



Research report

Investigating attitudes towards the use of mobile learning in higher education

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ARTICLE INFO

Article history:

Received 6 February 2015

Received in revised form

15 November 2015

Accepted 18 November 2015

Available online xxx

Keywords:

Mobile learning

Attitudes

Higher education

ABSTRACT

Mobile learning (M-learning) has become an important educational technology component in higher education. M-learning makes it possible for students to learn, collaborate, and share ideas among each other with the aid of internet and technology development. However, M-learning acceptance by learners and educators is critical to the employments of M-learning systems. Attitudes towards M-learning technology is an important factor that helps in determining whether or not learners and educators are ready to use M-learning. Such attitudes will serve to identify strengths and weaknesses and facilitate the development of the technology infrastructure. This paper aims at exploring students and educators' attitudes towards the use of M-learning in higher educational universities within Oman and UAE; two neighboring countries in the Arab Gulf region. To serve this purpose, two survey questionnaires were conducted: one for students and another for educators. The participants of this study are 383 students and 54 instructors from five universities. Different factors have been examined to test where there is a significant difference among students and educators' attitudes towards the use of M-learning, such as gender, age, country, level of study, smartphone ownership, major in terms of students and age, country, academic rank, academic experience and smartphone ownership in terms of educators. Findings revealed significant differences among the students' attitudes towards M-learning with regard to their smartphone ownership, country and age. Furthermore, results indicated that M-learning can be one of the promising pedagogical technologies to be employed in the higher educational environments within the Arab Gulf countries.

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1. Introduction

Mobile learning (M-learning) is a new research trend that attracts many researchers to explore this technology, study its impacts on students and educators, and develop the required infrastructure. M-learning researchers attempt to maximize the utilities of mobile technologies in higher education institutions while maintaining the educational mission. M-learning has dealt with mobility from a number of dimensions: mobility of technology, mobility of learners, mobility of educators, and mobility of learning.

In the literature, researchers have defined M-learning from

different perspectives. [Mcconatha, Praul, and Lynch \(2008\)](#) has defined M-learning as the learning that is employed through the use of small computing mobile devices. This definition includes smartphones and small handheld devices. Moreover, [Mirski and Abfalter \(2004\)](#) defined M-learning as a specific topic that is emerging form distance learning; whereas [Alzaza and Yaakub \(2011\)](#) stated that M-learning is the next generation of E-learning that uses mobile technology. More broadly, [Homan and Wood \(2003\)](#) specified M-learning as the technology that changed the way the students communicate, interact, and behave with each other and their perceptions towards their learning. In addition, [Al Emran and Shaalan \(2014\)](#) demonstrates that M-learning facilitates knowledge sharing among students and educators while interacting with each other. [Matias and Wolf \(2013\)](#) expressed that M-learning is not only the learning that is based on the use mobile devices but also the learning that is mediated across multiple contexts using portable mobile devices. Briefly, M-learning helps

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students and educators to perform their daily tasks in a short timely period using small technological devices (tablets or smartphones) in anytime anywhere.

Ardies, De Maeyer, Gijbels, and van Keulen (2014) argued that attitudes towards any educational technology could be used to measure into which extent the users of the technology (students and educators) have the ambition to use the technology and whether or not this technology has positive or negative impacts on the environment. In accordance with E-learning communities (Dascalu, Bodea, Lytras, De Pablos, & Burlacu, 2014), M-learning could enhance the collaboration among the learners and stimulate the interaction among them and their educators. Bagozzi, Davis, and Warshaw (1992) discussed the study by (Swanson, 1982, 1987) that pointed out the importance of attitude factor in the adoption of new computer technology. Bagozzi et al. (1992) argues that although both the Theory of Reasoned Actions (TRA), which is one of the well-known models in the social psychology literature, and the Technology Acceptance Model (TAM), from the information systems and management literature, perceive the intention of usage from the attitudes perspective towards technology usage. Legris, Ingham, and Collette (2003) stated that TAM has been designed due to the reason that how users could accept or reject a particular technology. Moreover, it has been demonstrated that TAM affords the basis for finding the effects of particular variables on attitudes. Barki and Hartwick (1994) has empirically supported that users' attitudes lead to the intentions of use and the actual user of the new system. Thereby attitudes can provide a context for understanding the learner intention of usage and acceptance of new M-learning technology.

Higher education nature has been changed 360° due to the rapid development of mobile computing devices and internet capabilities (Liaw, Hatala, & Huang, 2010). A survey by the (Educause Center for Applied Research [ECAR] 2012) on the usage of mobile technology in the higher educational environments indicated that students are currently leading the implementation of mobile technological devices into their classrooms. Moreover, 67% of the surveyed students expressed that mobile technology is very essential into their academic achievements and activities. Gikas and Grant (2013) have indicated that mobile technology has become an integral part of the educational process at the higher educational institutions as it brings many opportunities and challenges to both students and academics.

Recently, the usage of mobile technology has become crucial for higher educational institutions worldwide due to the wide spectrum of its benefits. When M-learning is integrated with various universities systems, it provides learning in anytime anywhere settings. Generally, mobile technology helps students in raising their technological awareness, make conversations, join social media, find answers to their questions, facilitate team collaboration, allow knowledge sharing, and hence leverage their learning outcomes. In particular, M-learning assist students with disabilities and motivate them to attend classes remotely with the help of their mobile devices. M-learning has gradually penetrated the traditional teaching and learning by integrating the mobile technology Apps which could be the “new-breath” in almost all of the classrooms whether in direct or indirect ways. With the advent of such mobile technology Apps, higher education has getting enriched by extending the conventional educational platforms by encouraging the distance learning or what is called by “out-of-class” settings.

