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► **To cite this version:**

Abdullah Baabdullah, Omar Nasseef, Ali Alalwan. Consumer Adoption of Mobile Government in the Kingdom of Saudi Arabia: The Role of Usefulness, Ease of Use, Perceived Risk and Innovativeness. 15th Conference on e-Business, e-Services and e-Society (I3E), Sep 2016, Swansea, United Kingdom. pp.267-279, 10.1007/978-3-319-45234-0\_25 . hal-01702211

**HAL Id: hal-01702211**

**<https://inria.hal.science/hal-01702211v1>**

Submitted on 6 Feb 2018

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# Consumer Adoption of Mobile Government in the Kingdom of Saudi Arabia: The Role of Usefulness, Ease of Use, Perceived Risk and Innovativeness

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**Abstract.** Utilising Mobile Government (M-Gov) services would raise socio-economic benefits. Thus, it is essential to examine the factors that may increase the adoption of M-Gov services within the context of Saudi Arabia. This research aims to examine potential users' intentions towards different variables that may be significant for supporting higher behavioural intention to use the M-Gov services in Saudi Arabia. This study embraces the following variables: perceived risk, innovativeness, perceived usefulness, perceived ease of use and behavioural intention. Data was collected by means of a self-administered questionnaire on a convenience sample that consisted of 600 subjects with a response rate of 69.67%. The findings were gathered and the statistical analysis suggested that the related variables are perceived as significant by participants and they have a strong behavioural intention to use the M-Gov services. Furthermore, the findings show that perceived ease of use significantly influences perceived usefulness.

**Keywords:** Saudi Arabia, M-Gov, TAM, perceived risk, innovativeness

## 1 Introduction

M-Gov deals with the group of services concerning the organised usage of the governmental services and utilisations that are mainly attainable via mobile phones [37]. The Saudi Government has aimed at increasing the adoption of M-Gov in order to offer citizens more accessibility to governmental services compared with traditional methods in terms of time and cost [7]. Nevertheless, the traditional channels for communicating and transacting with the government are still common in Saudi Arabia [3]. Saudi citizens have not adopted it quickly due to the risks associated with the adoption of M-Gov as well as the lack of Saudi infrastructure [2]. This study aims to explore the citizens' (potential users) perceptions on the significance of certain factors regarding the issue of M-Gov adoption in the domain of Saudi Arabia.

## 2 Literature Review

Theoretically, within the field of IT/IS, researchers have integrated and formulated different theories and models in order to get in-depth knowledge and thoughtful understanding of the customers' behavioural intention towards M-Gov. Examples include the Theory of Reasoned Action (TRA) which was embraced by [8]. The Theory of Planned Behaviour (TPB) was applied by [32]. The Technology Acceptance Model (TAM) has also been implemented by [35], and it proposed to predict the customers' behavioural intention to use M-Gov. The Unified Theory of Acceptance and Use of Technology (UTAUT) [34] were implemented by [37]. The low level of M-Gov adoption in the context of Saudi Arabia was referred by [5]. [7] referred that the overt lack of consumers' awareness and the low levels of trust were considered as the main problems when it comes to the actual adoption of the M-Gov service on a larger scale. It is obvious that due to the newly established E-Gov services in Saudi Arabia, the issue of M-Gov has not, so far, been studied comprehensively. Consequently, this matter requires further research to investigate the shortage of M-Gov adoption.

## 3 Conceptual model and research hypotheses

TAM has been recognised as the most adopted theory within IT/IS research [34]. In order to solve the matter of inaccuracy in prediction with behavioural intention, the TAM has been extended by a number of researchers. For example, within the context of M-Gov, [3] extended the TAM model to include factors from the IDT model (relative advantage, compatibility, trialability). Likewise, [31] added elements from the IDT and UTAUT models to the TAM model. [8] developed their conceptual model relying on factors from TAM, TRA and UTAUT. As Figure 1 shows, this study adopts PU and PEOU from TAM and extended it to include perceived risk (PR) and innovativeness (INN).

