

Factor Affecting the Success of Mobile Learning Implementation: A Study Of Jordanian Universities

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Abstract: This study proposed to establish the importance of IS success and their correlations with the intent to use, usage, user satisfaction and net benefits of M-learning at five institutions of higher learning in Jordan. It is observed that the work of DeLone and McLean guides the development of other models used in the assessment of IS implementation but the models have not completely exhausted all the factors that contribute to the successful implementation of IS. Also, despite the contribution of culture to success of new technology, prior studies in M-learning are yet to investigate its impact on the successful implementation of M-learning. Therefore, it is against this backdrop that this study aimed to measure the effect of the factors proposed in Delone and McLean IS Success Model on M-learning implementation in Jordanian higher education institutions and to measure the effects of cultural factors in using M-learning institutions of higher education institutions. The study introduced cultural factors into the DeLone and McLean Success Model and tested how these factors determined user intention and the student satisfaction as elements of M-learning. The data collected were analysed using SPSS version 18 which was used to check the nature of data, smart PLS 2.0 m³ software packages and 2-steps approach. Precisely, culture, information technology, system quality, intention to use were found to be significantly and positively related to user satisfaction. User satisfaction and intention to use was positively and significantly related to net benefit. The research findings provide support for culture, information technology, system quality and service quality as significant factors that affect the successful implementation of M-learning in Jordan. Therefore, university administrators should consider all these factors when implementing an M-learning system.

Key words: M-learning, higher education, factors, successful implementation, Jordan

INTRODUCTION

In the recent past years Mobile learning (M-learning) has witnessed development and become a real means of education, instead of a mere theoretical perspective in the academic field. This development has coincided with the evolution of the online world (Alzaza and Yaakub 2011). M-learning is a process that involves two-way communication between educators and students via a variety of learning apparatuses and by way of mobile gadgets, and it is not confined to time-and-space limitations.

The growth witnessed in the M-learning has seen to the integration of M-learning methods in some of the universities in Jordan as a means of improving knowledge delivery in Jordan. The research of DeLone and McLean (1992, 2003) guides the development of other models used in the assessment of IS implementation. However, the models have not completely exhausted all the factors that contribute to the successful implementation of IS. From reviewed literature this study discovered that most experiment that used DeLone and McLean (1992, 2003)

framework pay attention to one element of success and apply personal opinions as to how the success of E-learning is evaluated (Petter *et al.*, 2008; Heo and Han, 2003). The absence of a unified framework to evaluate the success of M-learning hinders its success and discourages universities to invest in the technology. Secondly, this study noted that despite the contribution of social influence and culture to success of new technology prior studies in M-learning are yet to investigate its impact on the successful implementation of M-learning. The issues surrounding the evaluation of successful implementation of M-learning drive the objective of this study. The main objective of this study is to examine the factors that contribute to the success of M-learning implementation in higher institution of learning in Jordan. Then, the main objective was subdivided in to the following:

- To measure the effect of the factors proposed in Delone and McLean IS Success Model on M-learning implementation in Jordanian higher education institutions

- Measure the effect of cultural factor that would predict the students' success of using M-learning in Jordanian higher education institutions

The findings of the study are expected to be useful in terms of supplementing the existing solutions to such problems and consequently resulted in the successful use of M-learning among students in Jordanian higher learning institutes. Also, it is hoped that the findings will convince university administration to pay attention to aspects that influence the use of M-learning.

Emergent issues from the review of literature

M-learning: Over the years, the implementation of M-learning has swollen in number, specifically in the developing countries (Motlik, 2008). Higher institutions of learning in Malaysia such as Universiti Utara Malaysia (UUM), International Islamic University Malaysia (IIUM), Universiti Putra Malaysia (UPM) are notable for adoption of M-learning (Karim *et al.*, 2006). Also Philippines has recorded steadily growing M-learning usage (Ramos *et al.*, 2006). The government of Mongolia has also taken initiatives to enhance M-learning (Batchuluun, 2007).

