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An Empirical Study of Factors Driving the Adoption of Mobile Learning in Omani Higher Education

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Article abstract

Mobile learning (M-learning) provides a new learning channel in which learners can access content and just in time information as required irrespective of the time and location. Even though M-learning is fast evolving in many regions of the world, research addressing the driving factors of M-learning adoption is in short supply. This article focuses on the driving factors in adoption of M-learning and the learner's perceptions and willingness towards M-learning adoption. Technology Acceptance Model (TAM) has been shown to be a valid and powerful model in mobile and other learning technologies research. Based on Technology Acceptance Model theory, this paper analyzes the influencing factors on M-learning adoption and measure the acceptance of M-learning in Oman. The data collected from 806 participants in 17 different Omani higher education institutions using a survey questionnaire. Some factors of perceived innovative characteristics, such as ease of use, usefulness, enjoyment, suitability, social, and economic were found to have more influence on learners' adoption of M-learning which help to facilitate and promote future empirical research. This effort is part of funded research project that investigate the development, adoption, and dissemination of M-learning in Oman.

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Abstract

Mobile learning (M-learning) provides a new learning channel in which learners can access content and just in time information as required irrespective of the time and location. Even though M-learning is fast evolving in many regions of the world, research addressing the driving factors of M-learning adoption is in short supply. This article focuses on the driving factors in adoption of M-learning and the learner's perceptions and willingness towards M-learning adoption. Technology Acceptance Model (TAM) has been shown to be a valid and powerful model in mobile and other learning technologies research. Based on Technology Acceptance Model theory, this paper analyzes the influencing factors on M-learning adoption and measure the acceptance of M-learning in Oman. The data collected from 806 participants in 17 different Omani higher education institutions using a survey questionnaire. Some factors of perceived innovative characteristics, such as ease of use, usefulness, enjoyment, suitability, social, and economic were found to have more influence on learners' adoption of M-learning which help to facilitate and promote future empirical research. This effort is part of funded research project that investigate the development, adoption, and dissemination of M-learning in Oman.

Keywords: mobile learning, M-learning, adoption factors, higher education

Introduction

The idea of using M-learning in educational and instructional technology field has dramatically evolved in the last decade. With growing acceptance of mobile devices, it is important that adequate learning and

educational approaches are developed in order to utilize the benefits of mobile devices effectively for an enhanced learning. M-learning is defined as learning delivered across multiple contexts through social and content interactions, using handheld and mobile technologies such as personal digital assistants (PDAs), smartphones, or other mobile devices (Sarrab, 2014; Sha, Look, Chen, & Zhang , 2012). M-learning increases learning flexibility by adapting learning to be more personalized and learner-centered. M-learning can be supported in formal as well as informal settings. The mobility and flexibility features offered by mobile devices enable knowledge building by learners in different contexts. A well-implemented M-learning application can assist in saving the cognitive load by filtering accessible information based on all contextual factors (Chao, Lai, Chen, & Huang, 2013; Sarrab, Elbasir, & Alnaeli, 2016).

Despite the rapid growth of M-learning technology, there is a lack of research data addressing the factors that drives M-learning adoption. The learner's perception and acceptance of M-learning has to be investigated before adopting the technology. Therefore, it is essential to conduct research that identifies the driving factors of M-learning adoption. Various techniques are available for deriving the factors for acceptance of M-learning. User's acceptance of M-learning is the vital part in the development of a successful M-learning application. Therefore, there is a need to explore the factors that have to be considered while application development. The most important factor to be considered in the development phase of M-learning is mobility. It enables users to be in contact even outside the reach of conventional communication spaces (Sarrab, Alzahrani, Alalwan, & Alfarraj, 2014; Yao-Ting, Kuo-En, & Tzu-Chien, 2016).

In this context, the research study was carried out using Technology Acceptance Model (TAM) as a theoretical framework for university students' acceptance of M-learning and its intention of use. TAM is one of the most widely used theories in studying the adoption of IT innovations and new information systems. The core objectives of the study are:

- To derive factors which affect M-learning adoption in Oman.
- To measure the acceptance of M-learning in Oman.