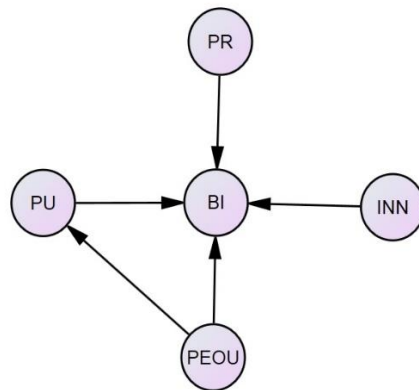


Figure 1. The Proposed Research Model - Adopted from [13]

*Perceived Usefulness (PU)* is defined as ‘the degree to which a person believes that using a particular system would enhance his or her job performance’ [14]. A considerable number of studies have affirmed the important role of PU over BI within the context of M-Gov (e.g. [22], [25]). Thus, the following hypothesis is: H1: PU positively influences Saudi customers’ intention to use M-Gov. *Perceived Ease of Use (PEOU)* is described as ‘the degree to which a person believes that using a particular system would be free of effort’ [14]. Because of the unique trait of M-Gov which necessitates a specific amount of skill and knowledge, PEOU might have a significant role in influencing the customers’ behavioural intention to adopt this service [30]. Furthermore, PEOU indirectly influences BI through facilitating the influence of PU on BI [38]. Accordingly, this paper concludes: H2: PEOU positively influences Saudi consumers’ BI to adopt M-Gov. H3: PEOU positively influences PU of using M-Gov. [27] defines *Perceived Risk (PR)* as ‘the consumer’s subjective expectation of suffering a loss in pursuit of a desired outcome.’ In M-Gov, the effect of PR on BI was significant [8], [31]. Similarly, it can be assumed that: H4: PR has a negative significant impact on consumers’ BI to adopt M-Gov. [29] described *Innovativeness (INN)* as ‘the level to which an individual is comparatively early in using novel thoughts than other members of a social system.’ [3] referred that increased levels of innovativeness led to a higher positive influence on consumers’ adoption of M-Gov services. The following hypothesis can be formulated for the M-Gov context: H5: Innovativeness has a significant and positive relationship with consumers’ BI to adopt M-Gov.

## 4 Methodology

Since the researchers presupposed as having no list of Saudi M-Gov potential adopters and because the citizens are dispersed in different areas, this research employed convenience sampling (i.e. in Jeddah, Riyadh and Dammam). Twenty-two items of the selected constructs were derived from [1], [4], [13], [15], [23] and [39]. The level of responses was measured by the seven-point Likert scale.

## 5 Results

### 5.1 Response Rate

Table 1 outlines the distributed sample along with the returned responses, incomplete and problematic responses, and finally valid responses.

**Table 1.** Response Rate

	M-Gov	%
Sample	600	100
Returned responses	418	69.67
Incomplete and problematic responses	22	3.67
Valid responses	396	66

## 5.2 Data Screening

Data screening was able to check whether the data was clean, reliable, useable and valid with a normal distribution before conducting further multivariate statistical analysis such as Structural Equation Modelling (SEM) [12].

### Treatment of Missing Data

The amount of missing data and their distribution pattern has been examined in the data set based on [11] role, and the amount of missing data per construct was less than 0.05 and in an acceptable level. In addition, the  $p$  value of missing completely at random (MCAR) was found to be non-significant in the data set ( $p= 0.483$ ). This indicates that the missing data over the data set is in a random manner and its values also existed non-systematically. All the missing values have been filled by the variable mean value as recommended [33].

### Outliers

Based on AMOS 22.0 outcomes, Mahalanobis-D squared distance ( $D^2$ ) was used to screen multivariate outliers with a  $p$  value of 0.000 over the data set as shown below in Table 2. In fact, the small amount of outliers is not problematic in the large sample size [24]. In addition to this, removing outliers may negatively reflect the generalisability of the results. Accordingly, it was decided to keep these outliers, as they could not improve the multivariate statistical results [18].