In Jordan, there have been some developments in all fields of industry and in certain specified sectors. Higher education has been named one of the most important sectors, garnering special attention from the Jordanian government. Tertiary education has benefitted from immense government support, including the construction of new universities and colleges and a handsome financial allocation from the national budget. Today, five of the ten government-supported public universities have adopted M-learning. These include: the University of Jordan, Yarmouk University, Mutah University, Jordan University of Science and Technology (JUST) and Hashemite University.

Drawn upon previous research on M-learning, it is opined that M-learning and mobile technologies and devices can supplement different learning activities in different settings and for diverse age groups. As a matter of fact, M-learning can also galvanize the value of orthodox classroom learning by supplying a blended approach.

Despite the benefits of M-learning, technical, pedagogical, or administrative obstacles to use remain a challenge which should be attended to. According to Keegan (2002) lack of adaption to M-learning in educational settings has inhibited their widespread use. The causes are mostly technical, primarily arising from the screen size of the mobile devices and the market price of mobile service. Naismith *et al.* (2004) claim that the key

issues and challenges of M-learning and teaching lie in five key areas: context, mobility, informality, ownership and learning over time.

Furthermore, there has been a call by the researchers Al-Mushasha and Hassan (2009) and Al-Zoubi *et al.* (2007) to encourage students to make more use of M-learning to be able to achieve success in education. However, there is dearth of research about what factors could lead to the success of M-learning broadly, particularly in Jordanian universities (Al-Zoubi *et al.*, 2008). Successful implementation of technology is deemed important (Sabherwal *et al.*, 2006) and thorough review of extant studies have indicated that some studies have been conducted to measure IS success (M-learning success) Petter *et al.*, 2008; De Lone and McLean, 1992, 2003, 2004; Seddon *et al.*, 1999; Hunton and Flowers, 1997).

However, from the review of different trends of M-learning implementation in higher education institutions, the issues and challenges of M-learning implementation in higher education institutions, it is clearly discernible that there is need for a research on the main factors that predict the successful implementation of M-learning among students, specifically in Jordanian context. Such study requires the establishment of a suitable theoretical basis. These theories that are usually adopted to underpin the success of IS implementation are among others DeLone and McLean (1992)'s Theory D&M IS Success Model, IS Effectiveness Theory (1999), DeLone and McLean's Theory and Wang and Liu's Theory of IS, Sabherwal *et al.* (2006)'s Theory and the IS-Impact Success Theory (2008).

Extant research has indicated that of all the available theories on success of IS implementation, the D&M IS Success Model survives as a main reference to the success-measurement concept that has been widely used in the body of research ever since it was published in 1992 by DeLone and McLean. It also continues to be an efficient measure of IS success. Lately, a need to acknowledge the demand for assessment techniques that fit the evaluation process of technologies, namely, M-learning, has appeared. The suggestion has been made that through integrating facets of customary D&M evaluation elements, a newer, more refined and updated edition of the D&M IS Success Model can be used in measuring M-learning success measurement in context of the university.

DeLone and McLean's Theory D&M IS Success Model): Pioneering attempts to provide a definition of information system success were met with challenges because of the complex, interdependent and multi-dimensional nature of the metrics. This issue was addressed during the period from 1981-1987, the result was the creation of a taxonomy of IS success (Petter *et al.*, 2008) by DeLone and McLean (1992).

