireless mobile devices, including smartphones, tablet PCs and PDAs, to connect learners and instructors, and to manage the learning process from anywhere at any time (Wang, Wu, & Wang, 2009). The growth of M-learning reflects the growing accessibility and cheapness of mobile devices, the spread of wireless networks and the advance of the mobile web and mobile applications (Nassuora, 2012). The key benefits offered by M-learning are flexibility and mobility, the broad functionality of mobile devices and the availability of handwriting options, portability and extended collaboration tools (Abu-Al-Aish & Love, 2013).

Granted these direct advantages, however, the benefits of M-learning for all educational stakeholders depend on levels of acceptance of M-learning technologies. In many developing countries, M-learning is still in its infancy because of technological, economic, psychological and organisational constraints. Widespread adoption may be hindered by such factors as the complexity of M-learning applications and technological limitations of mobile devices, such as small screen size, short battery life cycle and lack of Wi-Fi coverage or Internet connectivity. To become popular among learners, mobile device-based courses must be adapted to the specific technological and user experience (UX) characteristics of those devices. In turn, the integration of M-learning into contemporary education will require a clearer understanding of factors and moderators that affect acceptance of this approach among various population groups, especially students.

Given these urgent practical and theoretical needs, the present study seeks to investigate the factors affecting technological adoption of M-learning among students. Taking as a starting point the available models of technology acceptance and previous studies on M-learning, the present research advances a framework for M-learning analysis with empirical application. The findings will be implemented in a real-world educational context in Saudi Arabia to enhance M-learning integration and adoption among learners and acceptance by educational staff in Saudi universities.

2.1 M-Learning Definition

The phrase "mobile learning" (M-learning) has become increasingly familiar in the last two decades. It is used in a variety of ways in relation to modern teaching techniques and in meeting the changing needs of educational institutions and communities (BEHERA; 2013). This reflects the increasing part played by mobile devices in the educational process, as well as more generally in our daily lives.

M-learning can be defined as learning that is mediated by small portable computers, which may include computing devices, smart phones, personal digital assistants (PDAs) and similar handheld devices. It remains controversial as to whether or not the laptop should be –included in this group (Chen & Huang; 2010). Some previous studies have suggested that connecting to the Internet for learning purposes by means of the wireless network is the defining feature of M-learning, so that any device used for learning and education might fit this perspective, extending to tablets and personal media players (Kukulska-Hulme & Traxler, 2005).

From the student's perspective, the essence of M-learning is the potential to learn from any location at any time by means of personal mobile devices, taking advantage of the increasing range of learning opportunities offered by mobile or smartphone technologies(Al-Fahad, 2009; Jaradat, 2014). This mobile flexibility can encourage students to learn without any restrictions of age, gender, group membership and free from the constraints of time, space and place. The advantages of M-learning can be summarised as follows.

- M-learning offers a new learning style for acquiring knowledge and skills anywhere and at any time (BEHERA; 2013).
- M-learning facilitates exchange of traditional knowledge sources such as books, which can be efficiently stored in high quality formats on various types of computing device (BEHERA; 2013).

In short, M-learning can be summed up in one phrase: providing learning aids through mobile devices.

2.2 The M-Learning Importance

One obvious reason for the increasing importance of M-learning is the improvement in mobile technologies emerging over the past decade. This in turn has contributed to reducing their cost by comparison with desktop computers, leading to larger numbers of users in many countries. These mobile devices offer many features beyond those of desktop computers, such as the ability to make phone calls, cloud storage, instant Internet access and ongoing connectivity.

M-learning can also help to enrich the educational context (MacCallum & Jeffrey, 2009), as for example in the implementation of virtual classrooms (Dawabi et al., 2003), using experimental methods of teaching scientific and practical knowledge across many educational channels (Milrad et al., 2004). M-learners can also create and share their knowledge through blogs and interactive games installed on their smartphone devices, and M-learning provides appropriate tools for exchanging ideas and voting through integrative online classroom management systems (Goh & Kinshuk, 2006). M-learning can also help users to deal with data and charts. The ability to access information at any time and in any place represents a significant advantage of M-learning, again confirming that it is an extension of E-learning rather than a subset of it (Wang et al., 2009).

2.3 M-Learning Importance for Higher Education

There are many advantages of smartphones for learning which have significant impact on the higher education institutes in general. These advantages can be summarized as follows.

- The interactive dimension allows learners to practise and share their knowledge with each other rather than passively receiving it from big screens.
- Using mobile devices in the classroom requires no special skills and makes learning easier than on desktop computers.
- E-memos and e-books are lighter and slimmer than files and textbooks or even laptops.
- Handwriting using pen-mail is a more intuitive approach than the keyboard and mouse.
- Sending and receiving educational pictures or videos and MP3 files
- Accessing information or services via the Internet
- Making voice and video calls.
- Sending or receiving e-mails with image, voice, text and video attachments.
- Organizing notes and address books.
- Sending or receiving SMS messages.
- These devices are cheaper than regular computers and more useful and affordable.
- These devices make M-learning a cooperative environment through opportunities to access study materials, including formative means assessment and feedback between students, and between student and teacher (Abu-Al-Aish & Love, 2013; Chong et al., 2011; InfoDev, 2010; Kennedy et al., 2008; Nassuora, 2012).

In summary, the tablets and smart phones devices became more convenient for higher education student because of to provide many of fundamental requirements to deal with these devices in the universities. This will be helpful to use these facilities to improve the universities online learning environment to assist the student in this stage.

2.4 M-Learning Importance for Higher Education in Saudi Arabia

As noted in earlier studies, technology has had a positive effect on the educational process, significantly enriching educational methods. It is noticeable and not surprising, then, that higher education institutions around the world are investing in strengthening the means of intensive learning in order to promote and keep up with required student knowledge and skills. Consequently, many current researchers are studying the M-learning approach in terms of influencing factors and acceptance boundaries among the main players—teachers and students (Phuangthong & Malisawan, 2005; Liu et al., 2008). More specifically, the research is also focusing on E-learning environments in smartphones (Chao & Chen, 2009; Brown et al., 2006; Liu, 2008) and acceptance levels in developed countries (Nassuora, 2012). One important issue arising is that specifications and characteristics of smartphones differ from one country to another, and this is an important factor in ensuring acceptance within the target segment. It should be noted that E-learning is not a new term in some universities, where it has been used for several years to upload files related to course materials through the personal academic web pages of staff and faculty members, as well as in the use of Short Message Service (SMS) to connect with

particular groups of students (Altameem, 2011).

Interest in M-learning has increased dramatically in Saudi Arabia over the past few years. This owes in part to the rapid advances in wireless networks and mobile technologies in general. Many of the country's government educational institutions are now investing significant effort in the M-learning field, based on the Government's vision of looking beyond oil to create a knowledge-based economy (Garg, 2013). There is now substantial investment and funding of M-learning projects at many of Saudi Arabia's universities, including King Abdul-Aziz University, the Imam Muhammad ibn Saud Islamic University, and Saudi Electronic University. Furthermore, the higher education ministry was developed to oversee an ambitious National Higher Education plan (the "Afaq Project"), which includes a long-term plan for higher education, addressing current and future challenges (Alriyadh, 2007). This project focuses on the implementation of fully-fledged online learning in all universities (Garg, 2013). As a result, some related infrastructure sub-projects have been established, such as the National Centre for E-Learning and Distance Learning (NCELDE), the learning management system (LMS), the national system for the management of E-learning (JUSUR), the Saudi Digital Library, and the Medicine program at Qassim University, which is the first M-learning program in Saudi Arabian universities (Adkins, 2011). In addition to these systems that represent the core infrastructure for online learning, an integrated HTML5 product has been designed especially for smart phones applications. This should help to encourage the rapid growth of M-learning and seems a productive way of meeting the growing demand of the expected audience for M-Learning features such as speed, flexibility, and awareness. This reduction of distance is fundamental to acceptance and adoption of the M-learning approach (Garg, 2013).