**Table 2.** Multivariate Outliers: Mahalanobis-D squared distance ( $D^2$ )

Observation number	Mahalanobis d-squared	p1	p2
61	86.862	.000	.000
341	70.379	.000	.000
20	70.017	.000	.000
225	63.930	.000	.000
29	63.617	.000	.000
325	60.903	.000	.000
158	60.758	.000	.000
111	52.108	.000	.000
233	50.717	.000	.000

### Assessment of Normality

Assessment of normality is meant to ensure that the attained data is normally distributed in a symmetrical shape. Accordingly, the univariate normality of each variable was examined by the skewness-kurtosis approach [10]. According to [36], the cut-off point of skewness and kurtosis values should be 3 and 8 respectively. As seen in Table 3 that represents AMOS 22.0 outcomes, the skewness-kurtosis approach was used over the data set, and all statistical values of this approach were found to be in an acceptable range.

**Table 3.** Assessment of Normality

Construct		M-Gov	
	Variable	Skewness	Kurtosis
Perceived Usefulness (PU)	PU 1	-1.320	.754
	PU 2	-1.044	.085
	PU 3	-1.025	.034
	PU 4	-1.087	.132
	PEOU 1	-.729	-.271
Perceived Ease of Use (PEOU)	PEOU 2	-.687	-.370
	PEOU 3	-.733	-.401
	PEOU 4	-.969	.312
	INN1	-1.133	1.138
Innovativeness (INN)	INN2	-1.287	1.680
	INN3	-.448	-.604
	INN4	-1.038	.584
	INN5	-.861	-.590
	INN6	-.671	-.686
	Perceived Risk (PR)	PR1	.077
PR2		.635	2.939
PR3		.274	.486
PR4		.072	.378
PR5		-.037	-.388
Behavioural Intention (BI)	BI1	-1.415	1.043
	BI2	-1.531	1.420
	BI3	-1.327	.787

## 6 Respondents' Profile and Characteristics

Table 4 below shows the demographic characteristics of respondents (i.e. Gender, Age, Education, Occupation, and Monthly Income).

**Table 4.** Demographic Characteristics of Respondents

Demographic Profile	Number of Respondents (N= 307)	Percentage (%)
Gender		
Male	228	57.6
Female	168	42.4
Total	396	100
Age		
>=18-20	25	6.3
21-29	40	10.1
30-39	230	58.1
40-49	64	16.2
50 and above	37	9.3
Total	396	100
Education		
Less than High School	7	1.8

High School	57	14.4
Diploma	82	20.7
Bachelor	170	42.9
Postgraduate	80	20.2
Total	396	100
Occupation		
Student	35	8.8
Government employee	253	63.9
Private sector employee	63	15.9
Self employed	45	11.4
Total	396	100
Monthly income (Saudi Riyals)		
1000-4000	30	7.6
4001-8000	64	16.2
8001-14000	212	53.5
14001-20000	44	11.1
More than 20000	46	11.6
Total	396	100

## 7 Structural Equation Modelling (SEM)

SEM is an approach that is made from two stages. The first stage is the reliability and validity of the constructs and then the fitness of the model are examined via CFA [10]. The second stage (i.e. structural model) examined the path coefficients between the endogenous variables (i.e. PU, PEOU, PR and INN) and the exogenous construct (i.e. BI) were checked. The relationship was also tested between PEOU and PU.

### 7.1 Measurement Model: Confirmatory Factor Analysis (CFA)

#### Model Fitness

For the purpose of testing the level of unidimensionality and the model's goodness of fit, a number of fit indices were used as seen below in Table 5 [21]. All the latent constructs were measured and their own indicators (22 items). The model is fitting the data according to the fit indices. According to [9], there is a need for a few respecifications and refinements. This process is meant to improve the model fitness by looking at standardised regression weights, modification indices and standardised covariance matrix. It was observed that PR1, 3 and INN1, 5 and 6 had an unacceptable higher value based on the modification indices, and thus all of them were removed. It was also found that the standardised residual values were within the acceptable range of  $\pm 2.58$  as recommended by [17]. Finally, and as suggested by [10], the CFA was tested once more to ensure the goodness of fit of the modified measurement model to see if it was sufficiently enhanced. Accordingly, no extra modifications were conducted regarding the measurement model.