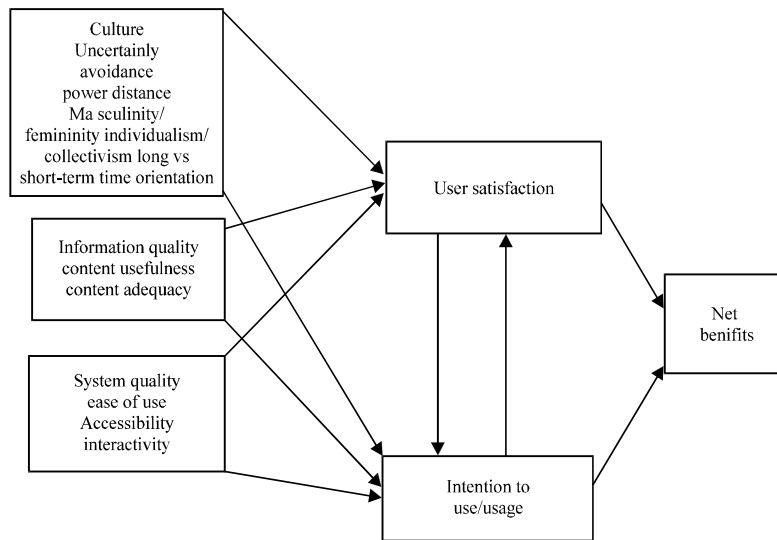


Fig. 1: Study framework

Past studies (Al-Mushasha and Hassan, 2009; Petter *et al.*, 2008; Piercy, 2014; Strikes, 2009) have documented that the success of information system is hinged on several factors. For instance, many study building on Delone and McLean (1992) demonstrated that the IS success is determine by culture, social influence, system quality, information quality, user satisfaction, individual impact and organisation impact. Shaping an education institution and learning modes often centre on technology, culture processes and individuals and they are deemed to be significant aspects (Goel *et al.*, 2010). The dividing line that sets students and teachers apart is also shaped by cultural influences (Hannon and Netto, 2007). Motivation differs from one culture to another (Hsu, 2006). In reference to Hofstede (1991)'s cultural aspects, those from a different culture have significantly different ways of perceiving things. In this context, culture serves as the collective programming of the mind which distinguishes the members of one group or category of people from another. In consideration of the above exposition, this study hypothesizes thus:

- H₁: There is a positive relationship between culture and user satisfaction with respect to the use/usage of M-learning systems in the selected Jordanian universities
- H₂: There is a positive relationship between culture and intention to use/usage of M-learning systems in the selected Jordanian universities
- H₃: There is a positive relationship between information quality and user satisfaction with respect to the use/usage of M-learning systems in the selected Jordanian universities

- H₄: There is a positive relationship between information quality and intention to use/usage with respect to the selected Jordanian universities
- H₅: There is a positive relationship between system quality and user satisfaction with respect to the use/usage of M-learning systems in the selected Jordanian universities
- H₆: There is a positive relationship between system quality and intention to use/use with respect to the use/usage of M-learning systems in the selected Jordanian universities
- H₇: There is a positive relationship between intention to use/usage and net benefit with respect to the use/usage of M-learning systems in the selected Jordanian universities
- H₈: There is a positive relationship between intention to use/usage and user satisfaction with respect to the M-learning systems in the selected Jordanian universities
- H₉: There is a positive relationship between user satisfaction and net benefit with respect to the use/usage of M-learning systems in the selected Jordanian universities
- H₁₀: There is a positive relationship between user satisfaction and intention to use/usage with respect to M-learning systems in the selected Jordanian universities

Based on the above exposition and the hypotheses, below research model is designed. Thus, this study adopts a more comprehensive model by incorporating culture as part of factors influencing successful implementation of M-learning (Fig. 1).

MATERIALS AND METHODS

Cross sectional survey method is the approach of this study. Research design in this study implies a procedure through which data is collected and analyzed in order to test the proposed hypotheses. The survey instruments were of two parts: demographic information of the respondents and the variables' instruments prepared to elicit information. The respondents were given 1-5 options for each response using five point Likert scale: Strongly Disagree (SD); Disagree (D); Neither agree or disagree (N); Agree (A) and Strongly Agree (SA). The Cronbach's Alpha values of the variables of the study fall between 0.870-0.875 and it is quite acceptable for social science studies.

The population of the study comprises of 144,571 students of five Jordanian public universities who are familiar with mobile learning services. Systematic random sampling technique was used to sample the population because it avoids sampling bias as it gives individual elements in the population an equal chance of getting selected based on probability. Underpinned by Krejcie and Morgan (1970) and the fact that large sample could be generalized to the whole population (Hair *et al.*, 2006), 768 samples were selected from the entire population of this study.

A set of 768 questionnaires were dispatched in person to the selected respondents, however 431 questionnaires were retrieved back. Total 320 were undelivered while 17 questionnaires were not filled up properly, thus removed from the final analysis. Therefore, only 431 responses, representing 56% were used for the final analysis.