Related Work

M-Learning

Instructors are enforced to use modern information technology tools as learners become more Information and Communication Technology (ICT) savvy through what is called E-learning that employ the networked communications systems which utilize the advantage of modern information technology to carry out the learning process using computer-based learning, virtual classroom, Web-based learning, digital collaboration and other learning technologies. The lack of flexibility in E-learning approach lead to M-learning utilizing the innovative technologies offered by recent portable and mobile devices (Ciampa, 2014; Isaiah & Martin, 2015; Moore, 2011). M-learning is a new and independent part of E-learning

(Florence & Jeffrey, 2013). M-learning in higher education is still in the early stages of development (Park, 2011).

The main concern of M-learning approach is to offer anywhere and any-time learning opportunity. Which can be achieved using different mobile devices, for example, personal digital assistants (PDAs), smart-phones, and tablet computers (Sarrab, 2015; Uzunboylu & Ozdamli, 2011).

Generally, M-learning can be defined as "any educational provision where the sole or dominant technologies are handheld or palmtop devices (Park, Nam, & Cha, 2012). With the growing popularity of mobile devices usage in education, there is a need for research that focuses on how learners adopt M-learning and the factors those drive its acceptance (Liu, 2008; Tsai, Tsai, & Hwang, 2012). Moreover, impelled by the growing market of various mobile technologies, M-learning has grown in to more widely accepted solutions in educational environments (Sarrab, Al-Shih, & Rehman, 2013). User's acceptance is the vital part in the deployment of M-learning solution (Liu et al, 2010) as M-learning allow users to customize their contents according to their needs offering more flexibility in learning process. However, it has been widely recognized that M-learning is not just about the use of mobile devices in the learning process but also about learning across contexts (Walker, 2006). Winters (2006) reconcept M-learning to address the mediated learning via mobile technology.

M-Learning in Middle East

In the Middle East, E-learning is seen to be very promising both to corporations and educational institutions. Mobile devices have revolutionized communication and entertainment systems of today's world. But the educational benefits of mobile devices remains unexplored predominantly in the educationally less advanced countries of the Middle East (Khan, Al-Shihi, Al-Khanjari, & Sarrab, 2015). There are only few countries that could employ mobile devices in learning environment quite effectively. These countries include South Korea, USA, Japan, Taiwan, Malaysia, Singapore, Australia, and European Union as well. The educationally advanced countries have developed strong policies and strategies for handling the 21st century educational need. These strategies are not effectively explored in Middle East. There are four major catalysts in the emergence of M-learning market in Middle East which includes: consumer demand for M-learning apps, large-scale deployments of tablets in the educational sectors, nationwide content digitization efforts across the academic institutions in the region, and the rapid adoption of M-learning in the higher education sectors (Romani, 2009; Sarrab & Elgamel, 2013).

According to the International Telecommunication Union (ITU), the Middle East has some of the highest mobile penetration rates in the world. With the growing number of mobile devices in Middle East, mobile connectivity is very important for internet connectivity. This is evident for Information Technology Authority of Oman, that the country has more than 150% of mobile penetration rate per inhabitant for mobile internet services. Hence, every Omani organization, school, business, home, and office has access to the World Wide Web. Most importantly, they will be able to use such internet accessibility with mobile technologies interact, transact, and gain the required of knowledge. In Oman, one of the key driving factors of mobile connectivity popularity is that the traditional landline options are simply unavailable or are prohibitively inconvenient to access in many regions in the country. Therefore, wireless technologies is the main internet infrastructure. The internet operators provide 3G and 4G networks and have

launched 4G Long Term Evolution (LTE) services as well (Information Technology Authority, 2013). In spite of a considerable mobile and network penetration, several findings in the Middle East region have revealed that stakeholder lacks awareness and potential benefits related to M-learning. The lack of awareness among stakeholders about the positive educational value that mobile phones can add, and a generalized conservatism toward the use of mobile phones by young people, also serve as inhibiting factors for adoption of M-learning in these countries (Isaacs, 2012). However, some countries in Middle East are taking initiatives for introducing M-learning to their educational system, for example Saudi government has initiated projects for distance and M-learning JUSUR (a Learning Management System), Saudi Digital Library. The Qassim College of Medicine is known to be the first higher education college in Saudi Arabia, providing M-learning.

