M-learning technology in Arab Gulf countries: A systematic review of progress and recommendations

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Abstract
With the recent development in mobile devices and mobile services, mobile learning (m-learning) has become one of the most common research topics across Arab Gulf countries (AGC). The literature showed an inconsistent usage of m-learning in these countries. This paper sheds light on the models and methodologies of m-learning, as well as offering recommendations to improve adoption of m-learning. A systematic literature review was conducted to identify the current evidence on the use of m-learning in AGC across several groups of instructors and students. The results from reviewing 31 previous studies showed that students' and instructors' acceptance of m-learning were the main topics of concerned. In addition, a lack of research on leadership and policy practices that impact the use of m-learning in AGC may lead to catastrophic failure of the technology. The key recommendations were presented and discussed.

Keywords: *m-learning, technology acceptance, activity theory, life-long learning, Arab Gulf countries*

1. Introduction

The current educational systems in most schools and universities have benefited from the tremendous revolution in the development and spread of mobile services as an effective way to enhance the overall learning experience (Aldowah, Al-Samarraie, & Ghazal, 2019). The extensive benefits, simplicity and availability of mobile devices and learning services offers an opportunity for educational institutions to promote learning and teaching in new and innovative ways (Aldowah, Al-Samarraie, & Fauzy, 2019; Almaiah & Alismaiel, 2018). M-learning offers numerous opportunities as well as challenges in education, which involves flexibility in adoption, communications and interaction between students and instructors (Bidin & Ziden, 2013). The current emphasis on the use of m-learning in Arab Gulf Countries (AGC) for learning development has motivated many scholars to explore the potential of this technology in promoting students' learning and engagement with the learning process. This includes changing students' attitudes towards the efficiency of mobile learning services for accessing and participating in various learning activities (Abachi & Muhammad, 2014; Alzahrani, Al-Samarraie, Eldenfria, & Alalwan, 2018). Our review of the literature revealed different definitions of m-learning with regard to the context and purpose of use (Al-Samarraie & Ahmad, 2016). For example, Huang, Liao, Huang, and Chen (2014) and Traxler (2007) defined m-learning as an extension of e-learning using mobile devices and handheld IT devices to deliver various learning activities.

However, the process of incorporating mobile technology in the teaching and learning environments of the developing countries is a challenging task. This can be due to various factors (e.g., technical, social, cultural, and learner-centred) that may hinder m-learning adoption among learners (Bidin & Ziden, 2013). As such, students' and instructors' use of m-learning has been slowly progressing in these countries. There is also a notable lack of evidence about the potential of m-learning in AGC. In addition, research on m-learning in AGC is in its early stage in which our theoretical understanding has not advanced much beyond the scenarios described by the previous studies (Ahmed Alsswey & Al-Samarraie, 2019). For example, several studies have been devoted to understand the use of m-learning in AGC (e.g., Althunibat, 2015; Jaradat & Al Rababaa, 2013; Nassuora, 2012) based on certain theories on the adoption and use of information technology. In addition, some of these studies investigated the factors that may affect the use of m-learning and improve users' learning experiences such as facilitating conditions, social, cultural, and cost.

Understanding the relevant models and theories of m-learning adoption is essential for AGC. This study, therefore, aims at reviewing the literature to present a better understanding of m-learning adoption in in AGC. A systematic review was conducted to investigate adoption problems, assesses and combine the results of individual studies related to the use of m-learning.

Outcomes from this study can potentially contribute to the current understanding of m-learning adoption in AGC, as well as providing the relevant recommendations for educational policy makers. This paper is structured as follows; Section 2 presents the methodology on how the review was designed and implemented. Section 3 presents the results of this study. Section 4 discusses the findings of the study. Finally, Section 5 concludes the study.