2.5 Previous Studies on M-Learning in Saudi Arabia

Saudi Arabian universities have made substantial progress in the integration of M-learning into the curriculum. However, given the rapid pace of technological development, there is room for further improvement and a number of challenges remain. Yusuf (2013) reported that one of the leading e-learning institutions in Saudi Arabia, King Fahd University for Petroleum & Minerals (KFUPM), has been working with e-learning technologies since 2003. The Saudi government and its National Centre for E-Learning and Distance Education have been the principal agents of e-learning and M-learning development in Saudi Arabia, financing and implementing a number of projects. These include the Tajsir e-Learning Initiative, the Educational Portal, the Jusur System for the Administration of Electronic Learning (an integrated software system for e-learning projects), the Saudi Repository for Learning Objects and the Qualification and Training Project (a program to train staff in universities in e-learning and M-learning), among others (Yusuf, 2013).

Additionally, the general context of M-learning in Saudi Arabia has been addressed by Chanchary and Islam (2011), who explored the perceptions of 131 students in relation to the efficiency of mobile technology in learning and the effect of teaching guidance on students' performance and their acceptance of this technology. The authors identified a number of limitations of M-learning such as the limitation in memory size, processing performance, battery life, basic user interface and different platforms as factors related to accept the M-learning in Saudi Arabia. In particular, while students rated positively the flexibility and improved communication options of mobile devices, many also stressed such limitations as the lack of visibility owing to smaller screen sizes, incompatibility of mobile operating systems (OS) which lead to poor adoption of M-learning compatible on mobile phones for learning perspective (Chanchary & Islam, 2011). In the main time, Al-Barhamtoshy and Himdi (2013) indicate other possible limitations of M-learning addressed which are distraction among mobile learners, fragmented experiences, additional costs and security risks (Al-Barhamtoshy & Himdi, 2013). Furthermore, there are another challenge which is the availability of reliable and cheap Internet access from home, and because campus IT security makes it difficult for students off campus to access the servers on campus" (Yusuf, 2013).

Some efforts have previously been made to develop and implement M-learning systems in Saudi Arabia and to assess learners' responses and experiences of using them. In particular, one M-system developed by Al-Barhamtoshy and Himdi (2013) was based on a web services implementation, delivered to mobile clients by means of an XML layer. The system developed by the researchers included several components allowing mobile clients to author content, access a knowledge base and communicate and interact with M-servers in a number of ways (Al-Barhamtoshy & Himdi, 2013). The technical approach they employed should, however, be revisited in line with current developments in web technologies. In particular, XML-based delivery and web services may now be complemented or replaced altogether by cloud-based applications, M-learning mobile applications and other technologies that leverage the power of ubiquitous computing systems. Additionally, Razek and Bardesi attempted to develop an adaptive mobile learning framework integrating a range of personalized learning techniques which is labelled Adaptive Mobile Learning System (AMLS). It is a promising development in the

field of M-learning, facilitating personalization of course delivery, learning materials, interaction styles, techniques and assignments, based on analysis of e-profiles of students that typically involves machine learning algorithms and/or questionnaires (Razek & Bardesi, 2011). However, among the main limitations of this study is the non-inclusion of any technology acceptance framework such as UTAUT or TAM, making it difficult to assess how the various parameters of the AMLS framework affect students' perceptions of adaptive mobile learning. Future research and development of mobile learning systems will benefit from the integration of such technology acceptance frameworks in assessing students' attitudes and customizing systems to improve usability and m-learning (Razek & Bardesi, 2011).

As noted above, several studies have sought to assess the influence of M-learning technologies on students' performance and satisfaction in Saudi Arabian colleges and universities. In particular, in a survey of 39 French language students, Jaradat (2014) found that the use of mobile phones in French language courses at Princess Nora University in Saudi Arabia was instrumental in achieving moderate improvement in undergraduate student performance. This improvement was mediated through mobile-based distribution of an assignment/exercises repository, provision of mobile tools for reading, vocabulary acquisition, email-based learning and instant messaging and VoIP applications that enhanced collaboration and delivery of instruction (Jaradat, 2014). However, further research is needed into the factors that affect students' performance, as Jaradat (2014) also found that students' perceptions of M-learning do not indicate that this technology makes learning easier, more accessible or more motivational. The majority of students surveyed were neutral about the use of mobile technologies in learning, which may in part be explained by the predominantly non-educational utilization of mobile technology among students.

2.6 General Studies on M-Learning Acceptance

Studies of M-learning acceptance have formed part of the growing use of technology acceptance frameworks in researching new developments in e-learning, and in M-learning in particular. Among the most widely-used models for studying determinants of technology adoption are the TAM and UTAUT frameworks. According to Abu-Al-Aish and Love (2013), the Technology Acceptance Model (TAM) addresses the impact of external variables such as objective system design characteristics, training, and computer self-efficacy, besides that the internal variables such as beliefs, attitude toward use, behavioural intentions, and actual system use (Abu-Al-Aish & Love, 2013). The classic TAM includes two parameters—Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)—that describe technology use, purposes and experiences. Another influential model is the Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. (2003). The UTAUT model was developed by incorporating insights from TAM, Innovation Diffusion Theory (IDT), the Theory of Reasoned Action (TRA), the Motivation Model (MM), combined TAM and TPB, the Model of PC Utilization and Social Cognitive Theory (SCT) (Nassuora, 2013).

The UTAUT combines four determinants of user behaviour and four related moderators that mediate the impact of these determinants on user motivation and intention to use a given technology. According to Venkatesh et al. (2003), the four determinants of technology acceptance are performance expectancy, effort expectancy, facilitating conditions and social influence. These are moderated by gender, age, experience and voluntariness of technology use. Moderating variables explain the differences in technology practices among various user groups and demographics (Abu-Al-Aish & Love, 2013).

The previous studies demonstrated the trend of M-learning field to adapt the UTAUT model to account for the technological, psychological and social peculiarities of m-learning. There are some of strengths and weakness in the UTAUT framework and thus M-learning with UTAUT model can be benefit from the inclusion of mobile-specific parameters. For example, Abu-Al-Aish and Love (2013) used UTAUT and their study extended the UTAUT to include extra variables such as quality of service, personal innovativeness and social influence of lecturers. The study revealed that all factors have a significant impact on M-learning acceptance among Brunei University students (Abu-Al-Aish & Love, 2013). However, the authors acknowledged that the validity of these findings was limited because the limit of study sample and non-inclusion of actual M-learning usage for research process (Abu-Al-Aish & Love, 2013).

In his study of M-learning acceptance, Liu (2008) also attempted to extend the UTAUT framework. In particular, the model he developed included such factors as self-efficacy, attainment value, perceived enjoyment and self-management of learning. Self-efficacy can be defined as a belief in one's own ability to master technology (Liu, 2008). Differing from Abu-Al-Aish and Love (2013), Liu (2008) defined social influence as an expectation of how “important others” would assess a person's usage of a given technology. “Attainment value”, however, seems to replicate the “performance expectancy” parameter of the classic UTAUT model, although it is defined

differently as the "…personal importance of doing well with regard to self-schema and core personal values, such as achievement" (Liu, 2008). In general, aside from the "mobility" parameter, the factors proposed by Liu (2008), including perceived enjoyment, attainment value and self-efficacy, are difficult to operationalize even in psychological terms or in terms of valid questions to survey participants. In contrast, Ju *et al.* (2007) utilized the concepts of Perceived Usefulness and Perceived Ease of Use (PEOU) derived from the TAM framework. In particular, they demonstrated that high perceived self-efficacy in M-learning positively affects PEOU, which in turn positively influences the perceived usefulness of M-learning technology.

Iqbal and Qureshi (2012) proposed a synthesis of the TAM and UTAUT frameworks, with greater emphasis on TAM parameters such as Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (p. 151). The UTAUT factors used by Iqbal and Qureshi (2012) included social influence and facilitating conditions. In addition, the authors utilized "perceived playfulness" as a variable to be understood as an "intrinsic motivation" or interest in technology (Iqbal & Qureshi, 2012). However, a positive correlation was found with M-learning adoption for all other factors. In general, Iqbal and Qureshi (2012) substantially improved the TAM framework, which was initially developed with employees rather than learners in mind. Additionally, the inclusion of various motivational and social parameters into the M-learning acceptance framework by Iqbal and Qureshi (2012), Liu (2008) and Ju et al. (2007) has substantially improved the UTAUT and TAM frameworks by accounting for the differences between mobile and traditional educational services.