In the Arab Gulf region, UAE and Oman are taking leadership role in developing and conducting research for mobile learning in the institutions of learning. Nurseries are supplied with digital classrooms equipped by PCs and tablet devices for better early learning attraction. In the same direction, many schools have started using the mobile technology into their classrooms with the

aim of promoting critical thinking, team collaboration and problem solving. However, in case of higher education, there is a need to explore the students and educators' attitudes towards M-learning, which is the main contribution of this study. This in turn will help the decision makers of the higher education institutions of the Arab Gulf region to take initiatives for adopting M-learning and to design the appropriate infrastructure, which is an important step towards applying M-learning. Without any prior investigation/exploration study, it is difficult to rely on M-learning technology as students and educators' attitudes are unknown. Our study indicated that these attitudes were not yet investigated sufficiently within the Arab Gulf countries. This is the main reason that motivates us to focus our study on this area and attempt to identify the gaps that have not yet been covered.

2. Literature review

M-learning has gained popularity among students and educators for performing the everyday tasks in more flexible and comfortable style. Various universities worldwide has implemented M-learning for delivering the learning anytime anywhere in different ways. In Canada College and San Francisco State University (SFSU), Interactive Learning Network (ILN) model which involves both tablet PCs and wireless technology has been implemented for pre- and post-tests to assess the students' performance (Enriquez, 2010). Erkollar and Oberer (2012) addressed the integration of M-learning with Geographic Information System (GIS) module in a pilot course within a Turkish university where each student has been provided with a tablet device equipped by Google+ and Hangout Apps in order to facilitate the students' communication. Gikas and Grant (2013) highlights the effects of mobile technologies on learning and teaching in accordance with social media in the form of Skype, Twitter, and Blogs for providing better learning. Glackin, Rodenhiser, and Herzog (2014) addressed the integration of mobile devices and E-Books in order to raise the students' familiarity with digital library. Azar and Nasiri (2014) pointed out the adoption of Mobile Assisted Language Learning (MALL) in listening classrooms in teaching English language and how that facilitates listening to the topics of interest using cell-phones. In addition, mobile phones have been used as a learning tool for teaching French language at Princess Nora University, Saudi Arabia (Jaradat, 2014). De Pablos, Tennyson, and Lytras (2015) conducted two studies at the American University of Sharjah, UAE, for undergraduates' students in order to examine the usage of iPads during one semester in Mathematics course.

Sharples, Taylor, and Vavoula (2005) proposed a framework for theorising mobile learning adopted from Engeström's expansive activity model (see Fig. 1) considering learning process that occurs outside classrooms. The framework indicated that learning occurs as a socio-cultural system where educators and technology are the controls, Context is the communities of actors (people and technology), and Communication technology adaption drives the use of technology in M-learning. Liaw et al. (2010) proposed a mobile learning framework that is adapted from Sharples framework. The proposed framework is based on the activity theory which focuses on mobility of learning. It discusses how new technologies can support knowledge management, accessibility, exchangeability and delivery of both knowledge and learning materials. In accordance with Sharples et al. (2005), the implementation to any educational technology should consist of three parts: the learner, the educator and the technology itself. M-learning as an educational technology involve both the learners and educators to take part in its implementation strategy; the reason that motivated us to focus on the learners (students) and educators (faculty members) attitudes towards the use of such technology in this study.

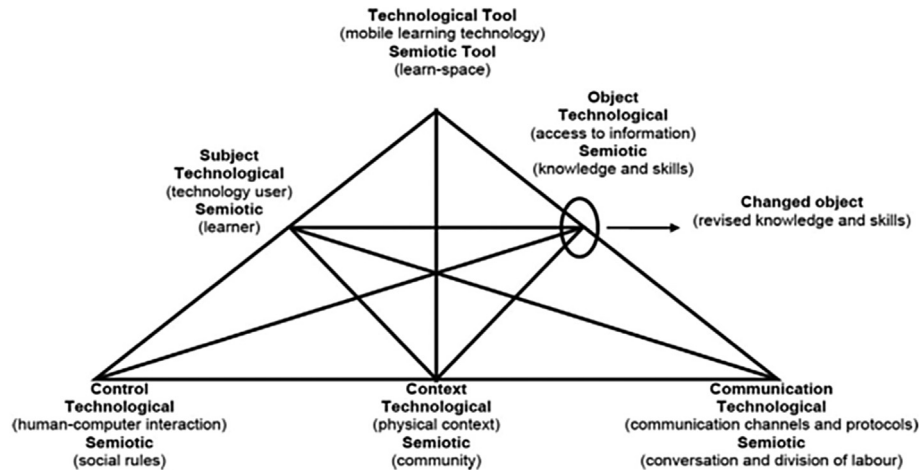


Fig. 1. A framework for analyzing M-learning (Sharpley et al., 2005).

Abu-Al-Aish and Love (2013) proposed a model that identifies the factors influencing the acceptance of M-learning in higher education based on the unified theory of acceptance and use of technology (UTAUT) concluding that performance expectancy, effort expectancy, lecturers' influence, quality of service and personal innovativeness are significant determinants of the behavioral intention to use M-learning. The study used gender, major, age, experience of mobile devices, usage of M-learning, frequency of using M-services for learning and M-learning knowledge in order to identify the characteristics of participants.