2. Methodology

This review attempts to answer two research questions: 1) What is the current progress in adopting m-learning across AGC? and 2) What are the recommendations for educational policy makers regarding the use of m-learning in AGC? This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) from Moher, Liberati, Tetzlaff, Altman, and Group (2009) to answer the two

research questions. The systematic process involved four stages: The identification stage, the screening stage, eligibility and inclusion criteria. In the identification stage, we identified the number of articles through online databases searching. In the screening stage, we identified the number of articles after duplications were removed. In the eligibility stage, we assessed and excluded articles that are not within the focus of this study. Finally, the inclusion stage was conducted to include articles for the final analysis.

2.1 Search strategy

Using PRISMA principles, we performed a multidisciplinary search of previous studies in order to answer the research questions above. The first step was to find studies on m-learning within AGC. A number of databases, such as Google Scholar, Scopus, IEEE, and Science Direct, were used for the search. The reference list in each selected paper was also scanned in order to gather more relevant papers. A specific terms were used during the search process to obtain related articles, such as 'm-learning' OR 'mobile adoption' OR 'mobile learning' OR "mobile learning services' AND 'Arab Gulf Countries (including Saudi Arabia, Kuwait, Oman, Qatar, United Arab Emirate, and Bahrain)' OR 'university students OR "Higher institutions". These search keywords were selected as they were frequently used when defining mobile learning. Then, the inclusion and exclusion criteria were employed. The collected articles were stored and processed in Microsoft Excel.

2.2 Eligibility criteria

This systematic review applied some inclusion and exclusion criteria to identify the relevant articles:

2.2.1 Inclusion and Exclusion Criteria

The authors have checked all the retrieved studies to ensure they meet the inclusion and exclusion criteria. This study considered papers that directly investigated students' and instructors' perceptions of m-learning usage in AGC. The selected articles had to be written in English, published in peer-reviewed journals within the period of January 2008 – August 2018, and used any qualitative, quantitative, and mixed methods. We eliminated papers on comparing or evaluating m-learning against e-learning systems. In addition, papers that studied development or usability issues pertaining to the use of m-learning technology were not included in this study. Other policy briefs, study protocols, oral presentations, commentaries, and reports from a nongovernmental organization were also excluded from this review.

The initial search, without performing the inclusion and exclusion criteria, resulted in 4403 articles. The initial review of the retrieved studies resulted in the removal of 71 duplicates. This resulted in 4332 articles. After screening the titles and abstracts of these articles, we further eliminated 4294 articles. The full text of the remaining 38 articles were checked against the inclusion and exclusion criteria. This resulted in removing 7 articles that did not use or effectively discuss m-learning use in AGC. The number of articles that met all the criteria was 31. Out of these, 28 articles used quantitative method, 2 articles used qualitative method, and one article used a mixed-method design. Figure 1 shows the searching and selection procedure of previous studies.