The data collected were analysed using SPSS version 18 which was used to check the nature of data, Smart PLS 2.0 m³ software packages and 2-steps approach as suggested by Chin (1998) was adopted to obtain valid and reliable results. The stage one entails validity and reliability of the measurement model. The second stage

involves structural model which entails R² values for the latent variables in the model (Chin, 1998); sign, magnitude, and significance of path coefficients (Henseler *et al.*, 2009); effect size (f²) of predictor variables (Cohen, 1988); and predictive relevance of the model (Q²), using blindfolding (a sample reuse estimation technique that excludes every dth data point to predict the excluded portions of the data) to obtain cross-validated redundancy measures described by Stone (1974) and Geisser (1974).

RESULTS

Descriptive analysis: The descriptive analysis with regards to mobile usage indicates that mobile phones are adopted for class lecture, assignments and examinations. The overall result indicates that 100% of the respondents used mobile. Mores so, the mean values for the variables ranged between 3.61 and 3.93 while the standard deviation of the variables ranged between 0.38 and 0.78.

Measurement model: To confirm the internal consistency reliability, convergent validity and reliability and discriminant validity, measurement model analysis was conducted.

Table 1-3 results of the measurement model analysis revealed significant (p<0.01) loadings for all reflective indicators. However, 3 items from Culture variables, 1 item from information quality, 3 items from system quality, and 5 items from net benefit fell below the threshold of 0.7 (Valerie, 2012) and were all removed from subsequent analysis. All remaining items showed satisfactory loadings ranging from 0.711-1.000 and composite reliability scores ranged between 0.874 and 1.000 (Hair *et al.*, 2011; Valerie, 2012) and thus indicating good convergent validity. The Average Variance Extracted (AVE) values of the reflective scales ranged between 0.635 and 1.000, thereby exceeding minimum requirements of 0.5 (Hair *et al.*, 2011). Discriminant validity was deemed

Table 1: Results of measurement model first order

Construct	Indicators	Loadings	Cronbach's alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Intention to use	IN1	0.918	0.920 603	0.936 752	0.68 0030
	IN2	0.815			
	IN3	0.839			
	IN4	0.803			
	IN5	0.748			
	IN6	0.876			
	IN7	0.764			
Net benefit	NB6	0.814	0.789 302	0.877 005	0.70 4196
	NB7	0.815			
	NB8	0.886			
Satisfaction	EU1	0.801	0.819 928	0.880 681	0.64 9057
	EU2	0.831			
	EU3	0.843			
	EU4	0.743			

Table 2: Results of measurement model second order

Model construct	Indicators	Loadings	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)	
Culture Variables	Uncertainty avoidance	UA1	0.834	0.731173	0.880068	
		UA2	0.846			
		UA3	0.848			
	Power distance	PD1	0.951			0.930144
		PD2	0.805			
		PD3	0.948			
Masculinity/individualism	MF1	1.000	1.000000			
	IC2	0.713				
	IC3	0.947				
Information quality	Content usefulness	CU1	0.742	0.924224	0.898785	
		CU2	0.852			
		CU3	0.823			
		CU4	0.739			
		CU5	0.838			
	Content adequacy	CA1	0.811			0.897525
		CA2	0.893			
		CA3	0.712			
		CA4	0.889			
		CA5	0.712			
System quality	Ease of use	EU1	0.798	0.663152	0.900969	
		EU2	0.812			
		EU3	0.711			
		EU4	0.812			
		EU5	0.878			
	Accessibility	ACc1	0.779			0.874125
		ACc2	0.788			
		Acc4	0.712			
	Interactivity	IN2	0.945			0.900671
		IN3	0.863			

Table 3: Correlations among constructs and discriminant validity

Parameters	Intention to use	Satisfaction	Net benefit	Culture	Information quality	System quality
Intention to use	0.680					
Satisfaction	0.633	0.649				
Net benefit	0.445	0.406	0.704			
Culture	0.527	0.597	0.615	0.690		
Information quality	0.553	0.342	0.400	0.349	0.600	
System quality	0.651	0.414	0.618	0.446	0.530	0.693

**Correlation is significant at the 0.01 level (2-tailed); Diagonal (bold face) represents the square root of the average variance extracted while other entries represent the correlations

satisfactory as each latent construct's AVE emerged greater than its highest squared correlation with any other latent construct in the model as shown in Table 3.

