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Factors Influencing Acceptance of Mobile Learning by Higher Education Students in Pakistan

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Abstract: This study explores the impact of various factors on students' intention towards the acceptance of mobile learning (m-learning) technology. Use of extended Unified Theory of Acceptance and Use of Technology (UTAUT2) model in the context of m-learning has been limited. This study explores its use and further refines UTAUT2 in the context of m-learning. A cross-sectional survey has been conducted in order to collect data from two universities of Pakistan. SmartPLS 3 and SPSS v.21 were used for investigating the data. The findings revealed that the behavioral intention regarding m-learning acceptance is positively influenced by performance expectancy, facilitating conditions, habit, hedonic motivation, ubiquity and personal innovativeness while effort expectancy has positive influence towards performance expectancy. Furthermore, the proposed conceptual model achieved acceptable fit and the hypothesized paths were valid. This study contributes in the m-learning and provides valuable insights to assess the acceptance of m-learning in the context of higher education institutes in Pakistan.

Keywords: Technology acceptance, Theoretical framework, UTAUT2, M-learning

1. INTRODUCTION

Mobile devices specifically smart phones offer additional benefits and learning opportunities in a learning setting as compared to traditional learning methods (Ozdamli and Uzunboylu, 2015). In the education field, m-learning provides vigorous learning environment in order to support learning anywhere and at anytime using mobile devices (Keengwe and Bhargava, 2014; Jeong and Hong, 2013). Ozdamli and Uzunboylu, (2015) highlight that mobile phones have positive influence on the behavioral intention towards learning interaction. Pena-Ayala *et al.,* (2014) have stated that mobile device is a ubiquitous learning tool. Abachi and Muhammad, (2013) have also stated that now-a-days almost every individual is involved in m-learning. Viberg and Gronlung, (2013) have indicated that smartphone is being used increasingly but potential factors of m-learning acceptance still need for further research. Few studies highlighted potential obstacles and m-learning adoption factors (Viberg and Gronlung, 2013; Chen and Tseng, 2012). Venkatesh *et al.,* (2012) have developed an extended UTAUT model by combining following three new technology acceptance predictors: hedonic motivation, habit and price value and named it as UTAUT2. As a contribution, we have enhanced UTAUT2 model in the context of m-learning acceptance. Two additional constructs: ubiquity and personal innovativeness have been combined with UTAUT2 to fill research gap towards m-learning acceptance by higher education students of Pakistan. Therefore, the main research question is formulated as follows:

RQ: Does proposed factors have a positive influence on m-learning acceptance?

2. RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

UTAUT2 is a unified technology acceptance model, which does not address any specific technology. Therefore, UTAUT2 model needs enhancement in order to integrate mobile technology acceptance. In this study, enhanced research model is presented by adding two additional constructs into the traditional UTAUT2 model: ubiquity and personal innovativeness regarding m-learning context. The price value construct was excluded as the m-learning software application used in this study was free of cost. Fig.1 shows the proposed m-learning model. Theoretical and empirical justification is provided below to rationalize our hypotheses.

2.1 Effort Expectancy (EE)

Effort expectancy is explained as "The degree of ease/effort associated with consumers' use of the technology" (Venkatesh *et al.,* 2012). Venkatesh *et al.,* (2003) have experimentally verified that behavioral intention has significant influenced by effort expectancy to use an information system. Furthermore, the scholars (Zhou *et al.,* 2010; Teo *et al.,* 2015; Chen and Chang, 2013) proved that more effort expectancy leads to higher performance expectancy. Therefore, the following hypotheses have been formulated:

H1: To use the m-learning, EE will positively impact on BI.
H2: To use the m-learning, EE will positively impact on PE.

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2.2 Performance Expectancy (PE)

PE is defined as "The degree to which using a technology will provide benefits to consumers in performing certain activities" (Venkatesh *et al.,* 2012). Empirically verified construct performance expectancy was robust predictor of technology acceptance and it has significant influence on the intention of end-users (Venkatesh *et al.,* 2012). Therefore, the proposed hypothesis in this study was:

H3: To use the m-learning, PE will positively impact on BI.