**Table 5.** Measurement Model

Fit Indices	Cut-off Point	Measurement Model	Modified Measurement Model
CMIN/DF	≤3.00	1.900	1.488
GFI	≥ .90	.922	.955
AGFI	≥ .80	.901	.937
NFI	≥ .90	.935	.965
CFI	≥ .90	.968	.988
RMSEA	≤ 0.08	.048	.035

### Construct Reliability

Internal consistency (Cronbach's alpha), CR and AVE were employed to check the reliability of each construct after unidimensionality of the goodness of fit of the measurement model was tested [9]. Accordingly, and as Table 6 shows, adequate values of internal consistency, CR and AVE were realised.

**Table 6.** Constructs' Reliability

Latent Constructs	Cronbach's alpha ( $\alpha$ )	Composite Reliability (CR)	Average Variance Extracted (AVE)
PU	.910	.909	.715
PEOU	.874	.875	.637
PR	.780	.775	.535
INN	.758	.843	.649
BI	.947	.947	.860

### Construct Validity

The CFA was used to examine the constructs' validity of the conceptual model; both convergent and discriminant. [19] indicated that all items should have standardised regression weights above the cut-off value of .50. As seen in Table 7, all values were above .50. A threshold that is less than .85 has to be attained for all of the inter-correlation measurement [19]. According to the correlations table, the measurements of all of the inter-correlations attained this condition. As it can be seen in Table 8, the inter-correlation values with other similar constructs were no more than the square root of AVE given for each latent constructs [16]. Therefore, the conceptual model's estimations achieved a reliable level when it comes to the validity of convergent and discriminant.

**Table 7.** Constructs' Validity

Latent Constructs	Items	Factor Loading
PU	PU1	.915
	PU2	.818
	PU3	.810
	PU4	.835
PEOU	PEOU1	.803
	PEOU2	.759
	PEOU3	.814
	PEOU4	.813
PR	PR2	.661



	PR4	.774
	PR5	.755
INN	INN2	.860
	INN3	.599
	INN4	.921
BI	BI1	.931
	BI2	.945
	BI3	.901

**Table 8.** Discriminant Validity

Latent Constructs	PU	PEOU	PR	INN	BI
PU	<b>.846</b>				
PEOU	.710	<b>.798</b>			
PR	-.317	-.363	<b>.732</b>		
INN	.563	.515	-.449	<b>.805</b>	
BI	.618	.578	-.447	.578	<b>.927</b>

### Common Method Bias

This study considered Harman's single factor in order to check the common method bias (CMB) in the data set, and the 17 scale items [20]. All items in Table 9 were inspected by using an unrotated factor solution after loading the items into the EFA. According to [28], the first factor was able to account for less than the cut-off value of 50% as shown in the statistical results (44.864% of variance); otherwise, no factor was able to develop. Thus, the data set is perceived to be reliable, and there are no concerns about the CMB.

**Table 9.** Common Method Bias Test

Component	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.627	44.864	44.864	7.627	44.864	44.864
2	1.802	10.600	55.464			
3	1.298	7.637	63.101			
4	1.200	7.058	70.158			
5	1.096	6.446	76.604			
6	.649	3.816	80.420			
7	.538	3.163	83.583			
8	.466	2.740	86.323			
9	.441	2.594	88.917			
10	.359	2.111	91.028			
11	.314	1.849	92.877			
12	.308	1.810	94.687			
13	.240	1.412	96.099			
14	.211	1.242	97.340			
15	.180	1.060	98.400			
16	.164	.962	99.363			
17	.108	.637	100.000			

Extraction Method: Principal Component Analysis.