Recently, new trends could not consider learning as a reclusive process. Students are getting enriched in wide range of supportive educational environments. In higher education, M-learning offers many opportunities and challenges for both students and academics in ubiquitous manners as it increases the student's autonomy level by utilizing the online learning resources and assists academics in the delivery of information in "anytime-anywhere" settings.

As our study aims to explore the M-learning potential acceptance in the Arab Gulf region countries in the higher education sector, According to the literature, it investigates learners and educators' attitudes towards M-learning technology in the leading universities in Oman & UAE and how their attitudes influence the users' acceptance and usage. However, M-learning is still a new technology in these educational environments. Consequently, we seek to identify the differences in attitudes among the participants' groups according to their personal, academic and technology characteristics (i.e. Gender, Age, Country, major, level of study and smartphone ownership) by following a successful empirical proved models that were conducted in other countries. It is important to investigate M-learning technology before applying it to the learning process of higher educational institutions. This requires investigating and examining the users' attitudes towards M-learning technology.

To sum up, it has been observed that there is no such investigation study that covers all the addressed factors discussed in our literature review study that concern the institutions of higher education in the Gulf region. In order to draw a complete picture on whether or not students and educators are ready to use M-learning at the universities of the Gulf region, this study has been conducted.

3. Problem of the study

M-learning, as one of the educational technologies, has become

increasingly important in every educational level, including higher education. M-learning has added value to the meaning of E-learning by incorporating the latter with personal computing devices that enables access to learning information without posing any restriction on time and location.

We have perceived that M-learning has not yet been explored intensively within the universities in the Arab Gulf, except the efforts that have been done within the King Saud University, Saudi Arabia (Al-Fahad, 2009; Alwraikat & Al Tokhaim, 2014). UAE has launched the iPad initiative in the Higher College of Technology (HCT), a leading federal university that has branches in almost every city across the whole country and accepts only Emiratis (Hargis, Cavanaugh, Kamali, & Soto, 2014). However, this study was incomplete to judge on the project implementation in terms of the sample of users and the level of the academic program. It has focused on only faculty members' attitudes without considering students' attitudes. Moreover, it has concentrated on the foundation program students without paying attention to students from higher levels. On the contrary, Khaddage and Knezek (2013) has conducted a comparative study that investigates students' attitudes from UAE and USA towards the use of M-learning. This study was also insufficient since it did not consider the faculty members' attitudes towards M-learning.

We have observed many aspects that have not yet been examined within the Arab Gulf region, the reason that motivated us to conduct this study, which will help decision making of whether or not to adopt M-learning. Before setting a plan to develop any technology, it is important to investigate the end-user attitudes towards the use of such technology. The end-users of M-learning technology are students and educators. Attitudes toward technology help in determining strengths and weaknesses, assessing technology readiness level, and facilitating the development of the required infrastructure. Therefore, our research seeks to answer the following research questions:

- **RQ1:** Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *gender*?
- **RQ2:** Is there any significant difference among the students' attitudes towards the use of M-learning in terms of the academic *major*?
- **RQ3:** Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *smartphone ownership*?

- **RQ4:** Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *country*?
- **RQ5:** Is there any significant difference among the students' attitudes towards the use of M-learning in terms of their *level of study*?
- **RQ6:** Is there any significant difference among the students' attitudes towards the use of M-learning in terms of their *age*?
- **RQ7:** Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of *gender*?
- **RQ8:** Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of *Academic rank*?
- **RQ9:** Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of *Academic experience*?
- **RQ10:** Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of *country*?
- **RQ11:** Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of *smartphone ownership*?

4. Research methodology

This exploratory study focuses on the higher education students and educators from the perspective of perceiving the usefulness of mobile devices in the context of the educational environment. In terms of usage of smartphones in general life activities, the Arab Gulf region countries is vibrant. For example, new brands are usually launched in Dubai. This indicates the ease of use of such technology for its users. Accordingly, our study was dedicated to focus on exploring the students and educators' attitudes towards the usefulness of using M-learning technology in these educational environments.

The aim of our study is to explore the attitudes of learners and educators towards the use of M-learning in the higher educational institutions in order to predict their intention of using M-learning technology in the educational context. Similar to the framework proposed by (Sharples et al., 2005), we believe that the differences in attitudes between the sample groups will lead to the understanding of the required M-learning characteristics in order to increase the learners and educators intention towards the use and acceptance of such technology.

4.1. Sample and study instrument

The population of the study is the higher education institutions; students and educators in Oman & UAE. Data is collected by conducting two surveys: One for students and another for educators. Due to the limitations of resources, approval and acceptance of the participants in the study, the researchers administrated the surveys in five leading academic institutions. Each survey questionnaire has been distributed within two neighboring countries in the Arab Gulf region, i.e. Oman and UAE, in particular Al-Buraimi and Dubai, respectively. The data collection has been conducted in September and October of 2014. Table 1 demonstrates the comprehensive details of the collected data.

4.2. Sampling technique

The study uses the Purposive convenience sampling approach where the drawn samples are both easily accessible and willing to participate in the study using the predefined criteria considering

the representation of the students from different majors from different departments. In addition, educators were also drawn from different academic ranks and academic experiences (Onwuegbuzie & Collins, 2007; Teddlie & Yu, 2007). It's worth mentioning that Oman and UAE share various cultural characteristics and geographical aspects that were linked by historical relations.