M-learning infrastructure of a country depends upon the national telecommunications and information infrastructure. The educational institution must have proper infrastructure for a proper deployment of M-learning solutions (Khan et al., 2015). M-learning providers in educationally less developed countries of Middle East are less focused on the learners' characteristics and styles. Most of the available contents are un-organized as well as non-instructional. In Saudi Arabia, M-learning face the problems of customized contents. For example, a study at King Khalid University, revealed that the interference between learning and non-learning materials on social media.

Intrinsic of M-Learning Drivers

The ideas and concepts of M-learning started to become popular in different education sectors and learning environments. M-learning helps to reduce the traditional training infrastructure and simplifies the learning process. It enhances a new dimension for learner–instructor interaction thus improving the accessibility, interoperability, and reusability of educational resources and a positive attitude among the learners towards learning (Manoj & Jayesh, 2014). Despite the tremendous potential, there are a number of factors driving M-learning adoption. In order to deliver adequate M-learning services, it is essential to examine the learner's adoption process of M-learning (Liu, 2008). The key factors for the success of M-learning depends on the user's willingness and cognitive engagement in M-learning activities. There are technical and non-technical constraints in M-learning adoptions. The technical constraints include communication infrastructure, software application and content customization while the non-technical consists of operational feasibility, trust, awareness, training, cultural norms and financial support (Liu et al., 2010).

Based on previous researches on M-learning adoption, various roles of M-learning users are considered when adopting M-learning services, namely technology user, consumer, instructor and learner. The adoption of M-learning solution has been intensively studied by researchers in which the Technology Acceptance Model (TAM) is one of the most widely accepted and applied models. Two theories, namely subjective task value and readiness for online learning, are integrated with TAM in combination with two influencing factors – perceived usefulness and perceived ease of use, in order to develop an advanced conceptual model (Liu, 2008).

Theoretical Background

Technology Acceptance Model (TAM) is one of the well-known models related to acceptance of technologies which was originally proposed by Davis in 1986. The concept of TAM is to provide a theoretical basis to describe behavioral intentions attitude toward use, external variables impact, internal beliefs and the usage of actual system (Legris, Ingham, & Collerette, 2003). Based on Ajzen and Fishbein (1980) TAM is an extension model of Theory of Reasoned Action (TRA). TAM is proposed to be a model of user acceptance of information technology by adapting TRA Davis (1989) and Davis, Bagozzi, and Warshaw (1989). TAM adapts this belief attitude intention behavior relationship and further hypothesizes that two influencing factors (perceived ease of use and perceived usefulness) are the key factors leading to user acceptance of information technology (Zhao & Zhu, 2010). TAM also proposed that external factors affect actual and intention use through mediated effects on perceived ease of use and perceived usefulness (Davis, 1989). Perceived ease of use refers to the degree to which prospective user expects that using a particular service would be free of effort while perceived usefulness is defined as the degree to which an individual perceives that using a particular system would enhance their performance (Davis, 1989). Further, perceived ease of use is supposed to influence perceived usefulness, which directly affects attitude and intention as well as willingness. Figure 1 shows the proposed research model.

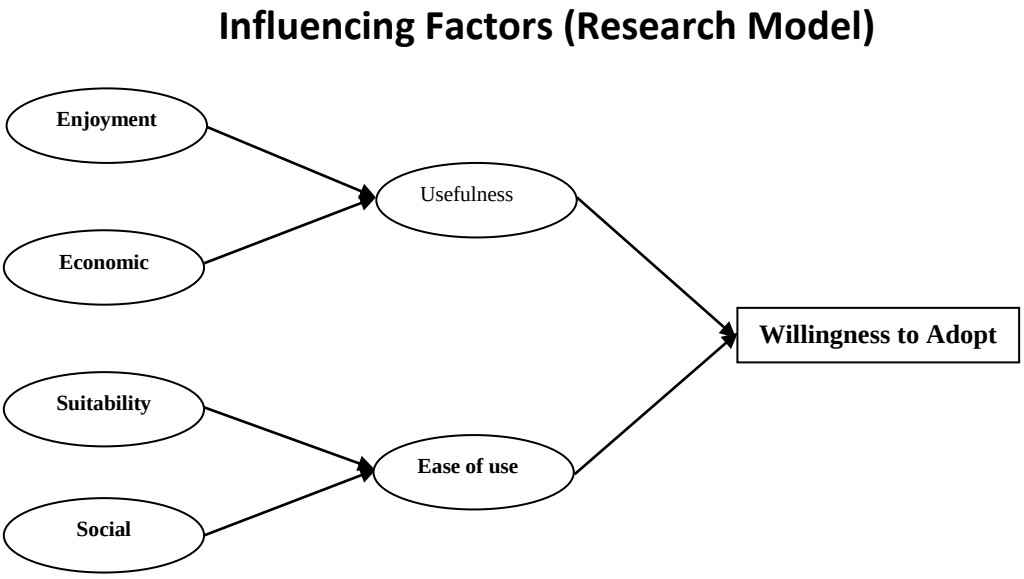

Figure 1. Research model.