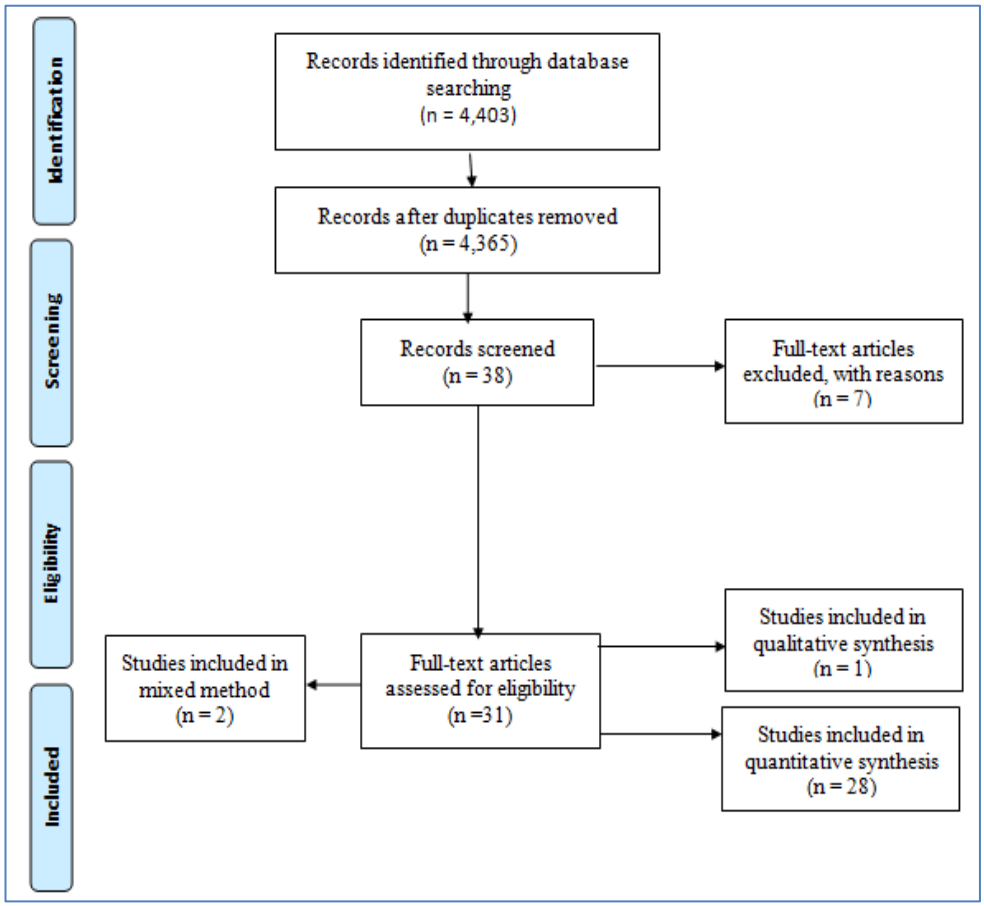

Figure 1: PRISMA stages

2.2.2 Coding Technique

1. Country: Studies conducted in AGC.
2. Study design: Three comprehensive types of study designs were considered in this review: qualitative, quantitative, and mixed method.
3. Sample size: Studies that involved small, (≤150), medium (>150≤250), and large (>250) sample size.
4. Subjects: The sample in the selected studies was split into either: students, instructors, or both.
5. Statistical instrument: The utilized data analysis methods were classified into content analysis, descriptive statistics, correlation, regression, and Structural Equation Modelling (SEM) technique.

3. Results

This section presents a comprehensive analysis of the results retrieved. The first section discusses the progress with regard to the use of m-learning across AGC. The second section highlights the relevant policy recommendations.

3.1 Progression in the use of m-learning in AGC

Since m-learning technologies were adopted in various AGC, we decided to categorize the adoption of m-learning based on the country of origin (see Figure 2). The aim of this cataloguing was to help show the core aspects with regard to the use of m-learning in AGC. Figure 2 shows the major countries in the gulf region. The results showed that there were 10 studies conducted on m-learning in Saudi Arabia, representing 32.3% of the total studies in this region. This was followed by both Kuwait and UAE with 5 studies each, representing 16.1%. Followed by Oman with 4 studies (12.9%), Iraq with 2 studies (9.7%), Bahrain with 2 studies (6.5%), Qatar and Yemen with 1 study each (3.2%). The rapid progress in using m-learning in some of these countries can be due to current advances in information and communication technology.