After getting the ethical approval from the aforementioned universities, the researchers administrated face-to-face hand-delivered questionnaire in class. The participants were informed that their participation is entirely voluntary in the study and their responses are completely confidential.

4.3. Surveys structures

Each survey consists of three sections regardless of whether it is for students or faculty members. The students' survey consists of 28 items (questions). The first section consists of eight items that represents the student/faculty member personal information/demographic data. The second section consists of ten items that represents the student/faculty member information regarding the mobile technology. The third section of the survey consists of ten items that represents the attitudes towards the use of mobile learning. A five-point *Likert Scale*, with Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), and Strongly Disagree (1), has been used to measure the ten attitude items. Attitudes have been computed by combining the ten items in the third section in each survey.

The two surveys have been developed by the authors of this study. Some items have been adopted from relevant studies, such as (Liaw & Huang, 2012; Cavus, 2011; Yadegaridehkordi, Iahad, & Mirabolghasemi, 2011; Alwraikat & Al Tokhaim, 2014) in order to ensure content validity (Chang & Tung, 2008). Table 2 demonstrates the students' attitudes towards M-learning while Table 3 demonstrates the faculty members' attitudes towards M-learning along with their scales. Both surveys have been exposed to three expert professors at the British University in Dubai, UAE, to verify the clarity of the questions as a content validity. After a thorough examination, the experts indicated that the surveys are suitable for both students and educators and could answer the intended research questions in details.

4.4. Measurement analysis

The exploratory factor analysis was conducted for the questions related to the attitude in both surveys using Principal Component Analysis Extraction Method with Varimax rotation, the learners' attitudes (Q1-10 in Table 2) were all loaded into one factor (between 0.722 and 0.844) and the educators' attitudes (Q1-10 in Table 3) were all loaded into one factor (between 0.61 and 0.856). Reliability test has been measured for the ten independent variables that represent the attitudes by calculating Cronbach's alpha; the same measurement that has been used by (Khaddage & Knezek, 2013; Zhang, De Pablos, & Xu, 2014). The Cronbach's alpha values for the students' attitudes (Alpha = 0.937) and for the faculty members' attitudes (Alpha = 0.929) were greater than 0.7.

Derived by the mobile learning framework introduced by (Sharples et al., 2005), we are seeking to explore the attitudes dimensions that were adopting the mobile learning framework and adopting the quantitative approach using the survey instrument in order to measure the learners' attitudes through their perceiving of usefulness using the mobile devices in their study (Q1, Q8, Q9 in Table 2), communicating with colleagues and instructors (Q2, Q6 in Table 2), information and materials access, retrieval and exchange (Q5, Q3, Q7 in Table 2), perceiving of improvement, and developing of their learning processes and skills (Q4, Q10 in Table 2).

Table 1
Participants details.

University name	Country	No. of students	No. of faculty members
Al Buraimi University College	Oman	225	24
Total in Oman		225	24
The British University in Dubai	UAE	29	8
The American University in Emirates	UAE	46	8
Murdoch University Dubai	UAE	56	8
Amity University Dubai	UAE	27	6
Total in UAE		158	30
Total		383	54

Table 2
Survey structure of students' attitudes towards M-learning.

#	Items	SD (1)	D (2)	Un (3)	A (4)	SA (5)
1	Mobile technology is a useful tool for my study.					
2	Mobile technology can offer opportunities for communication and team-working.					
3	Mobile technology can help me in finding resources related to my study.					
4	Mobile technology can bring many opportunities to the learning process.					
5	Mobile technology can help me to access the course-material anytime anywhere.					
6	Mobile technology can be an easy way to get feedback and notifications from my instructors.					
7	Mobile technology can help me to exchange the course-material with my friends.					
8	Mobile Apps can help me to manage my study.					
9	Mobile technology can help me to do my coursework.					
10	Mobile technology can help me to develop my learning skills.					

Table 3
Survey structure of faculty members' attitudes towards M-learning.

#	Items	SD (1)	D (2)	Un (3)	A (4)	SA (5)
1	Mobile technology is a useful and effective tool in Education.					
2	Mobile technology can offer opportunities for communication and collaboration among teaching staff.					
3	Mobile technology can help in finding many resources related to my work.					
4	Mobile technology allows students to be more active with the course-material.					
5	Mobile technology is suitable for providing feedback for my students.					
6	Mobile technology can help me to develop my teaching skills.					
7	Mobile Apps can help me to manage my work.					
8	Mobile technology can help me in preparing coursework for my students.					
9	Mobile technology facilitates the communication between the students and their instructors.					
10	Mobile technology can make my educational role more flexible.					

Regarding the educators survey, we are intending to measure the attitudes through their perceiving of usefulness using the mobile devices in education (Q1 in Table 3), communicating with other colleagues and students (Q2, Q9 in Table 3), information and materials access, retrieval and exchange (Q3 in Table 3), perceiving of M-learning for students (Q4, Q5, Q8 in Table 3) and perceiving of improvement and developing of their work processes and skills (Q6, Q7, Q10 in Table 3). According to Ardies et al. (2014), the questions were randomized in order to avoid the bias due to the grouped questions that covers the same theme which might influence each other.

5. Results and discussion

By analyzing the students' personal/demographic data, results indicated that female students was 64.8% as compared to the male students (35.2%). 73.1% of the students age ranges between 18 and 22. 50.7% of the students were from IT major while students in Business Management, English and Project Management were 30%, 13.1% and 6.3%, respectively. 91.9% of the students are studying at the undergraduate level while only 8.1% are studying at the post-graduate level. On the other hand, by analyzing the educators' personal/demographic data, results revealed that 66.7% of the

educators were males while the rest were females. 51.9% of the faculty members have awarded MSc degree while those with PhD and BSc awards were 31.5% and 16.7%, respectively. 63% of the participants were at the instructor rank while the rest were academic professors.