According to TAM, ease of use and perceived usefulness are most important determinants of actual system use. These two factors are influenced by external variables. The main external factors are social factors, cultural factors, and political factors. Social factors include language, skills, and enabling conditions (Almasri, 2014). Political factors are mainly the impact of using technology in politics and political crisis. The attitude to use is concerned with the user's evaluation of the desirability of employing

a particular information system application. Behavioral intention is the measure of the prospect of a person employing the application (Zhao & Zhu, 2010).

Perceived Usefulness

"Perceived usefulness was found to have significant impacts on the willingness to adopt any technology" (Chau, 1996). Perceived usefulness has been proposed or validated to be an important motivator for the acceptance of a number of technological innovations (e.g., Jiang, Hsu. Klein & Lin,, 2000). In M-learning perceived usefulness is defined as "the learners' perception that the task will be useful to meet some future goal" (Cole, Bergin, & Whittaker, 2008). Eccles and Wigfield in 2002 stated that learners may adopt a learning activity since it facilitates the attainment of important future goals, although they lack interest in the learning activity (Eccles & Wigfield, 2002). Concerning educational IT innovations, such as web-based learning, utility value is also found to be a substantial factor impacting learners' intentions (Chiu, Sun, Sun, & Ju, 2007). "Chiu and Wang in 2008 indicated that improving learning performance, effectiveness and productivity represent learners perceived performance expectancy." (Chiu & Wang, 2008).

The proposed model considers the influence of two external variables of perceived usefulness which are enjoyment and economic. Enjoyment refers to the felt when using mobile devices for learning (Andrew, 2011; Sarrab, Alzahrani, Alalwan, & Alfarraj, 2015) and economic refers to M-learning solution that predicts the learner's economic behavior (Andreea & Cristina, 2012; Sarrab, Alzahrani, Alalwan, & Alfarraj, 2015).

It is essential to include a construct of perceived usefulness in TAM to explain the adoption of educational IS innovations. Instead of offering instant rewards, educational IS innovations, such as M-learning tend to benefit learners in the future and in the long term. When it complies with their future goals, students would be more likely to accept M-learning. This increases a positive feeling of near-term usefulness.

Perceived Ease of Use

Perceived ease of use issues have been considered as an important factor affecting M-learning adoption. Perceived ease of use refers to the degree to which the user expects that using a particular service would be free of effort. In 2009, Wang, Wu, and Wang stated that there are several challenges facing M-learning, such as connectivity, limited processing power, and reduced input capabilities along with many possible technological restrictions impeding M-learning adoption, such as small screen size and poor screen resolution. The proposed model considers the influence of perceived ease of use in respect of two external variables including suitability of using mobile devices in learning (Economides & Nikolaou, 2008; Sarrab, Alzahrani, Alalwan, & Alfarraj, 2015) and social use of mobile devices and social media produces personalized M-learning (Claudia, 2013; Economides & Nikolaou, 2008; Sarrab, Alzahrani, Alalwan, & Alfarraj, 2015). In TAM, perceived ease of use is found to be significant behavior predictor of perceived usefulness and behavioral intention (Legris et al., 2003; Li, Qi, & Shu, 2008); perceived ease of use is found to be a significant predictor of perceived to behavioral of willingness to adopt M-learning.