Taken together, the above studies constitute a valuable contribution to our understanding of M-learning adoption among students. In particular, the synthesis of TAM and UTAUT, or their extended use with M-learning-specific parameters, seems the most promising methodological trend in the field. However, attention must be directed to the proper operationalization of such variables as perceived playfulness, attainment value and others that suffer from numerous psychological connotations.

2.7 Studies on M-Learning Acceptance (UTAUT Model) in Saudi Arabia

Several attempts have been made to apply the UTAUT model to the analysis of M-learning use intention among Saudi Arabian students. In particular, Nassuora (2013) surveyed 80 students from Saudi private universities to determine the relative weights of various UTAUT factors in M-learning acceptance. The study established a significant correlation between the factors of the UTAUT model and M-learning adoption. However, the validity of these findings may be limited in a number of ways. In particular, the study sample was not sufficient to satisfy generalization criteria. It has been only 80 respondents in this study. In fact, public universities account for more than 90% of higher degree students in Saudi Arabia and make the largest contribution to online learning facilities and courses (e.g. King Abdulaziz University, Al Imam Muhammad Ibn Saud Islamic University).

3. Theoretical Framework and Research Hypotheses

Following the example of the reviewed studies, the proposed research will adopt the UTAUT framework as a starting point for M-learning acceptance analysis. The UTAUT framework has been positively assessed by various researchers as providing an extendable vision of technology acceptance by exploiting the cumulative insights of other widely-used frameworks (Abu-Al-Aish & Love, 2013; Chanchary & Islam, 2011). Notwithstanding its benefits, the UTAUT framework might helpful to be adjusted for specific context of M-learning technologies. Various studies discussed above have used variations of the UTAUT model, extended to include such factors as perceived playfulness, personal innovativeness, attainment value, quality of service, self-management of learning and self-efficacy, among others.

Proceeding from the above critical analysis of these contributions, the present study advances an extended UTAUT framework that includes the following parameters:

- **Performance Expectancy:** The extent to which a person believes that using an information system would benefit job performance, as measured by five questions coded PE1 to PE5.
- **Effort Expectancy:** The degree of subjective ease or difficulty associated with use of an information system, as measured by four questions coded EE1 to EE4.
- **Lecturers' Influence:** The extent to which a person perceives it as important that others believe they should use the new information system, as measured by three questions coded LI1 to LI3.
- **Personal Innovativeness:** An individual's willingness to try out any new information technology, as measured by three questions coded Plnn 1 to Plnn3.
- **Self-Management of Learning**: The extent to which an individual feels sufficiently self-disciplined to engage in autonomous learning, as measured by four questions coded SL1 to SL4.

- **Behavioural Intention:** The influence of the above factors in determining commitment to M-Learning, as measured by five questions coded BI1 to BI5.

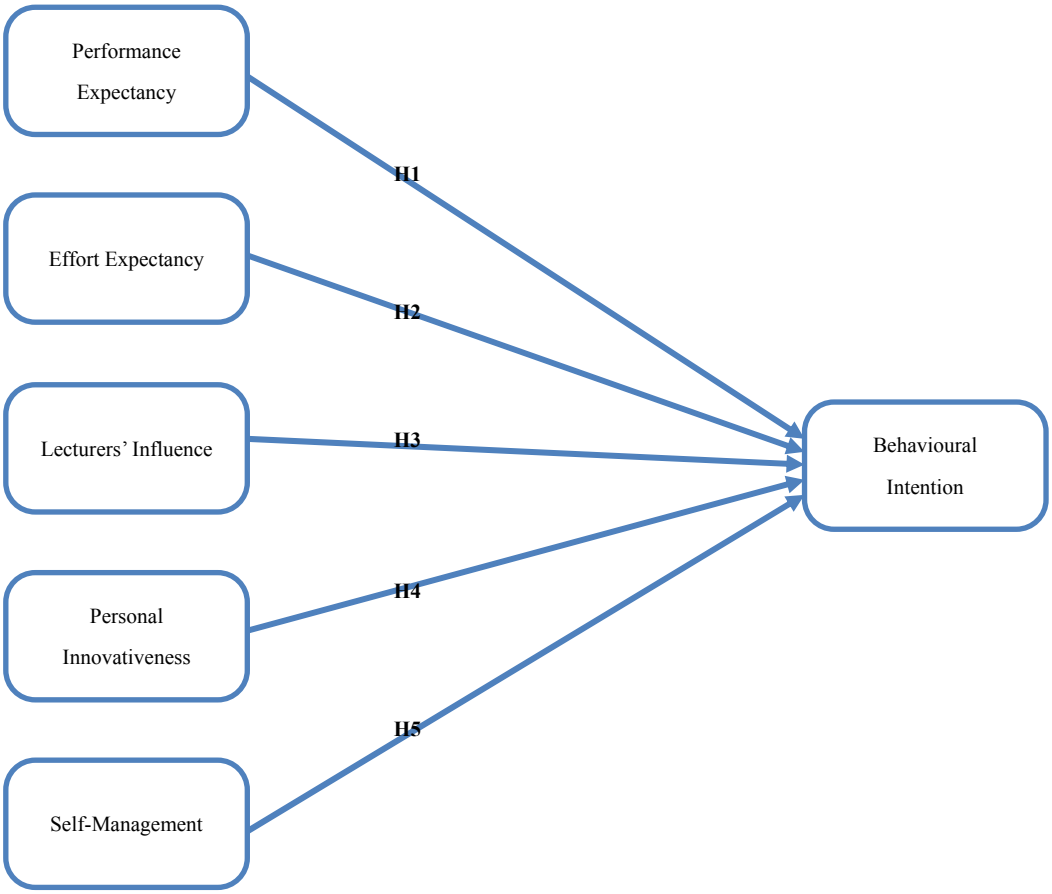

Figure 1. The m-learning model with the hypotheses

The proposed model utilizes three factors formulated in the initial UTAUT framework: effort expectancy, behavioural intention and performance expectancy, as well as a modified "social influence" variable emphasising lecturers' influence in M-learning adoption. Additionally, the framework extends UTAUT to include self-management of learning and personal innovativeness, which we consider to be important in understanding the M-learning context. In particular, personal innovativeness refers to an individual's willingness to acquire creative experience with new information technology and ambition to develop personal creative capacities. Self-management of learning refers to the self-discipline, autonomy and time management needed for organization of independent M-learning.

The inclusion of personal innovativeness in the framework was motivated by the available evidence of its role in technology acceptance. In particular, the IDT framework suggests that innovative individuals are attracted to positive ideas and changes in technology and have higher levels of uncertainty tolerance (Lu *et al.*, 2007). Similarly, Abu-Al-Aish and Love (2013) hypothesized that students with high levels of personal innovativeness would be more risk taking and have a more positive intention to use M-learning in their study. As far as the "self-management of learning" factor is concerned, it was included in the present study in order to assess the role of self-discipline, autonomy and personal responsibility in technology adoption. The literature offers a mixed account of the role of "self-management" in M-learning adoption, with positive results obtained by Liu (2008) and negative findings by (Lowenthal, 2010). It is therefore crucial to clarify the role of this self-management factor in M-learning adoption.

The hypotheses of this study as follow:

H1. Performance expectancy has a positive effect on behavioural intention to use M-learning.

H2. Effort expectancy has a positive effect on behavioural intention to use M-learning.

H3. Lecturers' influence has a positive effect on behavioural intention to use M-learning.

H4. Personal innovativeness has a positive effect on behavioural intention to use M-learning.

H5. Self-management of learning has a positive effect on behavioural intention to use M-learning.