By analyzing the students' mobile technology information, results have shown that 71.3% of the students own a smartphone only, 27.7 have a tablet while only 1% of the students do not have any of them. 41.5% of the students are using their mobile devices (smartphone or tablet) for browsing the Web and accessing their emails while 16.7% of them were using their mobile devices in their education. 81.5% of the students are using their mobile devices in their study while only 18.5% do not do so. "WhatsApp" is the most popular messenger application since it is used by 83.3% of the students.

By analyzing the students' attitudes towards mobile technology, it has been observed that the total average score of the students' attitudes was (3.43) and the score average of their usefulness perception of using mobile devices in their study was (3.27), their perception of its role in supporting communication with colleagues and instructors has achieved the highest average score (3.514), while the average score of the perception of facilitating information and materials access, retrieval and exchange was (3.514), and the

average score of the perception of the self-improvement and the development of their learning processes and skills was (3.45).

By analyzing the educators' mobile technology information, results have indicated that 57.4% of the faculty members own a smartphone, 38.9% of them own both a smartphone and tablet, and 3.7% of them have neither. 51.9% of the faculty members use their mobile devices for browsing the Web and accessing their emails, while only 22.2% uses their mobile devices for learning/education. 77.8% of the faculty members indicated that they were not using their mobile devices in teaching. WhatsApp messenger takes the highest percentage which is used by 79.6% of the educators compared to the traditional SMS (16.7%) and BBM (3.7%). 63% of the faculty members has indicated that their daily use of their mobile devices for the educational purposes is less than two hours.

By analyzing the educators' attitudes towards mobile technology, we found that the total average score of the educators' attitudes was (3.63) and the average score of their usefulness perception of using mobile devices in the education process was (3.8), the average score of their perception of its role in supporting communication with other colleagues and students was (3.84), while the average score of the perception of facilitating information and materials access, retrieval and exchange was (4.0), the average score of the perception using of M-learning for students was (3.4), and the average score of the perception of the self-improvement and development of their work processes and skills was (3.54).

The rest of this section presents the findings that answer the research questions.

RQ1: Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *gender*?

An independent samples *t*-test was carried out to examine if there is any statistical significant difference among the students' attitudes towards the use of M-learning with regard to their gender. As shown in Table 4, the results imply that the mean values for both male and female students do not indicate any significant differences among the students in their attitudes in terms of their gender. The computed value of *t* is (1.024) and the significance level is ($p = 0.307, p > 0.05$). The result of this research question could be attributed to the fact that males' students in the Arab Gulf region are working with females' students in almost every sector and both of them have enough technological background. Hence, no significant difference has been noticed.

Similarly, studies like Cavus (2011) (who targeted students at Computer Information Systems Department at Near East University in Cyprus), Wang, Wu, and Wang (2009) (who targeted students at different universities in Taiwan), Uzunboylu, Cavus, and Ercag (2009) (who targeted students at Computer Education and instructional technologies at Near East University in Cyprus), and Yang (2012) (who targeted students at the Engineering Department at the Technical University in Taiwan) have indicated that there were no significant differences among the students' attitudes towards the use of M-learning with regard to their gender. However, Taleb and Sohrabi (2012) (who intended students of Psychology and Educational Science in Islamic Azad University of South Tehran in Iran), Khaddage and Knezek (2013) (who intended students from Midwestern University in USA and students from Higher College of Technology in UAE) have indicated that there are significant differences among the students' attitudes in terms of their gender

Table 4
Differences among students' attitudes in terms of their gender.

	Gender	N	Mean	Std. Deviation	t	Df	Sig.
Attitudes	Male	135	3.5030	1.09775	1.024	381	0.307
	Female	248	3.3919	0.96519			

where female students were more positive towards the use of mobile phones rather than male students.

RQ2: Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *major*?

To determine if there is any significant difference among the students' attitudes towards the use of M-learning with regard to their major, means and standard deviations for the students' majors, including IT, English, Business Management and Project Management, are calculated as presented in Table 5. In addition, a one way analysis of variance (ANOVA) is carried out to test if there is any statistical significant difference between mean values. As shown in Table 6, results revealed that there is no statistical significant differences ($p = 0.926, p > 0.05$) among the students' attitudes with regard to their academic majors and the *F* value is (0.156). The result of this research question could refer to reason that almost all the students were using their mobile devices (smartphones/tablets) for accessing their emails, chatting on social media, sharing files via cloud services. Therefore, no significant difference has been reported.

Likewise, Taleb and Sohrabi (2012) (who targeted students of Psychology and Educational Science in Islamic Azad University of South Tehran in Iran) has revealed that there was no significant difference among the students' attitudes towards the use of M-learning in terms of their academic majors.

RQ3: Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *smartphone ownership*?