Research Methodology

The study commenced with a focused literature review on key concepts from the following areas: technology adoption and diffusion, learning management systems, E-learning, and M-learning. The aim was to highlight E-learning adoption factors and issues and specifically, M-learning. Several adoption factors were highlighted, as well as technical and non-technical issues were considered. The issues were investigated as likely inhibitors to adoption. At this stage, factors and issues were refined and combined to produce 12 distinctive factors. A pilot survey instrument was developed with sets of questions for each factor following Likert scale (1 – 5). The aim was to validate the accuracy and consistency of the factors and their corresponding questions statements from the point of view of teachers and students. More than 850 online and hard copy survey questionnaires were distributed with a response rate of about 95% was achieved. Intially, the data validation showed low accuracy/consistency for more than half of the questions and factors, subsequently, only six factors were chosen to develop the M-learning acceptance measure, as follows:

- Ease of use of mobile devices in accessing learning contents anywhere (Davis, 1989).
- Suitability of using mobile devices in learning (Economides & Nikolaou, 2008).
- Enjoyment felt when using mobile devices for learning (Huang, Hsiao, Tang & Lien, 2014).
- Usefulness of using mobile devices in learning on society in general and the relationship between teachers and students in specific (Davis, 1989).
- Economic M-learning as an economic learning approach provides a solution that predicts the learner's economic behavior (Andreea, 2011).
- Social using mobile devices and social media produces personalized M-learning (Claudia, 2013; Economides & Nikolaou, 2008).

Survey Instrument and Sample

As most of the current M-learning services are focused on university students, they accordingly became the target group of the study. The sample was collected from undergraduate students in all over Sultanate of Oman colleges and universities. Students and faculties were invited to participate and complete the questionnaire. A brief seminar of survey purposed, talking about scope of the study, objectives, problem of M-learning, and other point's related to same topic was given.

A total of 806 responses were collected. The respondents consisted of 39.6% males and 60.4% females. Ages ranged between 23-29 had a response percentage of over half at 59.9%. The descriptive statistics of the sample are shown in Table 1. Among the respondents, 47.4% are using smart phones for internet access and about 35.6% are using mobile devices for more than 4 hours daily.

Table 1

Demographic Information of Study Participants

Demographic Profile	Percent (%)

Gender	
Male	39.6%
Female	60.4%
Age Range (in year)	
18-23	59.8%
24-29	11.6%
30-35	7.3%
36-41	10.8%
42-47	4.8%
48+	5.7%
Devices used most for internet accessing	
Desktop/ PC	17.5%
Laptop	31.5%
Smart phone	47.4%
Tablet	2.9%
Other	0.8%
Period of time using mobile devices	
Less than 1 hour daily	7%
1-2hours daily	29.5%
3-4 hours daily	26.5%
More than 4 hours daily	35.6%
Other	1.4%

Data Analysis and Results

Table 2 showed the measurement model including the question items and extracted factors values and Table 3 presents the correlation matrix and discriminant assessment of the selected factors Principal components extraction with Varimax rotation was first conducted to extract five factors using SPSS 23. The results show that all items fit their respective factors quite well. All the factor loadings are above the threshold of .7. As described in Table 2, the Cronbach's alpha values range from .716 to .0.8649, which are all over the .7 level. Confirmative factor analysis was then conducted using AMOS 7.0. The composite reliability values (CR) and average extracted variance (AVE) of all the constructs satisfy the recommended level of .8 and .5 respectively, thereby indicating good internal consistency (Fornell & Larcker, 1981).

Table 2

The Measurement Model

Item	Factors Extracted						Cronbach's alpha	CR	AVE
	1	2	3	4	5	6			
Q241	.737	.116	.336	-.003	.164	.031	0.846	0.843	0.478

Q242	.750	.119	.307	-.068	.123	.060			
Q243	.645	.171	.189	.127	.056	.179			
Q244	.724	.073	.115	.197	.048	.082			
Q245	.728	.104	-.024	.244	.079	-.003			
Q246	.620	.250	-.029	.266	.062	.066			
Q258	.059	.003	.160	.095	.210	.673			
Q259	.031	.121	.066	.026	.161	.820	0.716	0.729	0.477
Q2510	.186	.209	.109	.134	.041	.777			
Q271	.198	.216	.385	.543	.252	.116			
Q272	.146	.106	.106	.752	.138	.107	0.7927	0.796	0.496
Q273	.204	.192	.219	.743	.166	.072			
Q274	.158	.188	.333	.591	.003	.062			
Q281	.272	.200	.743	.253	.169	.101			
Q282	.197	.179	.728	.289	.145	.160	0.8639	0.867	0.686
Q283	.206	.159	.692	.249	.102	.198			
Q301	.167	.129	.161	.131	.773	.086			
Q302	.008	.165	.092	.060	.762	.252	0.7307	0.731	0.476
Q303	.196	.180	.122	.193	.666	.130			
Q311	.084	.571	.437	.106	.311	.049			
Q312	.096	.625	.394	.128	.202	.098			
Q314	.157	.678	.273	.077	.154	.130	0.8277	0.828	0.491
Q315	.220	.777	.079	.143	.090	.130			
Q316	.215	.717	-.047	.267	.082	.070			