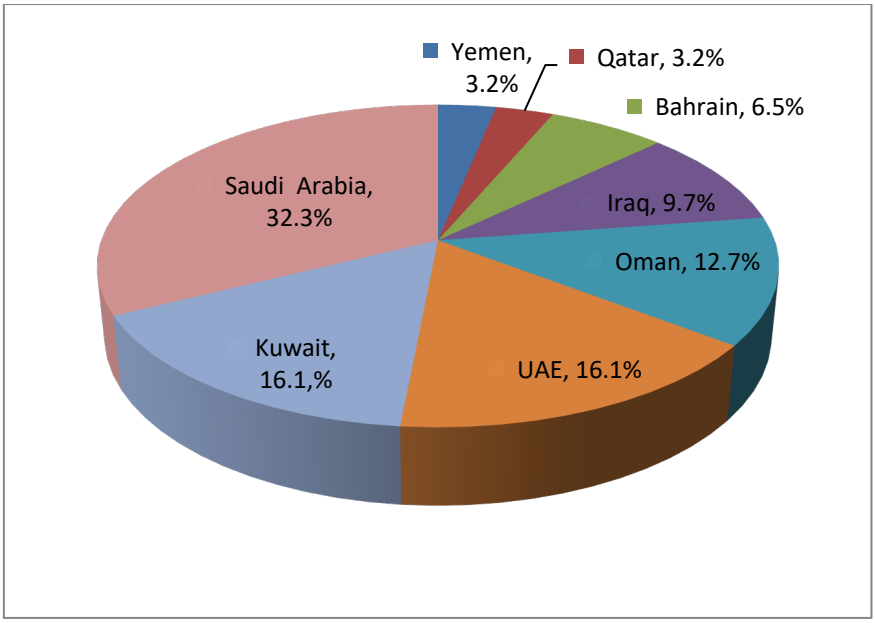

Figure 2. Progression of m-learning use in AGC

The main aspects highlighted in previous studies with regard to the use of m-learning in AGC were mostly related to the accessibility of m-learning services, especially when students are in rural areas (Aljuaid, Alzahrani, & Islam, 2014). The results also showed other cultural and behavioral dimensions pertaining to the use of m-learning in AGC. According to Al-Hunaiyyan, Alhajri, and Al-Sharhan (2018) students and instructors were generally found to have positive perceptions of m-learning, and indicated that video-based social media applications can be used among them. However, the authors found that some social and cultural issues may act as barriers to m-learning implementation. In addition, Al-Shehri (2014) stated that both schools and universities are required to offer the necessary technological infrastructure in order to fully promote the m-learning promising initiatives. The authors added that some universities in the region have also trained their staff to use technology effectively, and provided online courses for students in different mediums. This facilitated a smooth integration of m-learning in key AGC such as UAE, Saudi Arabia, and Kuwait. Table 1 shows the different models employed in previous studies with regard to the use of m-learning in AGC.

Table 1. Models employed in previous studies

Model	**Number of studies**	%	**Adopted model (original model)**	%	**Adapted Model (modified)**	%
UTAUT	8	25.8%	2	25.0%	6	18.8%
TAM	5	16.1%	1	3.1%	4	12.5%
Activity theory	1	3.1%	0		1	3.1. %
None	17	54.8%				
Total	100%	100%				

Table 1 shows that the main models used in previous studies were Technology Acceptance Model (TAM), Unified Theory of Acceptance and use of technology (UTAUT), and Activity theory. The results revealed a lack of evidence about the association between certain cultural and social dimensions on the use of m-learning in AGC. A possible reason for this could be that suitable models designed to study mobile adoption or particularly mobile learning adoption do not exists. For example, the current m-learning evidence are mapped around the attitude and intention of students to adopt or use m-learning where studies on how students with a particular learning style can learn with this technology is lacking. In addition, the majority of previous studies on this topic were focused on the relationship between the technology and students' learning. The subjects and their sample size are shown in Table 3. Factors such as m-learning flexibility, enjoyment, economic and social feasibility were reported in many previous studied (Sharma, Sarrab, & Al-Shihi, 2017). Meanwhile, other aspects related to students' attitudes, institutional and cultural values, gender segregation were generally reported (Alasmari & Zhang, 2019; Marinakou & Giousmpasoglou, 2014) to hinder the success of m-learning in these countries. From these, it can be

assumed that there are still other variables that have a significant relationship with the decrease or increase in m-learning adoption in AGC.

Table 3. Subjects and sample size

Design	No. of studies	%	Sample size		
			<=150 small size	>150 <=250 medium size	> 250 large size
Instructors	8	25.8%			
Students	17	54.8%	16 (51.6%)	3 (9.7%)	12 (38.7%)
Both students instructors	6	19.4%			
Total	31				

3.2 Recommendations for educational policy makers

After reviewing the previous studies, a number of recommendations were emerged. First, more in-depth studies are needed to capture the diversity of how students and instructors approach m-learning with regard to various cultural and social influences. Second, more attention is needed towards the role of individual differences in motivational beliefs, which may lead to differential performance when using m-learning in a learning context. Third, the type of learning activities that students engage in while learning can be further explored and linked to other theories and advanced version of TAM (TAM 2 or TAM 3), especially the relationship between the activity taught and individuals' subjective norm. Furth, there is a need to provide a wider view about the impact of m-learning on students' performance by considering a variety of statistical analysis methods in order to determine the predictive significance of models and factors affecting students' use of m-learning in AGC.