4. Methodology

This part presents a brief description of the theoretical frameworks used to design the empirical study, including questionnaire design, data collection, selection of target audience, conduct of surveys and data distribution. Also included is an account of the strategies for ensuring the survey's accuracy.

4.1 Survey Design

The design was based on a number of criteria collated from the literature review. To elaborate and answer the research question, the questions are designed on the positivist paradigm and 24 factors influence the acceptance level of UTAUT framework.

4.2 Survey Design Overview

The questionnaire comprises two kinds of item: general and demographic questions and questions about influencing factors as presented the result in table 1. The demographic information related to the participants' experience and their background such as Gender, age group and education level of participants Experience to use the Internet and how using smartphone devices for m-learning and it is consists of 11 questions. The Influencing factors that focus on factors led the participant to accept M-learning. The questions in this part are divided into 24 factors which into following headings. Performance Expectancy (5 Questions), Effort Expectancy (4 Questions), Lecturers' Influence (3 Questions), Personal Innovativeness (3 Questions), Self-Management of Learning (4 Questions), and Behavioural Intention (5 Questions). The questions in this part are measured by Likert Scale (Strongly Agree – Agree - neither Agree nor Disagree – Disagree - Strongly Disagree).

4.3 Describe and Select the Target Sample

The data is collected from distance learning students of many universities in Saudi Arabia such as King Abdul Aziz University, King Saud University, and King Fahad University. These universities are chosen because they have the fundamental infrastructure to exploit E-learning facilities and there is independent deanship of distance learning.

According to the Statistics Centre of the Ministry of Higher Education, the number of students currently enrolled in Saudi universities is 1.4 million, distributed across 24 government universities and nine private universities (MOHE, 2014). These institutions are the main target audience of this research because online learning is a primary consideration for academic staff, who must create and manage their own website for communicating with their students by e-mail. Some public and private universities offer fully online teaching, with electronic versions of all materials for courses such as English and Arabic language, law, public administration, marketing and information systems (KUA-E-Learning, 2014).

For present purposes, the sample size is calculated by the formula below, based on the number of university students. The margin of error is 5.0%, with a confidence level of 95%. The resulting sample size is calculated as not less than 385 participants. During this phase, 401 responses were collected that meet the survey's qualifying requirements as outlined above.

4.4 Procedure and Conduct of the Survey

The questionnaire was distributed to undergraduate students from nominated universities, based on e-mail lists supplied by the distance learning deanship dealing with online students. Also, other potential participants are selected from social networks such as Twitter, Facebook and LinkedIn by using "snowballing" technique. This technique is useful in Saudi participants because they are willingness to participate is likely to be increased by receiving the invitation from a known person. Therefore, to ensure to get the participation of appropriate person, it is designed four conditional questions that are used to filter the qualifying participants who are willing to participate. The questions are has the participant use E-learning systems before, have participant used smartphone devices, are participant resident in Saudi Arabia, and are participant a higher education student? If yes, please enter your age (…….) and your degree (Diploma/Bachelor/Master/PhD). The positive answers to all of the above questions will qualify to participate in the survey. Other participants will receive a letter of regret.

There are three steps have been taken to ensure that questions are understandable correctly and clearly by the

target segment. Firstly, the questionnaire was sent for review by three different groups which are information technology background group, teaching and e-learning methods field members, and the questionnaire's linguistic and verbal content group. Secondly, the questionnaire was translated into Arabic to be used in Saudi Arabia, where the official language is Arabic. The questionnaire was subsequently translated back into English by an independent organization to ensure compatibility between the first and second versions of English meanings are match and with adjustable notes if there are. Finally, a pilot study was conducted with a sample equivalent to 10% of the official sample size, and to measure internal consistency which was good and the Reliability test result was 0.932 (other result in Table 1).

Some difficulties arose during the data collection stage—for instance, e-mail is not an ideal option for communicating in Saudi society, as most universities send text messages to students' mobile devices, which, although quick, is very expensive.

5. Analysis

The analysis part highlighting the statistical aspects and focuses on four main key parts. Firstly, it presents the descriptive statistics and demographic data. Secondly, it describes factors that will be used ensure the possibility to adopt the UTAUT model in M-learning. Thirdly, it interprets the medium and internal consistency of factors, as well as both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) which helps in Pretesting Structural Equation Model (SEM). Finally, it tests Measurement model for the design of the final model of the influencing factors to accept M-Learning model in higher education institutions in Saudi Arabia.

5.1 Demographic Question Descriptive

The results of demographic questions show some interesting points, the first three questions represent Initial idea of the participants' characteristics which include gender, age, and academic degree (see appendix A). The results showed that participants are universities students and they have great interest to use online learning as conditional questions showed in the beginning of the questionnaire. The Q1 indicate the participants' gender. The rate of male group was 48.4% while the female was 51.6 %. This represents the similarity between the gender samples. In the Q2 the number of participants is greater than 27years old was representing 48.9 % and they are students at the postgraduate sections in the universities, while representing less than 27 years old represented 51.1% and this mean a significant number of respondents interested in e-learning special master's and doctoral phases which are shown in the following question. In Q3 which focused on the educational stage, the results of the survey showed two-thirds of the participants received a master's degree 62.6 %, while 16.2% undergraduate and doctoral 21.2%. in the Q4 where that about 51.1% of the participants have more than 5 years' experience in M- learning. The Q5 noted that the level of participants' experience was the average and above which is reached to around 65% this the expertise level of target population is High somewhat. In addition, the Q6 focus on the number of M-learning services times are used per day and the percentage are reached into 62.5%, which shows that the universities' students segment is ready to accept and use online learning facilities. Moreover, Q7 relating to Internet service plan is divided into prepaid and post-paid. 50% of respondents preferring to deal with prepaid cards and about 12% has shown prefer to use both the same time so as to provide many advantages of each type of Internet Plan. Q8 is focused on kind of the Internet service which is divided into 3G & 4G or Wi-Fi. 47% of the participants have dealing with both Kind of the Internet which indicated that the target audience would like to provide more option of Internet for make the files and applications downloading are more flexible. Q9 is shown the operating system types that are most commonly used. The result noted that IOS & Android obtained the 37% & 42% respectively, and they are the highest two number of participants in the four operating systems listed in the questionnaire. Q10 is identifying the type of smart devices more widely used and it was shown the smartphone was used the most by 56% of participants. This was a summary of the most important points mentioned in the demographic questions, which focused on the characteristics of the data sample that their views on the factors affecting in the following sections.

5.2 Scale Reliability

The reliability in defined the test that is used to evaluate between the internal consistency of the data in the same construct. If the value of reliability test is high, that means the correlation between the variables is consistency very well. If the test gains low score that mean the variables are heterogeneous and therefore one or more variable should be remove to increase the test score. Kline (2005) points out that "internal consistency" or "Cronbach's alpha" is most measurement that is commonly used to determine the internal consistency (Kline, 2005). The results of Cronbach's alpha were ranged between 0.850 & 0.941 which indicate good internal consistency and reliability of the study sample.

For the elements in six constructs all the results were satisfy in Cronbach's alpha coefficient and they were more

than 0.6, however the factor coded LI3 in Lecturers' Influence construct recorded the value seesaw between acceptance and rejection and the construct value recorded 0663. Due to other result in the same construct will be risen if this variable has been excluded, so the LI3 was abolition and the Cronbach alpha for this construct was rose to 0.850. The table 1 presented all the factors result in the Cronbach's Alphas.