Table 3

Correlation Matrix and Discriminant Assessment

Variable	Mean	SD	Usefulness	Ease of Use	Suitability	Enjoyment	Economic	Social
Usefulness	3.5246	0.9696	0.828					
Ease of Use	3.1803	1.0667	0.584	0.692				
Suitability	3.2437	1.1355	0.453	0.359	0.691			
Enjoyment	3.6565	0.9901	0.733	0.571	0.439	0.704		
Economic	3.3203	1.0473	0.566	0.451	0.533	0.582	0.69	
Social	3.5989	1.0216	0.671	0.545	0.477	0.684	0.633	0.701

Table 4 shows the model fit indices that determines how well proposed model fits the collected data that aims to provide the most fundamental indication of how well the proposed theoretical framework fits the sample data. Included in this category are the Goodness-of-fit statistic (GFI) with recommended value <0.9 and obtained value 0.891 and the adjusted goodness-of-fit statistic (AGFI) with obtained value

0,862, Normed-fit index (NFI) with obtained value 0,882, Comparative fit index (CFI) has value 0.903 which revised from FNI. In both NFI and CFI values for this statistic range between 0.0 and 1.0 with values closer to 1.0 indicating good fit, Tucker-Lewis Index (TLI) has obtained 0.887 and finally the Root mean square error of approximation (RMSEA) has obtained 0.066.

Table 4

Model Fit Indices

Model fit indices	GFI	AGFI	NFI	CFI	TLI	RMSEA
Recommended value	<.9	>.8	>.9	>.9	>.9	>.08
Obtained	0.891	0.862	0.882	0.903	0.887	0.066

General Discussion

Based on the study findings, it was revealed that about 90% of study participators were keen interest and willingness to adopt M-learning and use mobile devices in learning process. The study initial findings on the demographic section indicated that more than half 60.4% of the study participators were female and 39.6% were male. Most of the participators were from young generation where 59.8% were aged between 18-23 and the remaining 40% were distributed between different age groups as was shown in Table 1. The 47.7% majority of study participants use smart phones for internet accessing followed by 31.5% of participants using laptops to obtain information from the internet and about 20% of respondents using other types of machines to access internet. The responses indicate that more than 95% use their mobile devices for more than one hour per day. Finally, it can be discovered that more than 90% of the study participants are enthusiast and willing to use mobile devices as a learning tool.

The results of this study can provide insight into what factors need to be considered for designing an M-learning system. This research adds to the existing literature on user's acceptance and intention to adopt M-learning. Understanding the factors affecting M-learning will help the stakeholders to incorporate these factors in their design and implementation of M-learning initiatives.

Conclusion

M-learning has the potential to become an effective solution for providing education along with traditional methods. It is important to motivate learners about the benefits of using M-learning for higher education. The ease of use and usefulness of M-learning systems can add value to the existing learning management system through an advancement in learning process and enhancing the learner's acceptance towards M-learning. This research offers useful information in understanding the influencing factors on M-learning adoption and its acceptance in Oman. This study used Technology Acceptance Model (TAM) as a theoretical framework to examine the driving factors related to M-learning adoption. According to

TAM, perceived usefulness and perceived ease of use had a significant positive effect on user's adoption of M-learning systems. Furthermore, the findings reveal that ease of use, usefulness, enjoyment, suitability, social, and economic contributed significantly towards adoption of M-learning.

There is a need to motivate instructors, increase their awareness of using M-learning, and provide them with adequate training. The quality of service offered by M-learning systems needs to include user-friendliness, meeting of all user needs, and conversant service as this will attract more users to M-learning. In conclusion, the results indicated that there is a need to develop strategic plans and provide guidelines considering learners acceptance in order to include all critical driving factors for the sustainable deployment of M-learning.