## Structural Model

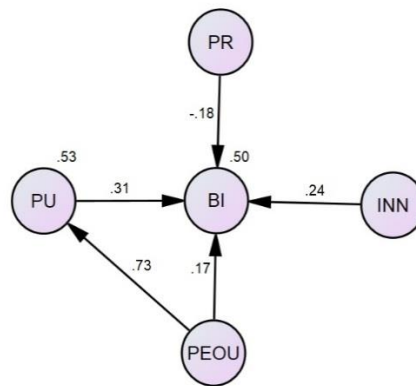
The conceptual model was validated and the causal paths between the dependent and independent factors were tested - See Figure 2. The structural model was examined at the second stage of the SEM. The structural model adequately fits the data based on the fit indices (see Table 10). A variance of .50 in BI and of .53 in PU was explained. The standardised estimates of the structural model are detailed below in Table 11.

**Table 10.** Structural Model

Fit Indices	Cut-off Point	Structural Model
CMIN/DF	$\leq 3.00$	1.714
GFI	$\geq .90$	.948
AGFI	$\geq .80$	.928
NFI	$\geq .90$	.958
CFI	$\geq .90$	.982
RMSEA	$\leq 0.08$	.043

**Table 11.** Standardised Estimates of the Structural Model

Path	Standardised Estimate	Critical Ratio	P-value	Significance
PU→BI	.308	4.500	***	Significant
PEOU→BI	.173	2.418	.016	Significant
PR→BI	-.184	-3.306	***	Significant
INN→BI	.243	4.334	***	Significant
PEOU→PU	.729	13.090	***	Significant



**Figure 2.** Validation of the Conceptual Model

## 8 Discussion

The statistical findings affirmed the predictive power of the adopted conceptual model in interpreting suitable variances explained on the dependent factors (i.e. PU and BI) - see Figure 2. In detail, the statistical findings strongly affirmed that PU is a main factor anticipating of BI with ( $\gamma=.31$ ). This means that Saudi customers tend to have a stronger behavioural intention to use M-Gov when considering this technology as

productive, useful and effective during their routine life. The empirical outcomes asserted that PEOU has significant influence over BI with 17%. As such, the Saudi customers will have a higher behavioural intention to use M-Gov when they perceive the service is easy and only takes a few efforts to use. Indeed, it can be seen that although PEOU has significant influence over BI; yet, it has the least effect amongst other independent variables over BI. This is because the fact that conducting M-Gov requires customers to have some knowledge of using the system which might be difficult in some cases. Interestingly, PEOU significantly influences the PU with ( $\gamma=.73$ ). This indicates that customers will perceive M-Gov as a useful service when considering that this service is easy to handle. Accordingly, it is considerably importance to assert the role of INN when pursuing to increase the customers' behavioural intention to use M-Gov. This study shows the significance of this path ( $\gamma=.24$ ). This can be explained by the idea that economic prosperity in the Kingdom of Saudi Arabia allows the consumers to experience new technologies and novel products or services such as M-Gov. This study measured the negative importance effect of PR over BI in M-Gov ( $\gamma=-.18$ ). Thus, this paper suggests that PR is recognised by Saudi customers as a significant aspect in shaping their behavioural intention to accept or discard the M-Gov in terms of social, financial, performance, and psychological risks.

### **8.1 Contribution**

The achievement of this research is estimated to add to the context of M-Gov and to Saudi Arabia's initiatives in developing M-Gov applications as well as citizens' behavioural intention towards using this new promised service. Furthermore, this study theoretically adds to the literature by extending TAM to include two powerful factors to enhance the citizens' intention to shape an actual behaviour.

## **9 Conclusion**

This study measured the influence of PU, PEOU, INN and PR on BI to use M-Gov within the Saudi Arabian context. The findings indicated that the aforementioned independent factors positively influenced BI; also, PEOU significantly influences PU.

### **9.1 Limitations and Future Research Directions**

This study only examines M-Gov which, in turn, adversely reflects on the outcomes' generalisability to other types of mobile services. Future research should consider other contexts and technologies such as the Mobile Internet. As this study considers investigating behavioural intention instead of actual use of M-Gov in Saudi Arabia, future research should provide a complete view about the actual usage in addition to new effective factors to provide a more comprehensive model.

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