5.3 Exploratory Factor Analysis

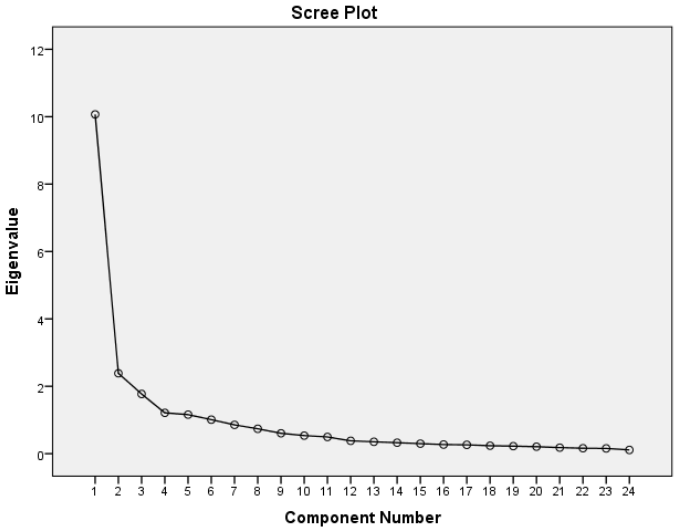

Figure 2. Scree plot of m-learning modified UTAUT in EFA

The EFA test is used to reduce the number of elements to be more manageable and measurement with other statistical tests (Hair et al., 2006). Additionally, it will be helpful to develop and present preliminary analysis of study variables during the absence of enough theory details about the relations between the variables in the research hypotheses (Gerbing & Anderson, 1988). In spite of the study variables may be come from some of previous research, and thus the EFA represents the necessary tests for all variables to revise them in one model. The results in EFA showing consistent in all constructs and all the factors that have been accepted in EFA test were got value 0.5 or more in the factor loadings test in EFA (See Table 1). The Factors of groups have emerged in the constructs as presented in the figure 2 and thus were constituent factors for each group represent the best representation all elements were more than 0.5.

In this stage of the analysis it was identifying the factors that affect the acceptance of this study and to what of these factors are belongs to the Constructs. For ensuring the factors unequivocally belong to the Constructs affiliate, so it was used an additional test which as CFA in order to further validate the model which is presented in details in this part of this part.

5.4 Confirmatory Factor Analysis

It is important to ensure the information that was collected is appropriate and suitable for the proposed model. Thus, the importance of assessing the validity of model constructs which is one of the used methods in the data analysis in the contemporary time. For these reasons, it was used of CFA, which can be defined as a subset of the SEM and it a means to test the success of the Factor Structure and its special pattern. The CFA provides an explanation more stringent than previous used tests in EFA (DiStefano & Hess, 2005; Hair et al., 2006). CFA can be used to refine the model, support the existing structure, and test-dimensional structure and the CFA is used to strengthen the EFA, and to refine and support the structure of the building (DiStefano & Hess, 2005). The appropriate number for the relation between the factors and constructs more than 0.5 and this study the results were between 0.5 and 0.9, and between the related constructs 0.53 and 0.75. Therefore, this part is including the structure analysis of factors in every construct n the model as presented in the following parts.

Table 1. Data analysis from all respondents showing factors listed in order of descending mean value for each group

Construct Name	*Factor Code*	The Factors under consideration	N	Factor Analysis	Mean	Std. Deviation	Cronbach's Alpha	
							Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Performance Expectancy	PE1	I find m-learning useful for my studies.	399	0.779	4.1675	0.8551	0.788	0.896
	PE2	Using m-learning would enable me to achieve learning tasks more quickly.	399	0.773	4.1775	0.9371	0.802	0.893
	PE3	Using m-learning in my studying would not increase my learning productivity.	399	0.803	4.1175	0.9412	0.812	0.891
	PE4	Mobile learning could improve my collaboration with classmates.	399	0.729	4.1775	0.9017	0.683	0.917
	PE5	Using m-learning would not improve my performance in my studies.	399	0.812	4.0700	0.9393	0.839	0.885
Effort Expectancy	EE1	I would find an m-learning system flexible and easy to use.	398	0.661	4.6025	0.6368	0.647	0.863
	EE2	Learning to operate an m-learning system does not require much effort.	399	0.868	4.6275	0.6203	0.782	0.807
	EE3	My interaction with an m-learning system would be clear and understandable	398	0.877	4.7025	0.5566	0.798	0.806
	EE4	It would be easy for me to become skilful at using an m-learning system.	399	0.766	4.5875	0.6390	0.673	0.853
Lecturers' Influence	LI1	I would use m-learning if it was recommended to me by my lecturers.	400	0.787	4.1850	0.8960	0.617	0.376
	LI2	I would like to use m-learning if my lecturers' supported the use of it.	399	0.732	4.2700	0.8826	0.597	0.409
Personal Innovativeness	PLNN 1	I like to experiment with new information technologies.	400	0.774	4.3350	0.8059	0.654	0.700
	PLNN 2	When I hear about a new information technology I look forward to examining it.	400	0.764	4.3050	0.7833	0.675	0.682
	PLNN 3	Among my colleagues, I am usually the first to try out a new innovation in technology.	399	0.738	3.9050	0.9291	0.590	0.780
Self-management of learning	SL1	When it comes to learning and studying, I am a self-directed person.	400	0.512	4.3700	0.7345	0.461	0.842
	SL2	In my studies, I am self-disciplined and find it easy to set aside reading and homework time.	400	0.829	4.0875	0.9176	0.698	0.741
	SL3	I am able to manage my study time effectively and easily complete assignments on time.	400	0.812	3.8900	1.0002	0.707	0.739
	SL4	In my studies, I set goals and have a high degree of initiative.	400	0.820	4.0250	0.8403	0.711	0.738
Behavioural Intention	BI1	I plan to use m-learning in my studies.	399	0.663	4.0850	0.9696	0.810	0.932
	BI2	I predict that I will use m-learning frequently.	400	0.716	4.1050	0.9676	0.828	0.929
	BI3	I intend to increase my use of mobile services in the future.	400	0.725	4.2100	0.9582	0.867	0.922
	BI4	I will enjoy using m-learning systems.	400	0.772	4.1750	1.0009	0.830	0.929
	BI5	I would recommend others to use m-learning systems.	399	0.750	4.1200	1.0090	0.864	0.922

5.5 SEM Overview

The SEM represent an extension of related to statistical tests of variables efficiency such as regression analysis test, while taking into account the errors that appear in some of measurements test in some of other statistical tools (Hair *et al.*, 2006). Overall the SEM focuses to test if the Theoretical Model is valid, and by studying and

evaluating linear relations between the Constructs to see the strength relationship between them through hypothesis testing in the model, which helps to ensure the validity of the model (Shah & Goldstein, 2006). Therefore, the Measurement Model which is the SEM testing output focuses on measuring relationships between variables and Constructs, which can be used to determine whether the Constructs were measure accurately or not.

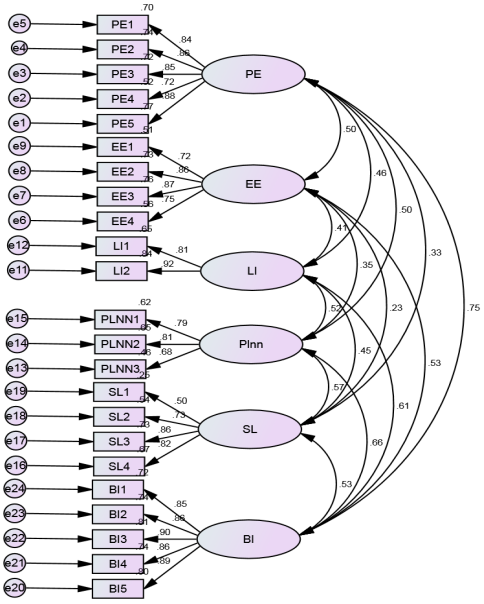

Figure 3. The model constructs are tested by CFA

The reliability test of the all model Constructs by using more accurate test which called Composite Reliability Scale (CR). The CR test is alternative test to Cronbach's alpha, while the CR refers to the degree of two variables or more to involve for build the constructs and model (Koufteros, 1999; Lu *et al.*, 2007). If CR was more than 0.6, that is the CR degree can be acceptable (Bagozzi & Yi, 1988). Thus, this shows that all the factors in the model are statistically significant and measure the same Construct. The CR can be calculated by the following equation (Hair *et al.*, 2006; Fornell & David, 1981):

Average Variance Extracted (AVE), it is used to calculate the variance between the variables in the Constructs separately (Koufteros, 1999). The recommend values of AVE is more than 0.5, this mean the variables are represent the Constructs a really. AVE can be calculated according to the following equation (Hair et al., 2006).