Limitation and Implications for Future Studies

The rapid increase of mobile applications has outpaced the traditional software applications. However, these traditional software engineering applications cannot be applied directly in mobile devices due to the following issues:

- Different mobile platforms such as iOS, Android, Windows 7, etc.
- Different hardware makers for platforms such as HTC, Google, Samsung, Apple, etc.
- Mobile device user interfaces (UI) which provide a new mechanism for human computer interaction sequences such as multi-touch interfaces, image recognition, code scanning, etc., that have not been previously explored in research and there is no existing established user interface guidelines.

The main future concerns and challenges of M-learning adoption are as follows:

- M-learning may make it easier to fraud. M-learning users may use dishonest methods to take or copy something valuable from another person, this may make it easier to cheat.
- Finding the best infrastructures by choosing the right infrastructure that supports the needed mobile application operations.
- Creating universal M-learning system user interface. Means designing for diversity in end-users and contexts of use of M-learning system interface.
- Design an effective context aware M-learning application that can sense the environment and react or adapt to the changing context while learner's learning process.
- The wireless network trust ability. M-learning learners can employ mobile device and wireless network to get suitability, simplicity, and immediacy of M-learning in a proper response time and accessing appropriate learning content.

- Disclosing of the learner information via network. There should be a kind of privacy policy that enforces network not to disclose any learners information, unless their consent has been granted.

- Feeling of isolation, separation, or of being out-of-the-loop. The freedom offered by M-learning opens up opportunities for learner to work alone and isolated from other learners.

- Cross platform. M-learning system should be platform independent, where, learners can connect irrespective of their used devices, or platforms, for example, Android, iOS, Windows, or Blackberry.

Recommendations

In an epoch where humanistic values are diminishing and vision towards social progress is disintegrating, our need to promote responsible education and learning is more crucial than ever. The advent of mobile phones presents a great opportunity and offers a timely challenge to re-define and transform our educational paradigms. As wine fans claim, we cannot pour fresh wine in old bottles, likewise, M-learning too requires a new philosophical framework and new educational paradigms if it is to flourish. Only then will it become ubiquitous. Hence, below are some recommendations for the learning system policy-makers:

a. Leverage existing investments. Policy-makers should take stock of existing ICT investments and approaches to devise strategies that complement rather than replace the current infrastructure.

b. Localize policies. Policy-makers should consider the local contexts of the country or region when creating new policies or adapting existing ones, as strategies that work for one country may not be appropriate in another.

c. Support open technical standards. Policy-makers should encourage the use of open, standards-based platforms for M-learning applications, to increase access and streamline the development process.

d. Promote intersectional cooperation and multi-stakeholder partnerships. Policy-makers should promote cooperation between different branches of government and encourage partnerships between stakeholders from a variety of sectors and levels.

e. Establish policies at all levels. Policy-makers should create or revise M-learning policies at both the national and local levels, regardless of whether education is decentralized. National policies should provide overarching structure and guidance, while local policies direct implementation in individual districts or institutions.

f. Review and update existing policies. Policy-makers should revisit existing policies, particularly at the local level, that may be overly restrictive in regard to the use of mobile technology at schools and universities. National policies may need to be clarified or revised to give better guidance to districts and institutions.

g. Ensure inclusive education. Policy-makers should ensure that M-learning policies promote gender equality and accessibility for learners with disabilities. This effort is essential to meet Education for All (EFA) goals of providing quality education to all learners worldwide. ICT is a powerful vehicle for enhancing learning, and mobile devices form an essential part of this vehicle. If current ICT strategies for education begin to include mobile devices along with digital learning materials, support for teachers, and guidelines on best practices, M-learning will soon become an important part of education (Mehdipour & Hamideh, 2013).