4. Discussion

The results retrieved during the systematic review strengthened the importance of m-learning in advancing students' learning development. The results showed a rapid increase in research conducted around m-learning in AGC. The findings of the study showed that m-learning studies were mostly centered around Saudi Arabia, followed by Kuwait and UAE. Other countries, such as Oman, Iraq, Bahrain, Qatar and Yemen, recorded the lowest number of studies. This can be due to the economical condition of these countries, which may have reflected positively on the development of information and communication technology. Cultural differences and varied geographical variables were also reported in the literature to hinder the success of m-learning in the region. As mentioned by A Alsswey, Umar, and Al-Samarraie (2018), cultural differences play a vital role in the adoption and use of technology. The results also showed that UTAUT was a frequent model used by previous studies. Due to the novelty of UTAUT, it has become the most widely used in AGC. This is could be due to the fact that UTAUT reflects some cultural and social dimensions when examining technology adoption (Thomas, Singh, & Gaffar, 2013). Despite the popularity of TAM in the region, it may still lack some social and cultural dimensions (Bagozzi, 2007). In addition, Mathieson (1991) claims that TAM without external factors does not provide valuable detailed information that can support system enhancement and development, only provides wide information on users' attitudes toward system usages.

Despite the important role of activity theory in understanding the integration of technology in a specific context, only few studies used it in measuring the success of m-learning in AGC. This is mainly because activity theory can effectively explain the design activity of mobile applications (Park, 2011). In addition, various social and cultural aspects have been found to significantly contribute to m-learning use by fostering skills, habits, and mindsets that enable students and instructors progress at the learning task. For example, Ahmed ALsswey, Umar, and Bervell (2018) claimed that localization of user interface (UI) design can enhance the use of technology in which an individual inclines to trust to a higher degree these cultural and social factors. Our review of the literature also showed the need for examining individual differences which may lead to a better learning performance, as well as enhancing the utility value of an activity (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2019). We are also of the view that employing various types of activities through mobile medium might promote students' engagement and understanding of the topic (Brigham, Scruggs, & Mastropieri, 2011). In addition, our review of the literature showed that the context of using m-learning has a significant role in understanding its progress in AGC. As such, learners' actions should not be excluded from the evaluation of m-learning adoption. The review also showed that the majority of previous studies were based on students' views, whereas the extent of instructors' involvement was not systematically investigated (Al-Samarraie & Saeed, 2018; Baragash & Al-Samarraie, 2018). This finding also in line with the work of Salleh (2016) who reported that instructors' use of technology is directly linked to students' learning development. Similarly, Beswick (2006) reported that

studying instructors' belief in their capability to impact student learning can help understand how learners use technology in learning. In general, when instructors possess positive attitude towards technology usage, they are possible to positively affect students' attitude to use it and vice versa. Hence it becomes essential to emphasis on instructors' intentions and involvement in a m-learning activity.

5. Conclusion

Understanding the current progress in using m-learning in AGC can play a significant role in its success. This study reviewed studies published from the year 2010 to 2018 in the AGC in an attempt to explore students' and instructors' use of m-learning technology in various learning settings. A total of 31 research studies were analyzed with the majority of studies conducted in Saudi Arabia. Various social and behavioral factors were studies in the literature. This study recommended that a wider view about the influence of engaging students in m-learning activities on their learning performance is needed. This can potentially open the direction for future studies into the application of m-learning in AGC education.