To determine if there is any significant difference among the students' attitudes towards the use of M-learning with regard to their smartphone ownership, means and standard deviations for the students' smartphone ownership, including smartphone, tablet, both or none, are calculated as shown in Table 7. In addition, a one way analysis of variance (ANOVA) is performed to examine if there is any statistical significant difference between mean values. As shown in Table 8, results revealed that there are statistical significant differences ($p = 0.023, p < = 0.05$) among the students' attitudes with regard to their smartphone ownership, where the *F* value is (3.229). In order to determine where the differences in mean values occur, the Tukey test for post-hoc comparisons is used. Results indicated that there are statistical differences among the students' attitudes between smartphone and both smartphone and tablet devices where the differences are in favor of both devices. Findings of this research question could be attributed to the huge number of students who own mobile devices as to compare with those who were not (i.e. students who own mobile devices are highly motivated to incorporate their devices into their learning).

On the other side, Khaddage and Knezek (2013) (who intended students from Midwestern University in USA and students from Higher College of Technology in UAE) indicated that students who own smartphones (114 students) were more positive towards M-learning than those who do not own them (12 students) with ($p < 0.03$).

RQ4: Is there any significant difference among the students' attitudes towards the use of M-learning in terms of *country*?

An independent samples *t*-test was performed in order to test if

Table 5
Mean and standard deviation for students' attitudes in terms of their major.

Major	N	Mean	Std. Deviation
IT	194	3.4253	1.05680
English	50	3.5200	0.97164
Business management	115	3.4096	0.96591
Project management	24	3.3958	1.02171
Total	383	3.4311	1.01386

Table 6
ANOVA results for students' attitudes in terms of their major.

	Sum of squares	df	Mean square	F	Sig.
Between groups	0.485	3	0.162	0.156	0.926
Within groups	392.175	379	1.035		
Total	392.660	382			

Table 7
Mean and standard deviation for students' attitudes in terms of smartphone ownership.

Smartphone ownership	N	Mean	Std. Deviation
Smartphone	273	3.3451	1.00080
Tablet	12	3.2417	0.95485
Both	94	3.7096	1.02811
None	4	3.3250	0.83815
Total	383	3.4311	1.01386

Table 8
ANOVA results for students' attitudes in terms of smartphone ownership.

	Sum of squares	df	Mean square	F	Sig.
Between groups	9.786	3	3.262	3.229	0.023
Within groups	382.874	379	1.010		
Total	392.660	382			

there is any statistical significant difference among the students' attitudes towards the use of M-learning within their country of residence (i.e. Oman or UAE). The Levene's test results was significant ($p = 0.009$, $p \leq 0.05$) indicating that homoscedasticity assumption was vaulted, thus independent samples t -test (Equal variances not assumed) results was used (Ho, 2006). As shown in Table 9, results indicated a statistical significant difference among the students' attitudes ($p = 0.000$, $p \leq 0.05$). The nonparametric Independent-Samples Mann–Whitney U test results ($p = 0.000$, $p \leq 0.05$) confirming the t -test significant results, the differences were in favor of students resident in UAE. Findings of this research question are very constructive and reasonable due to the technological resources availability, technology awareness in Dubai, UAE as compared to Al Buraimi, Oman.

However, Khaddage and Knezek (2013) indicated when attempted to compare students' attitudes within two different countries that students who live in USA (representing a Western country) were more positive towards the use of M-learning technology rather than students who live UAE (representing a Middle Eastern country). It is worth noting that this study has only focused on students' attitudes without considering the faculty members' attitudes.

RQ5: Is there any significant difference among the students' attitudes towards the use of M-learning in terms of their level of study?

An independent samples t -test was carried out to investigate if there is any statistical significant difference among the students' attitudes towards the use of M-learning with regard to their level of study. As demonstrated in Table 10, the results revealed that the mean scores for both undergraduate and postgraduate levels do not

Table 9
Differences between students' attitudes in terms of their country of residence.

	Country	N	Mean	Std. Deviation	t	Df	Sig.
Attitudes	Oman	225	3.2204	1.00704	−5.055	350.117	0.000
	UAE	158	3.7310	0.94868			

indicate any significant differences ($p = 0.382$, $p > 0.05$) among the students in their attitudes with regard to their level of study and the calculated value of t is (-0.875). Results of this research question could be referred to the small number of postgraduates' students ($N = 31$) who took part in the study as to compare to the undergraduates' students ($N = 352$).

RQ6: Is there any significant difference among the students' attitudes towards the use of M-learning in terms of their age?

To determine if there is any significant difference among the students' attitudes towards the use of M-learning with regard to their age, means and standard deviations for the students' age groups (i.e. 18 through 22, 23 through 28, 29 through 35 and Above 35) are calculated as shown in Table 11. Furthermore, a one way analysis of variance (ANOVA) was carried out to examine if there is any statistical significant differences between the mean scores. As shown in Table 12, results indicated that there are statistical significant differences ($p = 0.019$, $p < 0.05$) among the students' attitudes with regard to their age and the calculated of F value is (3.337). In order to determine where the differences in mean scores occur, the Tukey test for post-hoc comparisons was used. Results revealed that there are no statistical differences among the students' attitudes between and within age groups. This could be attributed to the fact that the age factor is distributed across four groups (18–22, 23 to 28, 29 to 35 and Above 35). Therefore, it is very difficult to determine where the difference may occur.

RQ7: Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of gender?

An independent samples t -test was performed to examine if there is any statistical significant difference among the educators' attitudes towards the use of M-learning with regard to their gender. As shown in Table 13, results indicate that the mean scores for both males and females do not indicate any significant differences ($p = 0.482$, $p > 0.05$) among the faculty members in their attitudes with regard to their gender and the calculated value of t is (-0.708). Results of this research question could be referred to the fact that females' educators in the Arab Gulf region were using mobile technology similarly to males' educators. Hence, no difference has been recorded.