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Appendix

Table 5

An Empirical Study Survey Items

Demographic Background	
Gender	Male, Female
Age range (in years).	18- 23, 24- 29, 30-35, 36-41, 42-47, 48+
Highest completed level of education	Higher Secondary, Diploma, Bachelor, Masters , Ph.D., Other
Profile	Full time, Part time, Teacher, Other
Income range (in R.O)	No income, Less than 251, 251-500, 501-750, 751-1000, 1001-1250, 1251-1500, 1501+
Internet Experience	
Internet usage	Yes, No
Devices used for internet accessing	Desktop/ PC, Laptop, Smart phones, Tablets, Other
How long (internet access time)	Less than 1 hour daily, 1-2hours daily, 3-4 hours daily, More than 4 hours daily, Other
Tasks accomplished using the internet	Searching information, Taking quiz, Playing games, Watching Videos online, Video conferencing, Downloading, Uploading, Chatting, Communication and Social networking
E-learning Experience	
E-learning Usage	Yes, No
How long (the use of E-learning)	Less than 1 hour daily, 1-2hours daily, 3-4 hours daily, More than 4 hours daily, Other
Tasks accomplished in E-learning	Downloading learning contents, Uploading learning contents, Reading E – books, Preparation of learning materials, Assignment preparation, Taking mock test, Communication with colleagues and teachers,
Major issues in E-learning	Not available all the time, not available everywhere, Not available all the time and Not available everywhere and others.
Mobile device experience	
Own mobile device	Yes, No
Type of mobile device	Desktop/ PC, Laptop, PDA, Tablets, Smart phones, E-Book reader, All of them except Desktop/ PC, Other
Apps used most often on	Limited period free trial (e.g. Verb Ace-Pro Arabic-English Dictionary,

mobile device	Magic Translator),Open source (WhatsApp, moodle), Purchased (Apps from Apple store, Apps from android)
How long (the use of mobile device)	Less than 1 hour daily, 1-2hours daily, 3-4 hours daily, More than 4 hours daily, Other
Tasks accomplished using mobile device	Accessing internet, Searching information, Messaging (SMS, MMS), Recording of video, Taking photographs, Installation of software, As a calculator, Taking quiz, Playing games, Watching videos, Video conferencing, Downloading (say games, videos), Uploading (say documents, ideos), Chatting, Communication (say email) and Social networking (say face book)
Mobile learning experience	
Usage of mobile device for learning	Yes, No
Where do mobile devices used for academic tasks	School, college campus, home, office, class room, lecture theatre and other.
Motivators behind the use of mobile device for learning	Parents, colleagues, teachers, myself and others.
Tasks accomplished in E-learning	Accessing learning contents, Watching educational videos, Chatting for learning, playing educational games, social networking for learning (say educational forums, discussion boards), assignment preparation, communication (say email, text messages) with colleagues and teachers, accessing dictionary, reading E-books, downloading (say games, educational software), up loading (say documents), taking quiz, recording of lectures, taking photographs of slides and video conferencing.
Mobile devices as learning tool	
Ease of use of mobile devices for learning	Learner can use learning material at any place, learner can use learning material at any time, creation of learning materials is easy, sharing of learning materials is easy, learning contents are in multiple formats (e.g. audio, video, document), learning content can be used for practical courses, the learning contents are compatible with different mobile operating systems (android, i phones etc.), end user support exists in the form of chat, and educational forums, people deprived of education can learn and people with special needs can learn (e.g. physically challenged).
Suitability of mobile devices for learning	Using mobile devices for learning is easy, mobile devices can be easily operated, learners has knowledge how to use mobile devices for learning, mobile device use as a learning tool requires training, mobile device use as a learning tool requires planning, the average screen size of mobile devices is appropriate for learning, the ordinary memory storage capacity of mobile devices is good enough for learning, the moderate power capacity of mobile devices is sufficient for learning, the accessible internet connectivity is good for learning in Oman and the available mobile device infrastructure can be used for learning in Oman
Interaction and Collaboration learning using mobile devices	Mobile devices facilitates one to one Learning, mobile devices facilitates learning in groups, and tracking the progress is easy, evaluation can occur instantly and interface design are user friendly.
Enjoyments of using mobile	Learning using a mobile device gives satisfaction, learning with the help of educational games is amusing, learning with the help of Educational Apps

devices for learning	is pleasing and learning using a mobile device is not boring.
Economic feasibility of learning using mobile devices	A mobile device cost is affordable, internet subscription fee is manageable, learning contents are economical (say E-book, discussion forums), learning contents can be used as many times as desired, M-learning requires financial support from the College, Financial support from the Government is desired for M-learning and Reduction in the overall learning expenditure.
Social feasibility of learning using mobile devices	Develops human values, develops trust between students and teachers, reduces use of paper so it friendly to environment, learning contents are available according to the local culture, learning contents are available according to the users need and learning contents are available in different languages
Willingness to adopt mobile devices for learning	Yes, No