2.3 Social Influence (SI)

SI is explained by Venkatesh *et al.,* (2012) as "The consumers perceive that important others (e.g. family and friends) believe that they should use a particular technology". The researchers have verified that the individuals' behavioral intention is greatly influenced by co-workers, fellows, elders and teachers when using technology (Yuan *et al.,* 2005; Rice *et al.,* 1990; Kraut *et al.,* 1998). Therefore, the following hypothesis has been formulated:

H4: To use the m-learning, SI will positively impact on BI.

2.4 Facilitating Conditions (FC)

Venkatesh *et al.,* (2012) and Brown and Venkatesh, (2005) have defined facilitating conditions as "Consumers' perceptions of the resources and support available to perform a behaviour". Seymour *et al.,* (2007) have used facilitating conditions construct in their study and found that this predictor is a statistically significant towards the intention of end-users. Therefore, the following hypothesis has been formulated:

H5: To use the m-learning, FC will positively impact on BI.

2.5 Hedonic Motivation (HM)

HM is explained as "The pleasure or enjoyment derived from using a technology" (Venkatesh *et al.,* 2012). Its influence on the end-users' intention was positive (Venkatesh *et al.,* 2012). The researchers state that if any technology gives fun or pleasure during usage then user enjoys it (Kim *et al.,* 2011). Therefore, the following hypothesis has been formulated:

H6: To use the m-learning, HM will positively impact on BI.

2.6 Habit (HA)

HA is defined as "The extent to which people tend to perform behaviors automatically because of learning" (Venkatesh *et al.,* 2012 and Limayem *et al.,* 2007). According to researchers Chuang, (2011) and Nikou and Bouwman, (2014), habit has significant impact on the end-users to divert their intention. Therefore, the following hypothesis has been formulated:

H7: To use the m-learning, HA will positively impact on BI.

2.7 Ubiquity (UB)

Ubiquity has been define as "The learning content can be accessed anywhere and at anytime, regardless of location" (Parsons and Ryu 2006). According to Huan *et al.,* (2015), the strongest and advantageous feature of m-learning is ubiquity. Therefore, the following hypothesis has been formulated:

H8: To use the m-learning, UB will positively impact on BI.

2.8 Personal Innovativeness (PI)

PI is an individual's readiness for trying new techniques in the information technology (Agarwal and Prasad, 1998). Various researchers have tested personal innovativeness predictor and they found personal innovativeness has strong influence on behavioral intention (Fang *et al.,* 2009; Lian and Lin, 2008; Lu *et al.,* 2005). Therefore, the following hypothesis has been formulated:

H9: To use the m-learning, PI will positively impact on BI.

2. RESEARCH METHODOLOGY

In this section, the methodology is defined.

3.1. Instrument development

In this study, two additional constructs: ubiquity and personal innovativeness have been combined with UTAUT2 to investigate the reasons, which affect the universities students' intention towards acceptance of m-learning. Table 1 presents research variables with number of items and their sources.

Table 1 Operationalization of research variables

S#	Research Variables	Items	Source
1	Performance Expectancy	4	Venkatesh et al. (2012)
2	Hedonic Motivation	4	
3	Effort Expectancy	4	
4	Habit	3	
5	Facilitating Conditions	4	
6	Social Influence	3	
7	Behavioral Intention	3	
8	Ubiquity	4	T. Lee (2005)
9	Personal Innovativeness	4	Agarwal and Prasad (1998)

3.2 Sample and data collection

In this study, the questionnaire was adapted after exploring the literature review based on m-learning acceptance. In this regard, data was collected from two universities with sample of 730 students. Cross-sectional survey method was adopted to test the hypothetical model as shown in **(Fig.1).**

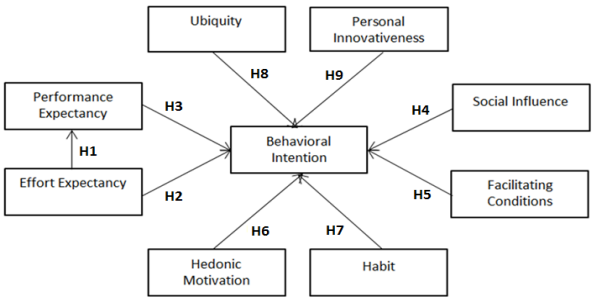

Fig. 1 Proposed Research Model

4. DATA ANALYSIS AND RESULTS WITH DISCUSSIONS

The questionnaire was administered among the students and seven hundred and thirty valid responses were collected.