Structural model: The evaluation of structural model was based on the requirements mentioned by Chin (2010) Hair *et al.* (2011, 2013) and Valerie (2012) by considering the R² values, effect size (f²), predictive relevance of the model and Goodness of Fit (GoF). The level and significance of the path coefficients and bootstrapping were employed to test the study hypotheses. The R² was found to be 0.916 indicating that user satisfaction can account for 91.6% of the variance in net benefit which is in the high range. Secondly, the R² value of intention to use was 0.952, suggesting that 95.2% of the variance in extent of net benefit can be explained by intention to use. Since finally, the R² of net benefit was 0.945 indicating that net benefit account for 94.5.% of the variance in the model which was also in the high range.

The obtained cross validated redundancy values for information quality, intention to use, net benefit, system

quality, user satisfaction and culture were found to be 0.374, 0.199, 0.634, 0.179, 0.572 and 0.013, respectively. These results support the claim that the model has an adequate prediction quality. In addition, the GoF value of 0.509 was compared with the baseline values as recommended by Wetzels *et al.* (2009) (Small = 0.1, medium = 0.25 and large = 0.36). The result indicated that the models goodness of fit measure was higher than the adequate validity of the global PLS Model.

Based on the above table 4, the proposed relationship between culture factors and user satisfaction was significant ($\beta = -0.367$, $t = 2.978$) while culture factor and intention to use shows insignificant relationship ($\beta = 0.012$, $t = 0.159$). Regarding information quality factor, there is association between it and user satisfaction of mobile learning ($\beta = 1.029$, $t = 7.012$) but information quality did not show any association with intention to use ($\beta = 0.169$, $t = 1.582$) and hence the hypothesis was not supported.

The proposed relationship between system quality and user satisfaction was highly significant ($\beta = -0.521$,

Table 4: Proposed relationship culture factors and satisfaction

Relationship	Path coefficient	Standard error	t-value
Culture a user satisfaction	0-0.367	0.121816	2.978
Culture intention to use	0.012	0.092854	0.159
informatio à user satisfaction	1.029	0.149218	7.012
Information intention to use	0.169	0.116026	1.582
System user satisfaction	0-0.521	0.093664	5.328
System intention to use	0-0.065	0.066110	0.998
intention to use user satisfaction	0.612	0.059647	10.151
user satisfaction net benefit	0.206	0.045166	5.274
intention to use net benefit	0.776	0.038901	20.555
user satisfaction intention to use	0.449	0.050473	8.841

t-values > 1.65* (p < 0.10); t-values > 1.96** (p < 0.05); t-values > 2.58*** (p < 0.01)

t = 5.328) but system quality did not show any association with intention to use ($\beta = -0.065$, t = 0.988). Also, the proposed relationship between intention to use and user satisfaction was highly significant ($\beta = 0.612$, t = 10.151) and the proposed relationship between user satisfaction and net benefit was also highly significant ($\beta = 0.206$, t = 5.274). Likewise, the proposed relationship between intention to use and net benefit was highly significant ($\beta = 0.775$, t = 20.555) so also the proposed relationship between user satisfaction and intention to use was highly significant ($\beta = 0.449$, t = 8.841).

DISCUSSION

The findings of this study indicates that culture explains how psychological behaviour in different societies affect the satisfaction gained by users when a new technology is introduced. Whereas, user satisfaction is an important factor that determine the success of a new technology. Due to the theoretical and practical implication of user satisfaction, the satisfaction of IS users is very important. The stisfaction of Jordanian student based on their usage of M-learning is captured in this study by their post-usage evaluation or on-going experience of the M-learning system. Thus, culture in this study refers to the Jordanian student mind-set and behaviour shaped by their culture necessary which influence their satisfaction on M-learning. Hence, the current study significantly agree with previous studies (Scollon *et al.*, 2004; Waheed, 2011) that reported positive relationship between culture and user satisfaction. Blanchard and Frasson find that culture difference affects student expectation, satisfaction and learning. Chase *et al.* (2002) found that there is cultural gap among students of online education. This clearly shows that the higher these factors: uncertainty avoidance power distance, masculinity/femininity, individualism/collectivism, long vs short-term time orientation that are measures of culture the higher the intention of student to use mobile learning. This is

consistent with the belief that cultural environment influence individual thinking, feeling and working style (Scollon *et al.*, 2004; Waheed, 2011).