On the contrary, Alwraikat and Al Tokhaim (2014) (who intended all the educators at King Saud University in Saudi Arabia) revealed through the use of an independent t -test that female instructors' attitudes were more positive towards M-learning rather than male instructors. Furthermore, Uzunboyly and Ozdamli (2011) (who targeted various faculty members from different universities in Cyprus) indicated that male instructors' attitudes were more positive towards M-learning than female instructors.

RQ8: Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of Academic rank?

To determine if there is any significant difference among the educators' attitudes towards the use of M-learning with regard to academic rank, means and standard deviations for the educators' academic rank (i.e. Instructor, Assistant Professor, Associate Professor and Professor) have been calculated as presented in Table 14. Furthermore, a one way analysis of variance (ANOVA) was carried out to test if there is any statistical significant difference between the mean scores. As shown in Table 15, results revealed that there are no statistical significant differences ($p = 0.410$, $p > 0.05$) among the educators' attitudes with regard to their academic rank and the calculate value of F is (0.980). The results of this research question as it is noticed from the high mean scores in Table 14; could be attributed to the reason that almost all of the faculty members have the potential capability to incorporate mobile technology into their classrooms. Hence, no difference has been reported.

Table 10
Differences between students' attitudes in terms of their level of study.

	Level of study	N	Mean	Std. Deviation	t	Df	Sig.
Attitudes	Undergraduate	352	3.4176	1.01332	-0.875	381	0.382
	Postgraduate	31	3.5839	1.02408			

Table 11
Mean and standard deviation for students' attitudes in terms of their age.

Age	N	Mean	Std. Deviation
18 to 22	280	3.4929	0.92876
23 to 28	72	3.2069	1.20309
29 to 35	23	3.6391	1.05991
Above 35	8	2.6875	1.43471
Total	383	3.4311	1.01386

Table 12
ANOVA results for students' attitudes in terms of their age.

	Sum of squares	df	Mean square	F	Sig.
Between groups	10.104	3	3.368	3.337	0.019
Within groups	382.556	379	1.009		
Total	392.660	382			

Table 13
Differences between faculty members' attitudes in terms of gender.

	Gender	N	Mean	Std. Deviation	t	Df	Sig.
Attitudes	Male	36	3.5694	0.86877	-0.708	52	0.482
	Female	18	3.7389	0.74054			

Table 14
Mean and standard deviation for faculty members' attitudes in terms of their academic rank.

Academic rank	N	Mean	Std. Deviation
Instructor	34	3.5412	0.77386
Assistant professor	9	3.5222	1.26469
Associative professor	6	4.1333	0.50859
Professor	5	3.7800	0.23875
Total	54	3.6259	0.82512

Table 15
ANOVA results for faculty members' attitudes in terms of their academic rank.

	Sum of squares	Df	Mean square	F	Sig.
Between groups	2.004	3	0.668	0.980	0.410
Within groups	34.079	50	0.682		
Total	36.084	53			

On the other hand, Alwraikat and Al Tokhaim (2014) (who intended all the faculty members at King Saud University in Saudi Arabia) indicated through the use of an ANOVA test that instructors' attitudes, i.e. young teaching assistants, were more positive towards M-learning than the academic staff of higher ranks.

RQ9: Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of Academic experience?

To determine if there is any significant difference among the faculty members' attitudes towards the use of M-learning with regard to academic experience, means and standard deviations for the educators' academic experience (i.e. falling in Less than 5 years, Between 5 and 10 years, and More than 10 years) was calculated as

shown in Table 16. Moreover, a one way analysis of variance (ANOVA) was performed to investigate if there is any statistical significant difference between the mean scores. As shown in Table 17, results indicated that there were no statistical significant differences ($p = 0.894$, $p > 0.05$) among the educators' attitudes with regard to their academic experience and the calculate value of F is (0.112). The authors might attribute the result of this research question to the reason that faculty members with their different years of experience, have the technological awareness and they were ready to the implementation of the M-learning systems into their classrooms even with no significant difference has been observed.

On the contrary, Alwraikat and Al Tokhaim (2014) revealed through the use of an ANOVA test, that faculty members' attitudes with 21 years of experience or more were more positive towards M-learning than the others.

RQ10: Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of country?

In order to test if there is any statistical significant difference among the educators' attitudes towards the use of M-learning within residence in both countries (Oman and UAE); an independent sample t -test was carried out. As shown in Table 18, results indicate that the mean scores for both countries do not reveal any significant differences ($p = 0.763$, $p > 0.05$) among the faculty members in their attitudes with regard to their country and the calculated value of t is (-0.303). Findings of this research question could be referred to the fact that faculty members in both countries (Oman & UAE) have the similar environmental culture that enable them to have the balanced willingness to integrate mobile technology into the education field.

RQ11: Is there any significant difference among the faculty members' attitudes towards the use of M-learning in terms of smartphone ownership?

To determine if there is any significant difference among the faculty members' attitudes towards the use of M-learning with regard to their smartphone ownership, means and standard deviations for the educators' smartphone ownership, i.e. smartphone, tablet, both, or neither, have been calculated as shown in Table 19. Moreover, a one way analysis of variance (ANOVA) was carried out to examine if there is any statistical significant difference between the mean scores. As shown in Table 20, results indicate that there are no statistical significant differences ($p = 0.338$, $p > 0.05$) among the educators' attitudes with regard to their smartphone ownership and the calculate value of F is (1.151). The authors could attribute the results of this research question to the fact that faculty members whether they own mobile devices (smartphones/tablets)

Table 16
Mean and standard deviation for faculty members' attitudes in terms of their academic experience.