5.6 Measurement Model Results

The Table 2 indicates that the Factor extracted values in the Constructs were recorded higher than 0.5 and the value of the AVE was higher than 0.5. The AVE values were ranging between 0.873 and .0.727 and the CR values ranged between 0.971 and 0.987. The highest value of Squared multiple correlations was 0.842 while the smallest value was 0.457. Thus, these indicators are pointing to the differentiation in the used scales, and that should be enough to validate the M-Learning acceptance model in this study. Even though the values in Squared multiple correlations should be 0.5 or more. Moreover, the Factor loading values were between 0.621 and 0.834. Also, all of them were significant at $p < 0.001$. No factors has been excluded in this stage of analysis, because the accepted values and compatible among the factors. The final result of this part indicates the convergence between the values in the tests, which lead to the reliability of the variables in the model constructs.

One measuring aspect that is used to measure the discriminant validity between the factors is compared the square root of the AVE values with each Constructs in the Model (Fornell & Larcker, 1981). If the square roots of AVE values are bigger than other constructs values, which means each Constructs are closely linked other Constructs (Fornell & Larcker, 1981). As shown in Table 3, the squared root of AVEs is larger than the correlation of each constructs. The numbers with dark blue represents the square root of the AVEs at level of 0.001.

After that, the relationships between the constructs were calculated by three main indicators which are t-value,

p-value, and Standardized regression coefficient. The Constructs result was shown proportionate and significant for all model hypotheses from H1 to H5. The value of Standardized regression coefficient were between 0.749 and 0.533 and the p-value was significant in the level 0.001 and the R2 values between 10.905 and .7.069 which is recommended more than 1.96 ranged. As shown in the Table 3 all the modelling fit indicators in the acceptable level as presented in the path coefficient structure model.

The result of previous statistical tests shows all the model constructs (PE, EE, LI, Plnn, and SL) have positive effects on BI to use M-learning. As mentioned in the Table 4.

Table 2. Results of m-learning for the measurement model

Construct–Code	Construct Name	Construct	Factor extracted	Cronbach's alpha	Standardized factor loading	Squared multiple correlations	Critical Ratio or (t-value) (>1.96)
PE	Performance Expectancy	PE1	0.779	0.916	0.836	0.700	10.905
		PE2	0.773		0.859	0.738	
		PE3	0.803		0.851	0.724	
		PE4	0.729		0.719	0.517	
		PE5	0.812		0.877	0.768	
EE	Effort Expectancy	EE1	0.661	0.869	0.716	0.512	8.391
		EE2	0.868		0.857	0.734	
		EE3	0.877		0.873	0.762	
		EE4	0.766		0.749	0.561	
LI	Lecturers' Influence	LI1	0.787	0.850	0.806	0.650	9.969
		LI2	0.732		0.917	0.842	
Plnn	Personal Innovativeness	PLNN1	0.774	0.793	0.785	0.617	7.069
		PLNN2	0.764		0.808	0.653	
		PLNN3	0.738		0.676	0.557	
SL	Self-management of learning	SL1	0.512	0.817	0.496	0.566	9.456
		SL2	0.829		0.733	0.537	
		SL3	0.812		0.857	0.734	
		SL4	0.820		0.821	0.674	
BI	Behavioural Intention	BI1	0.663	0.941	0.850	0.722	11.314
		BI2	0.716		0.860	0.740	
		BI3	0.725		0.899	0.808	
		BI4	0.772		0.861	0.742	
		BI5	0.750		0.893	0.798	

Table 3. Correlation matrix and discriminant validity of the measurement model

The relationship or path	PE	EE	LI	Plnn	SL	BI	Composite Reliability values (CR) (>0.6)	AVE (> 0.5)
PE	0.686						0.978	0.828
EE	0.503	0.638					0.983	0.799
LI	0.460	0.407	0.675				0.983	0.822
Plnn	0.500	0.346	0.521	0.672			0.979	0.756
SL	0.334	0.230	0.453	0.570	0.528		0.971	0.727
BI	0.549	0.533	0.606	0.655	0.531	0.761	0.987	0.873

Table 4. Path coefficients, t-values, and p-values of UTAUT model hypothesis

Hypothesis No.	The relationship for path	Standardized regression coefficient	Critical ratio or (t-value)	P-value	Significance
H1	PE → BI	0.749	10.905(>1.96)	***	Yes
H2	EE → BI	0.533	8.391	***	Yes
H3	LI → BI	0.606	9.969	***	Yes
H4	Plnn → BI	0.655	7.069	***	Yes
H5	SL → BI	0.531	9.456	***	Yes

5.7 Summary of Testing the M-Learning Acceptance Measurement Model

This study was designed to develop and test the Nomological validity, which includes test relations between the

constructs and the factors influencing the acceptance of M-Learning in higher education students in Saudi universities. The hypotheses in this study are focus to test theoretical model and test the acceptance of the associated constructs in the model and are numbered from H1 - H5.

Form influencing factors to accept the M-Learning in higher education institutions in Saudi Arabia, as shown in Table 1 as Nomological network to identify validity of Constructs that reflect the basic influence factors of the theoretical acceptance Model. The Correlation analysis was conducted in the table 3 & 4 and the results indicate that all the factors in the constructs have significant relationships. These relationship produces the analyses concluded that the current study gives a complete visualization to identify the key factors for M-learning in higher education institutions in Saudi Arabia also has Nomological validity.

6. Discussion

The results indicate that the proposed model adequately explains patterns of M-learning adoption among students. All factors (performance expectancy, effort expectancy, lecturers' influence, personal innovativeness and self-management of learning) were significant variables in influencing behavioural intention to use M-learning. In particular, three factors (personal innovativeness, lecturers' influence and self-management of learning) added to the UTAUT model demonstrated high levels of statistical significance. The relationship path for personal innovativeness yielded $\beta = .655$, $\beta = .606$ for lecturers' influence and $\beta = .531$ for self-management of learning.

In line with previous research on M-learning acceptance among students, it was confirmed that both performance expectancy and effort expectancy have a positive influence on students' determination to use M-learning (Abu-Al-Aish & Love, 2013; Ju et al., 2007). Higher performance expectancy for M-learning among students results in better motivation to use M-learning technologies; similarly, students with lower effort expectancy are more deliberate in adopting M-learning than their peers who believe that M-learning will require a lot of effort. However, as the analysis below will demonstrate, the relative weight of effort expectancy in influencing students' intention to use M-learning was lower than expected. In fact, performance expectancy proved to be the strongest predictor of behavioural intention to adopt M-learning among students ($\beta = .749$). This finding suggests that the majority of students assess M-learning technologies in terms of their contribution to students' performance and educational results. That is, students believe that mobile technologies will substantially improve their learning performance. This finding would seem to provide clear evidence for system designers that M-learning courses should be designed with the criterion of students' performance expectancy in mind.

Quite unexpectedly it was also established that effort expectancy was among the weakest predictors of behavioural intention to accept M-learning ($\beta = .533$). This result contrasts with the findings of Abu-Al-Aish and Love (2003), who identified effort expectancy as the most significant factor in students' motivation to use M-learning. According to Abu-Al-Aish and Love (2003), this means that "…the M-learning system will be easy to use and they will not need a lot of instruction on how to use it" (p. 98). In contrast, the present finding suggests that a majority of students from the selected sample believe that M-learning is not so easy to use and will require a lot of effort to master. These beliefs may be explained by students' awareness of the technological limitations of M-learning (Chanchary & Islam, 2011) and/or by poor understanding of M-learning concepts. In any event, the relatively low significance of the effort expectancy factor in the present study suggests that M-learning architects and designers should place more emphasis on the improvement of UX (user experience) and Perceived Ease of Use (PEOU) of their mobile systems (Wang, Wu, & Wang, 2009).