At the start of the investigation, an exploratory factor analysis was conducted through SPSS v.21. Then the measurement model was evaluated using confirmatory analysis through SmartPLS v.3. Three recommended criteria of convergent validity were followed: Factor loading should be more than minimum threshold criterion 0.40 (Churchill, 1979), composite reliability (CR) more than 0.6 (Hair *et al.,* 2006; Bagozzi and Yi, 1991) and average variance extracted (AVE) more than 0.5 (Fornell and Larcker, 1981).

(Table 2) shows all constructs, Items code, mean, standard deviation and factor loadings. The factor loadings are greater than recommended value (i.e., >0.5).

Table 2 Descriptive statistics

S#	Constructs	Items code	Mean	Standard deviation	Factor loadings
1	Performance Expectancy	PE1	5.753	1.1826	0.7329
		PE2	5.704	1.2712	0.7016
		PE3	5.667	1.1748	0.7845
		PE4	5.647	1.1251	0.7740
2	Hedonic Motivation	HM1	5.208	1.6820	0.8266
		HM2	5.178	1.6028	0.8761
		HM3	5.041	1.5057	0.8477
3	Effort Expectancy	EE1	5.848	1.1933	0.7800
		EE2	5.859	1.1052	0.7591
		EE3	5.810	1.2704	0.5531
		EE4	5.700	1.2611	0.5451
4	Habit	HA1	4.937	1.6518	0.7342
		HA2	4.842	1.6165	0.8157
		HA3	5.127	1.4634	0.7470
		HA4	5.305	1.4939	0.7682
5	Facilitating Conditions	FC1	5.138	1.6393	0.7802
		FC2	5.436	1.5420	0.7642
		FC3	5.437	1.4655	0.5460
		FC4	5.473	1.4229	0.5359
6	Social Influence	SI1	5.192	1.4540	0.8006
		SI2	5.056	1.5514	0.8428
		SI3	5.274	1.4634	0.8227
7	Behavioral Intention	BI1	5.349	1.4325	0.8093
		BI2	5.341	1.3749	0.8280
		BI3	5.334	1.3418	0.8211
8	Ubiquity	UB1	5.556	1.2734	0.7565
		UB2	5.453	1.4708	0.7824
		UB3	5.474	1.4750	0.8100
		UB4	5.530	1.4238	0.7655
9	Personal Innovativeness	PI1	5.258	1.5287	0.7814
		PI2	5.282	1.5071	0.7528
		PI3	4.884	1.7658	0.6732
		PI4	5.633	1.3737	0.5432

(Table 3) shows the validity and reliability of the constructs. The results show that the AVE values of all the factors are more than 0.5. The value of the CR is more than 0.7; which shows the good convergent validity. In this study, for all the constructs, the values of Cronbach's Alpha are more than 0.7; which shows the good reliability.

Table 3 Validity and reliability indicators

Constructs	AVE	CR	Cronbach's Alpha
PE	0.5610	0.8361	0.7389
HM	0.7232	0.8868	0.8085
EE	0.5415	0.8250	0.7172
HA	0.5881	0.8508	0.7707
FC	0.5069	0.8587	0.7107
SI	0.6760	0.8622	0.7602
BI	0.6716	0.8598	0.7555
UB	0.6067	0.8604	0.7846
PI	0.5113	0.8848	0.7067

In order to investigate discriminant validity, AVE square root of every construct has been compared horizontally and vertically with correlation value of each construct. According to Fornell and Larcker, (1981) latent variable correlations show more close relationships with its own measurement than the values of other constructs.

The comparison of square root of AVE and the correlation value of each construct are shown in **(Table 4)**. The measurement model reveals the acceptable reliability, and validity of convergent and discriminant.

Structural Model and Hypothesis Testing

The hypotheses from H1 to H9 have been tested through partial least square (PLS) method with 5000 bootstrapping samples. This technique provides t-statistics for each hypothesis and generalization of the results (Lévy *et al.,* 2009).