Academic experience	N	Mean	Std. Deviation
Less than 5 years	18	3.5611	0.84236
Between 5 and 10 years	15	3.7000	0.81766
More than 10 years	21	3.6286	0.85155
Total	54	3.6259	0.82512

Table 17
ANOVA results for faculty members' attitudes in terms of academic their experience.

	Sum of squares	Df	Mean square	F	Sig.
Between groups	0.158	2	0.079	0.112	0.894
Within groups	35.926	51	0.704		
Total	36.084	53			

Table 18
Differences between faculty members' attitudes in terms of their country of residence.

	Country	N	Mean	Std. Deviation	t	Df	Sig.
Attitudes	Oman	24	3.5875	0.79143	−0.303	52	0.763
	UAE	30	3.6567	0.86331			

Table 19
Mean and standard deviation for faculty members' attitudes in terms of smartphone ownership.

Smartphone ownership	N	Mean	Std. Deviation
Smartphone	31	3.4710	0.74975
Tablet	1	3.3000	–
Both	20	3.8950	0.93385
None	2	3.5000	0.56569
Total	54	3.6259	0.82512

Table 20
ANOVA results for faculty members' attitudes in terms of smartphone ownership.

	Sum of squares	df	Mean square	F	Sig.
Between groups	2.330	3	0.777	1.151	0.338
Within groups	33.753	50	0.675		
Total	36.084	53			

or not, were ready to use mobile technology in teaching as per their responses to the distributed survey.

6. Conclusion and future work

The emergence of revolutionary M-learning technologies had a significant impact on educational technology. In this paper, we have highlighted the state-of-the-art in Mobile learning regarding students' and faculty members' attitudes towards the use of M-learning in the higher educational universities. The main contribution of this study is to explore the students and educators' attitudes, which in turn will support the decision makers of the Arab Gulf region institutions in designing the required M-learning infrastructure. Many factors have been taken into concern while examining those attitudes. Gender, age, country, major, smartphone ownership and level of study are the factors that are taken into concern while examining students' attitudes. Gender, country, academic rank, academic experience and smartphone ownership are the factors that are taken into concern while examining educators' attitudes.

Two surveys were conducted, one for students and one for faculty members. 383 students and 54 instructors from 5 different universities were participated within the study. Different statistical analyses have been performed in order to test whether there is any significant difference among the students and educators attitudes towards M-learning with regard to the aforementioned factors. Findings indicated a significant difference among the students' attitudes in terms of their smartphone ownership where the differences were in favor of both devices (smartphone and tablet), i.e.

students "learners" who have both devices and familiarity with mobile technology were more positive towards the use of such technology in learning than the others. Results indicated a statistical significant difference among the students' attitudes in terms of their country of residence where the differences were in favor of students resident in UAE. Results revealed that there are statistical significant differences among the students' attitudes with regard to their age but without any indication where the differences were occurred. Those significant differences could be taken into consideration by the decision makers of those academic institutions in the implementation of M-learning systems in the future. The usage of both tablets and smartphones will improve the learners' positive attitudes towards M-learning which in turn leads to the intention of using M-learning in the higher education. The differences in age could stimulate the decision makers in designing a special M-learning system that could suit all the ages.

Furthermore, results revealed that 99% of the students have mobile devices (smartphone/tablets) while only 1% have not. This is reasonable due to the reasonable price and availability of such mobile technology devices in the market. Findings revealed that 41.5% of the students were using their mobile devices (smartphone or tablet) for browsing the Web and accessing their emails while 16.7% of them were using their mobile devices in their education. Moreover, 81.5% of the students indicated that they were using their mobile devices in their study while only 18.5% do not do so. Accordingly, this could give a strong indicator that students are highly motivated towards the use of their mobile technology (smartphones/tablets) into their future study since they have already use them in their current study.

Although no significant difference has been noticed in the other factors, the mean scores were very promising for such factors. The results indicated that both students and educators' genders have positive attitudes towards M-learning with non-significant differences concluding that M-learning can be adopted by both genders without any additional special features. The results indicated that almost all of the majors have positive attitudes towards M-learning with non-significant differences concluding that M-learning can be adopted by all students from different majors without any additional special features. Results demonstrated positive attitudes by the students towards M-learning with non-significant differences with regard to their level of study, concluding that both (undergraduate and postgraduate) students are motivated and encouraged to use their mobile technology into their learning.

Results revealed that almost all of the educators have positive attitudes with regard to their academic ranks, academic experience and smartphone ownership towards M-learning with non-significant differences in these factors indicating that M-learning can be adopted by all educators regardless to their academic ranks, academic experience and smartphone ownership. Overall, these factors may not be taken into consideration by the decision makers of these institutions for designing the M-learning systems.

As a limitation of this study, we have focused on two countries from the Gulf region, i.e. Oman and UAE. In addition, only 54 instructors took part within the study. Besides, a survey questionnaire method has been used only for data collection. As a future direction, we are interested to improve the instrument, sampling approach and conduct the same research within the other universities in the other countries in the Arab Gulf region, such as Bahrain, Kuwait and Qatar. Increasing the number of educators will be taken into concern. Interviews and focus groups will be considered in collecting the data. According to the results of this study, our next step is to implement M-learning in some of the Arab Gulf region universities that have been participated in this study. Consequently, other surveys will be conducted for examining the students and educators' attitudes.

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