Conversely, the result revealed insignificant relationship between culture and intention to use. This finding is more consistent with the system determined theory that explain the factors that leads to acceptantce or the rejection of a new IS. In line with this theory, the intention to use M-learning by Jordain student by using M-learning is not depedent on the cultural difference of individual student, rather whether the student gained satisfaction or does not gain any satisfaction is detemined by the technological features of the M-learning system. Teng and Laroche (2007) found that behaviour intention is insisgnificant depedeing on the culture of the society.

As for information quality, it is found by this study that it affect users' satisfaction in the context of M-learning among Jordanian student. Consistent with this findings are the findings of Iivari (2005), Wu and Wang (2006). Information quality refers to the issues relating to personalization, completeness, eases of understanding and relevance of IS (DeLone and McLean, 2003). In this study, information study refers to the quality of M-learning system which leads to student satisfaction. However, the finding of this study suggest that information quality does not affect intention to use significantly. This is consistent with earlier studies like Iivari (2005) that found that information quality is not significantly related to intention to use. Using technology fit, Goodhue and Thompson (1995) reported that information quality was not signnificantly related to utilization.

Regarding the effect of system quality and user satisfaction was examined, the finding indicates that there is a positive relationship between system quality and user stisfaction. and this is consistent with previous studies findings (Devaraj *et al.*, 2002). However, the other finding indicates non significant relationship between system quality and intention to use. This result is in agreement with earlier studies (Agarwal and Prasad, 1997;

Venkatesh *et al.*, 2003; Kositanurit *et al.*, 2006; Gefen and Straub, 1997). These studies were in different IS contexts and found that system quality does not influence intention to use IS. Venkatesh *et al.* (2003) reported a non-significant relationship between system quality and intention to use when measured three and six months after the implementation of the system.

Furthermore, this study's findings confirm the extant findings that users' intention to use a new IS affects user satisfaction (Fernandez and Illera, 2009; Chiu *et al.*, 2005). Also, this study's findings confirm the extant findings that user satisfaction affects net benefit (Iivari, 2005) found a strong association between user satisfaction and net benefits. Yoon *et al.* (1995). In the same vein, in this study, intention to use was found to have a link with net benefit and thus confirm the extant findings such as Jones and Straub (2006) and Petter *et al.* (2008). Lastly, the study's findings established the effect of user satisfaction on intention to use and thus confirm the extant findings such as Rai *et al.* (2002) and Kulkarni *et al.* (2006).

CONCLUSION

This study has presented a detailed analysis of factors affecting the success of M-learning implementation in the institutes of higher learning in Jordan with emphases on culture as a significant predictor of IS success and thus expanding the IS success literature consistent with the model developed by DeLone and Maclean within the organisation context in a developing country. This study provides a framework for higher institutions of learning in Jordan to assess the success of their M-learning apps. The current study investigated the success of M-learning apps from the dimensions: culture, system quality, information quality, user satisfaction and intention to use. Culture represents technical and semantic levels of success. It is fundamental to achieving a high level of success: intention to use and net benefit. Successful M-learning can satisfy users and build the country's reputation of being technological growth. Intention to use the M-learning platform is the highest level of success because the continuous usage of the M-learning will lead to long-term benefits such as improved learning conditions of the student. Among the system characteristics examined, accessibility, interface design, privacy and security are important attributes of system quality for M-learning. These indicate that M-learning developers should focus on enhancing these features when designing and upgrading the M-learning application.

However, the findings of this study could be influenced by changes over time of studies variables. For instance, a change in government policies towards M-learning implementation may likely have an impact on

the research variables. Avolio documented that there is a possibility of variance in the data collected using the same method and the same point in time. Perception of users of M-learning could vary over time and depend on policy changes. Therefore, investigation over time can provide valuable insight, hence leading to better data quality. Meanwhile, during the survey, the questionnaire was not segmented; therefore, the empirical analysis could not be tested on gender, qualification and age and computer skill. Such a detailed analysis could provide further insight that could enhance the understanding of the providers of M-learning.

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