In the present study, the "social influence" factor was adapted to the educational context to account for lecturers' influence on students' adoption of M-learning. Students were found to believe that lecturers exert a significant impact on their acceptance of M-learning ($\beta = .606$). This finding implies that students' acceptance of M-learning technologies depends to a great extent on lecturers' own acceptance of M-learning, their expertise in mobile technologies and their motivation to use them in the learning process.

This may be explained by the collectivist features of Saudi culture, in which teachers are regarded as figures of power and authority to be strictly obeyed. Additionally, the finding may be interpreted in light of the transactional and administrative effects of M-learning integration into the learning process. In particular, it may be that the mere fact of M-learning integration into the curriculum causes students to feel obliged to adopt this technology. Similarly, there is no denying the importance of the fact that Saudi society exhibits a high level of uncertainty avoidance, and that the University's introduction of a M-learning course indicates the confidence of educational authorities and teachers in the advantages and benefits of this innovation.

The significant impact of students' personal innovativeness was also established ($\beta = .655$). Personal innovativeness refers to a student's intrinsic creativity, openness to new educational techniques and tools and

overall willingness to use innovative technologies in the learning process. The high rating for this factor in the present study suggests that educators should pay more attention to motivating students with high personal innovativeness to use M-learning, as well as investing greater effort in raising the general level of personal innovativeness among students. Finally, these findings suggest that self-management of learning is the weakest predictor of M-learning acceptance among students. Self-management refers to students' capacities of autonomous learning, self-discipline and time management. These capacities are especially important in developing critical thinking and creativity in students and should therefore be closely addressed by educators in implementing M-learning courses.

7. Implication

The areas of potential impact can grouped under three main headings: educational institutes and universities, target audience, and educational smartphone applications.

7.1 The Educational Institutes and Universities

Educational institutions and universities everywhere are seeking new technical means of enhancing learning facilities and options in the service of the educational process. To this end, special deanships in some universities provide online learning services, and these universities have helped to advance the wider use of distance learning more generally. This is an increasing trend in terms of the number of educational institutions and universities now offering such mediated disciplines and courses, perhaps reflecting labour market needs. Such courses can be provided through online learning systems that are mainly compatible with the needs of university students. The results of this study align with earlier evidence that students who complete bachelor degrees are likely to seek opportunities to complete further educational stages (such as masters degrees) in order to improve their future earning power. It is the responsibility of educational institutions and universities to provide such educational opportunities in all disciplines by electronic means wherever possible. In the present study, M-learning can be identified as an effective means of raising education levels in Saudi society, representing a good investment in the country's future by building on the experience of others in developing online learning infrastructure.

7.2 The Target Audience

In terms of the target audience, the results of the present study explored relevant characteristics of higher education students in Saudi Arabia in relation to learning by means of smartphone devices. One of the key findings was that higher education students considered it appropriate that M-learning should play a part in academic education. This information will be of help to interested agencies in developing online educational programs of interest to this population segment and confirms that scientific research can help to identify relevant development areas. The society characteristics have been shown to impact significantly on acceptance of online learning facilities among students in Saudi Arabia. The finding that previous experience also affects acceptance of M-learning in many cases highlights the importance of providing educational materials to increase the knowledge and skills required to fully exploit the benefits of smartphones for learning. Such materials offer a means of increasing the audience size for M-learning facilities in the future. Another of the study's results indicated that college students are interested in using online learning facilities. This emerged in the responses to some demographic questions, indicating that more than 65% of students are using online learning facilities, and that more than 62% are learning by electronic means daily. This is willingness to learn, whether in relation to academic or other subjects, lends further weight to the argument for activation of M-learning in Saudi universities.

7.3 The Smartphone Applications

In relation to educational smartphone applications, the results of this study indicate that the preferred devices for use in online learning among the target audience are smartphones, iPads and Tablets, with respective usage rates of 29.7%, 21.4% and 12.7%. This again provides useful information for the design of educational applications for M-learning in terms of device compatibility for the target audience.

7.4 Future Research

The present findings highlight a number of promising directions for future research in the implementation of M-Learning in higher education institutions in Saudi Arabia as informed by student acceptance. For example, what might be the requirements for effective informal e-learning systems, given the cultural issues surrounding women in Saudi Arabian communities? And what other cultural factors might influence levels of adoption and acceptance of M-learning in Arabic societies? In pursuing these lines of inquiry, it may be useful to engage with ongoing research in other Arabic societies, given the convergence of education policies between these countries. It seems likely that mobile educational applications developed in Arabic would serve many of the peoples of the

Arabic region because of their shared main language.

8. Conclusion

The present research has explored the factors influencing acceptance of M-learning in higher education institutions, including universities, in Saudi Arabia, which are actively seeking to adopt these technologies in the development of online learning. M-learning provides wide access across a range of educational goals and electronic networks. The use of mobile devices further extends the possibility of teaching and learning without the constraints of time and place. The main objective of this study was to verify the factors influencing acceptance of mobile learning among higher education students in Saudi Arabia. A quantitative, questionnaire-based approach was used to collect relevant data. The questionnaire was distributed across a wide range of institutions to students at different levels (e.g. diploma, bachelor, postgraduate). More than 400 participants, studying through e-learning (either partly or wholly) in different colleges and universities, responded to the questionnaire. As well as an online invitation by email, social networking channels such as Twitter, Facebook and WhatsApp were used to invite participation.

As a theoretical framework, the UTAUT model was adopted to study M-Learning acceptance levels. In previous studies, there has been relatively little specific focus on M-Learning in Saudi Arabia, and between 2013 and 2014, no such study used the Modified UTAUT framework. In this respect, the present study bridges a significant gap in the literature.

The study has identified factors affecting acceptance and adoption of M-learning in the Saudi context, identifying needs among the target population as well as the challenges they face in this regard. To improve the experience of users and to increase the numbers of university students using M-learning in the future, several Saudi universities have established special deanships with specific responsibility for online learning facilities and systems. The present research contributes to clarifying current trends, helping all stakeholders to face the major challenges in the developing field of online learning in general, and of M-learning in particular.

References

Abu-Al-Aish, A., & Love, S. (2013). Factors influencing students' acceptance of M-Learning: An investigation in higher education. *The International Review of Research in Open and Distributed Learning*, *14*(5), 82-107.

Adkins, S. (2011). *The US Market for Mobile Learning Products and Services: 2010-2015 Forecast and Analysis.* Retrieved June, 10, 2016 from http://www.ambientinsight.com/Resources/Documents/Ambient-Insight-2010-2015-US-Mobile-Learning-Market-Executive-Overview.pdf

Al-Barhamtoshy, H. M., & Himdi, T. (2013). *Designing and Implementing M-Learning Model,* 1-13.

Alriyadh. (2007). *Afaq is integrated project develop the universities in Saudi Arabia.* Retrieved June, 10, 2016, from http://www.alriyadh.com/214474

Altameem, T. (2011). Contextual mobile learning system for Saudi Arabian universities. *International Journal of Computer Applications*, *21*(4), 21. http://dx.doi.org/10.5120/2499-3377

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of Marketing Science*, *16*(1), 74-94. http://dx.doi.org/10.1007/BF02723327

Behera, A. P. D. S. K. (2013). E-and M-Learning: A comparative study. *International Journal on New Trends in Education and Their Implications*, *4*(3).

Brown, R., Ryu, H., & Parsons, D. (2006). Mobile helper for university students: A design for a mobile learning environment. In *Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments* (pp. 297-300). ACM. http://dx.doi.org/10.1145/1228175.1228227

Chanchary, F. H., & Islam, S. (2011). Mobile learning in Saudi Arabia: Prospects and challenges. *5th International Conference on E-Learning*, 1-6.

Chao, P. Y., & Chen, G. D. (2009). Augmenting paper-based learning with mobile phones. *Interacting with Computers*, *21*(3), 173-185. http://dx.doi.org/10.1016/j.intcom.2009.01.001

Chen, H. R., & Huang, H. L. (2010). User Acceptance of Mobile Knowledge Management Learning System: Design and Analysis. *Educational Technology & Society, 13*(3), 70-77.