APPENDIX

Table I: Summary of the Reviewed Studies

No.	Study	Subject	Sample	Country	Instruments	Statistical Tool	Model
1.	Al-Emran, Elsherif, and Shaalan (2016)	Students and Instructors	437	UAE	Quantitative	ANOVA	Activity theory
2.	Fayyoumi, Mohammad, and Faris (2013)	students and instructors	130	UAE	Quantitative	Chi-square	Self-developed
3.	Dhaheri and Ezziane (2015)	Students	148	UAE	Quantitative	Descriptive	Self-developed
4.	Shorfuzzaman and Alhussein (2016)	Students	84	UAE	Quantitative	Structural Equation Modelling (SEM)	UTAUT
5.	Al-Emran and Shaalan (2015)	Students and Instructors	437	UAE	Quantitative	Descriptive	Self-developed
6.	Al-Emran and Shaalan (2017)	Instructors	27	Oman	Quantitative	ANOVA	Self-developed
7.	Sarrab, Al Shibli, and Badursha (2016)	Students	806	Oman	Quantitative	AMOS	TAM
8.	Sarrab (2015)	Students	56	Oman	Quantitative	Descriptive	Self-developed
9.	Sharma, Sarrab, and Al-Shihi (2017)	Students	806	Oman	Quantitative	AMOS	UTAUT
10.	Al-Hunaiyyan, Alhajri, and Al-Sharhan (2017)	Instructors	132	Kuwait	Quantitative (survey)	ANOVA	Self-developed
11.	Al-Hunaiyyan, Alhajri, and Al-Sharhan (2016)	Instructors & Students	755	Kuwait	Quantitative (survey)	Descriptive	Self-developed
12.	Sulaiman and Dashti (2018)	Students	1,012	Kuwait	Quantitative	ANOVA	Self-developed
13.	Alhajri (2016)	Students & Instructors	609	Kuwait	Quantitative	Descriptive	UTAUT
14.	Aldhafeeri and Alajmi (2016)	Instructors	314	Kuwait	Quantitative	ANOVA	Self-developed
15.	Al-Hujran, Al-Lozi, and Al-Debei (2014)	Students	215	Saudi Arabia	Quantitative	Correlation & Regression	UTAUT
16.	Alfarani (2014)	Instructors	165	Saudi Arabia	Quantitative	ANOVA & Chi-Square	UTAUT
17.	Alwraikat and Al Tokhaim (2014)	Instructors	362	Saudi Arabia	Quantitative	ANOVA	Self-developed
18.	Seliaman and Al-Turki (2012)	Students	55	Saudi Arabia	Quantitative	Correlation	TAM
19.	Nassuora (2013)	Students	80	Saudi Arabia	Quantitative	Descriptive	UTAUT
20.	Narayanasamy and Mohamed (2013)	Students	300	Saudi Arabia	Quantitative	Descriptive	Self-developed
21.	Aljuaid, Alzahrani, and Islam (2014)	Instructors	140	Saudi Arabia	Quantitative	Regression	TAM
22.	Alshammari, Reyes Jr, and Parkes (2016)	Instructors	40	Saudi Arabia	Quantitative	ANOVA	Self-developed

23.	Alenezi (2017)	Students	114	Saudi Arabia	Mix method	Descriptive	Self-developed
24.	Alharbi, Alotebi, Masmali, and Alreshidi (2017)	Instructors	544	Saudi Arabia	Quantitative	Regression	UTAUT
25.	Nasser (2014)	Students	58	Qatar	Quantitative	Descriptive	Self-developed
26.	Alrajawy, Isaac, Ghosh, and Nusari (2018)	Students	320	Yemen	Quantitative	SPSS & SEM	TAM
27.	Muhammed (2014)	Students	20	Iraq	Qualitative	Descriptive	Self-developed
28.	Jawad and Hassan (2015)	Students & Instructors	159	Iraq	Quantitative	Regression	UTAUT
29.	Mnaathr, Basha, Mohain, and Jamaludin (2013)	Students	60	Iraq	Quantitative & Qualitative	N/A	Self-developed
30.	Al-Ani, Hameed, and Faisal (2013)	Students	107	Bahrain	Quantitative	Correlation	TAM
31.	Mohammad and Job (2013)	Students	123	Bahrain	Quantitative	Descriptive	Self-developed

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