(Table 5) presents the relationship between the independent and dependent constructs. In this study, the results show that the predictive capability (R-square) of PE and BI of the proposed model is greater than the recommended value (i.e., >0.10), hence it shows the satisfactory predictive capability of the model (Falk and Miller, 1992). All the hypotheses are supported except hypotheses H2 and H4.

Table 4 Quality Criteria (Latent Variable Correlations)

	PE	HM	EE	HA	FC	SI	BI	UB	PI
PE	**0.749**								
HM	0.375	**0.850**							
EE	0.498	0.329	**0.736**						
HA	0.458	0.502	0.304	**0.767**					
FC	0.506	0.850	0.364	0.502	**0.712**				
SI	0.523	0.395	0.364	0.530	0.534	**0.822**			
BI	0.550	0.385	0.387	0.554	0.385	0.548	**0.820**		
UB	0.471	0.360	0.377	0.430	0.360	0.457	0.524	**0.715**	
PI	0.216	0.152	0.227	0.197	0.152	0.245	0.300	0.222	**0.779**

Table 5 Path Coefficients

Hypothesis	Path	Sample |O|	Mean (|M|)	(|STDEV|)	(|STERR|)	T Statistics (|O/STERR|)	Supported / Not Supported	R-Square
H1	EE→PE	0.2578	0.3034	0.0419	0.0419	6.1527	***	0.1279
H2	EE→BI	0.0219	0.0239	0.0392	0.0392	0.5581	Not Supported	0.3086
H3	PE→BI	0.1888	0.1859	0.0532	0.0532	3.5494	***	
H4	SI→BI	0.0111	0.0124	0.0337	0.0337	0.3290	Not Supported	
H5	FC→BI	0.1208	0.1277	0.0427	0.0427	2.8283	**	
H6	HM→BI	0.1465	0.1418	0.0409	0.0409	3.5818	***	
H7	HA→BI	0.2288	0.2312	0.0402	0.0402	5.6984	***	
H8	UB→BI	0.1750	0.1730	0.0387	0.0387	4.5232	***	
H9	PI→BI	0.1000	0.1024	0.0269	0.0269	3.7214	***	

* = <0.05 , ** = <0.01, *** = <0.001

5. DISCUSSIONS

The proposed m-learning model adequately enlightens future researchers and policy makers. This model has capability to predict students' intention towards the acceptance of m-learning. According to the results, effort expectancy towards performance expectancy has positive influence and the results are consistent with (Alalwan *et al.,* 2017), while effort expectancy is not significant towards behavioral intention as results are consistent with (Karahanna and Straub, 1999; Igbaria *et al.,* 1994). Performance expectancy has positively influenced towards the intention of the users; this is also reported by Chong *et al.,* (2011) and Wang *et al.,* (2009). Behavioral intention was significantly affected by social influence to use m-learning (Venkatesh *et al.,* 2012). Facilitating conditions has positively influenced on the students' intention towards the use of information system as reported by (Venkatesh *et al.,* 2012; Wang and Shih, 2009). The construct habit has significant and direct influence on the intention of end-users; the results are consistent with (Limayem *et al.,* 2007; Kim and Malhotra, 2005; Kim *et al,* 2005). In this study, ubiquity factor has significant impact on students' intention toward the acceptance of m-learning. The results show positive association between ubiquitous access and students' intention towards the acceptance of m-learning. Thus, universities and practitioners should address this factor during m-learning implementation. According to this study results, personal innovativeness has also significant impact on students' intention towards the acceptance of m-learning.

6. CONCLUSIONS

This study has proposed and investigated m-learning factors, which have significant influence on higher education students' intention towards m-learning acceptance in Pakistan. Moreover, UTAUT2 technology acceptance model has been enhanced in which two new m-learning predictors, ubiquity and personal innovativeness, have been combined. In response to the research question "Does proposed factors have a positive influence on m-learning acceptance?", the results indicate that proposed constructs have significant impact towards m-learning acceptance. It is very important to motivate the university administrators and practitioners to implement m-learning. Strategic

plans should be created to develop and implement the m-learning system in the universities of Pakistan.

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