Chong, J. L., Chong, A. Y. L., Ooi, K. B., & Lin, B. (2011). An empirical analysis of the adoption of m-learning in Malaysia. *International Journal of Mobile Communications*, *9*(1), 1-18. http://dx.doi.org/10.1504/IJMC.2011.037952

Dawabi, P., Wessner, M., & Neuhold, E. (2004). Using mobile devices for the classroom of the future. *Learning with Mobile Devices*, 55.

DiStefano, C., & Hess, B. (2005). Using confirmatory factor analysis for construct validation: An empirical review. *Journal of Psychoeducational Assessment*, *23*(3), 225-241. http://dx.doi.org/10.1177/073428290502300303

EMarketer. (2015). *Smartphones, Tablets Spread across the Middle East and Africa.* Retrieved February 3, 2016, from http://www.emarketer.com/Article/Smartphones-Tablets-Spread-Across-Middle-East-Africa/1012989

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 39-50. http://dx.doi.org/10.2307/3151312

Garg, V. (2013). *The Emergence of Mobile Learning for Higher Education in Kingdom of Saudi Arabia*. Retrieved May 2016 from http://www.upsidelearning.com/blog/index.php/2013/01/15/emergence-of-mobile-learning-for-higher-education-in-kingdom-of-saudi-arabia/Documents/PR_REP_009A.pdf

Gerbing, D. W., & Anderson, J. C. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research*, 186-192. http://dx.doi.org/10.2307/3172650

Goh, T., & Kinshuk, D. (2006). Getting ready for mobile learning—adaptation perspective. *Journal of Educational Multimedia and Hypermedia*, *15*(2), 175-198.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.

InfoDev. (2010). *ICT in school education* (primary and secondary). Retrieved June, 10, 2016, from http://www.infodev.org/en/Document.1016.pdf

Iqbal, S., & Qureshi, I. A. (2012). M-learning adoption: A perspective from a developing country. *The International Review of Research in Open and Distance Learning, 3*(3), 147-164.

Jaradat, R. M. (2014). Students' Attitudes and Perceptions towards using m-learning for French Language Learning: A case study on Princess Nora University. *Int. J. Learn. Man. Sys*, *2*(1), 33-44. http://dx.doi.org/10.12785/ijlms/020103

Ju, T. L., Sriprapaipong, W., & Minh, D. N. (2007). On the success factors of mobile learning. *Proceeding for the 5th International Conference on ICT and Higher Education.* Bangkok, Thailand. Retrieved June, 10, 2016, from http://phd-e%20Learning.pdf

Kline, R. B. (2005). *Principles and Practice of Structural Equation Modeling.* 2005. New York, NY: Guilford.

Koufteros, X. A. (1999). Testing a model of pull production: A paradigm for manufacturing research using structural equation modeling. *Journal of Operations Management*, *17*(4), 467-488. http://dx.doi.org/10.1016/S0272-6963(99)00002-9

Kukulska-Hulme, A., & Traxler, J. (Eds.). (2005). *Mobile learning: A handbook for educators and trainers*. Psychology Press.

Liu, Z., Zhao, G., Zheng, W., & Jin, J. (2008). *The research and exploration of mobile-learning based on Web 2. 0.* Paper presented at the International Symposium on Knowledge Acquisition and Modeling (KAM'08), Wuhan, China

Lowenthal, J. (2010). Using mobile learning: Determinates impacting behavioral intention. *The American Journal of Distance Education, 24*(4), 195-206. http://dx.doi.org/10.1080/08923647.2010.519947

Lu, C. S., Lai, K. H., & Cheng, T. E. (2007). Application of structural equation modeling to evaluate the intention of shippers to use Internet services in liner shipping. *European Journal of Operational Research*, *180*(2), 845-867. http://dx.doi.org/10.1016/j.ejor.2006.05.001

MacCallum, K., & Jeffrey, L. (2009). Identifying discriminating variables that determine mobile learning adoption by educators: An initial study. *Same Places, Different Spaces. Proceedings Ascilite Auckland 2009*.

Milrad, M., Hoppe, U., Gottdenker, J., & Jansen, M. (2004). Exploring the use of mobile devices to facilitate educational interoperability around digitally enhanced experiments. In *Wireless and Mobile Technologies in Education, 2004 Proceedings the 2nd IEEE International Workshop on* (pp. 182-186). IEEE. http://dx.doi.org/10.1109/WMTE.2004.1281380

MOHE. (2013). *Privacy Polices.* Retrieved June, 10, 2016, from http://www.mohe.gov.sa/ar/Pages/Policy.aspx

MOHE. (2014). *Public universities in Saudi Arabia*. Retrieved June 5, 2016, From http://kr.mohe.gov.sa/ar/eservices/ Pages/ ksa_gov_universites.aspx

Nassuora, A. B. (2012). Students acceptance of mobile learning for higher education in Saudi Arabia. *American Academic & Scholarly Research Journal*, *4*(2), 24-30.

Phuangthong, D., & Malisawan, S. (2005, August). A study of behavioral intention for 3G mobile Internet technology: Preliminary research on mobile learning. In *Proceedings of the Second International Conference on eLearning for Knowledge-Based Society* (pp. 4-7).

Razek, M. A., & Bardesi, H. J. (2011). Towards adaptive mobile learning system. *IEEE, 11th International Conference on Hybrid Intelligent Systems (HIS)*, 493-498. http://dx.doi.org/10.1109/his.2011.6122154

Shah, R., & Goldstein, S. M. (2006). Use of structural equation modeling in operations management research: Looking back and forward. *Journal of Operations Management*, *24*(2), 148-169. http://dx.doi.org/10.1016/j.jom.2005.05.001

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

Wang, Y. S., Wu, M. C., & Wang, H. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, *40*(1), 92-118. http://dx.doi.org/10.1111/j.1467-8535.2007.00809.x

Yusuf, N. (2013). The future of global education. *International Journal of Business and Economic Development*, *1*(3), 75-82.

Appendix A: Frequencies of demographic questions (N=401)

Category of Participants	No.	%
Q1. Gender		
Male	194	48.4
Female	207	51.6
Q2. Age Group		
18 Years or Less	8	2.0
19 – 20	77	19.2
21– 22	58	14.5
23 – 24	35	8.7
25 – 26	27	6.7
27 Years or Upper	196	48.9
Q3. Level of education		
Undergraduate	65	16.2
Graduate	251	62.6
Postgraduate	85	21.2
Q4. Experience of Smart mobile phone		
Less than 1 year	11	2.7
1-2 Years	37	9.2
3-4 Years	148	36.9
5 years or more	205	51.1
Q5. e-learning knowledge level		
Moderate	138	34.4
Good	106	26.4
Very Good	157	39.2
Q6. Frequently using m-service for learning		
1 time per week	150	37.4
1-5 times per day	100	24.9
5-10 times per day	100	24.9
More than 10	51	12.7
Q7. Internet plan		
Prepaid	208	51.9
Post-paid	144	35.9

Both	49	12.2
Q8. Type of ISP (internet Service Providers)		
Wi-Fi	122	30.4
3G or 4G	90	22.4
Both	189	47.1
Q9. Mobile OS usage		
Apple IOS	131	32.7
Android	171	42.6
Windows	10	2.5
BlackBerry	3	.7
Apple & Android	34	8.5
Android & Windows	25	6.2
Apple & Windows	14	3.5
Apple & Android & Windows	13	3.2
Q10. Kind of smartphone is used		
Smart Phone	226	56.4
Tablet	10	2.5
iPad	13	3.2
Smart Phone & Tablet	48	12.0
Smart Phone & iPad	83	20.7
Smart Phone & Tablet & iPad	17	4.2
PDA/Palmtop	1	.2
Smart Phone & iPad & PDA/Palmtop	3	.7
Q11. Prefare_Device_4_using in m-learning		
Smart Phone	119	29.7
Tablet	51	12.7
iPad	86	21.4
Palmtop	8	2.0
Smart Phone & iPad	60	15.0
Tablet & iPad	16	4.0
Smart Phone & Tablet	27	6.7
Smart Phone & Tablet & iPad	34	8.5