

# The Adoption of Mobile Government Services in Developing Countries

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## Abstract

Mobile government is just at the beginning of its rise as a future trend of e-government. Considering technical advancement's such as mobile Internet, smartphones, and tablet-PCs. m-government represents tremendous new potential for the communication between governments and citizens. There are many examples of failures of early e-government projects due to a lack of consideration of users' requirements. Although the importance of m-government, few developing countries successfully applied it. This research introduces a conceptual model for youth adoption of m-government services in developing countries. Using a survey method for data collection, the model was tested and findings showed that perceived usefulness, compatibility, awareness, social influence and face-to-face interactions significantly contribute to the prediction of the intention to use m-government.

**Keywords:** *m-government, adoption, youth, developing countries, Sudan.*

## 1. Introduction

Governments around the globe utilize the Information and Communication Technology (ICT) to improve services' delivery to citizens by introducing e-government [1][2]. In the last decade, some of the governments have noticed the rapid evolution of wireless technologies and the widespread of internet-enabled mobile devices in many countries [3]. This encouraged these governments to move naturally towards mobile government (m-government) as a next step to enhance the quality and delivery of their services [4][5]. M-government is an added value to the e-government since citizens will be able to access e-government services using mobile technologies such as mobile phones; Wi-Fi enabled devices and wireless networks in delivering public services [6]. The main forces that influence the move from e-government to m-government are mobile device penetration, emergence of mobile internet and mobile net applications and services [3]. Internet enabled mobile devices penetration rates are incrementally growing compared to the traditional wired PCs as well as internet penetration rates [7]. this

spectacular Growth has changed how citizens perceive the mobile phones functionality [8]. It is no longer used only for voice communication, but also as a way for convenient connectivity to the internet used for transferring data, exchanging emails and doing business transactions. Reviewing the literature shows that there is a gap regarding investigating the factors that affect citizens' adoption of using m-government services in developing countries [9]. Moreover, many studies covered the adoption towards e-government but not the m-government services [9][10]. To address this gap, a research question has been developed "What are the factors that affect the youth adoption for m-government services in Sudan?"

## 2. Literature Review

### 2.1 M-Government in developing countries

As citizens' demands increase for better public services, mobile technologies are paving the way for governments [8] to deliver better, quick and on time information as well as transactional services to the citizens. M-government helps governments to provide anytime and anywhere services for citizens [8]. The case of deploying mobility to e-government services is beneficial to the developing countries compared to the developed ones. Developing countries are able to bypass building heavy infrastructure required for regular internet access by adopting the wireless internet technologies that save them cost and time [11]. Therefore, barriers faced by e-government like the lack of technical infrastructure and low level of citizen's readiness are overcome with the m-government initiatives [6]. Although m-government has a number of benefits, yet this does not mean that the challenges [12] can be ignored. A number of issues do arise when it comes to developing and implementing m-government.

## 2.2 Citizens' Adoption: A Theoretical Background

Although the importance of understanding the benefits and limitations of m-government, there is still one important issue which needs to draw great attention towards which is the end user behavior regarding adopting and using m-government services. There are different models which explain how citizens could adopt new technologies. The Technology Acceptance Model (TAM) is considered to be a very commonly used model to study the behavioral intentions of information systems or newly diffused technologies [10][14]. This model is all about determining the acceptance of people to technology based on their intentions towards such technology and relying mainly on two factors: the perceived usefulness (PU) and the perceived ease of use (PEOU) [9]. These two factors are extracted from Theory of Reasoned Action (TRA) which was developed in 1975. The TRA states that the beliefs in one's mind affect one's intentions and the intention influence one's actions. So, TAM determines the acceptance of people towards the new technology based on their intentions towards such technology. Based on this, we posit the following hypotheses:

*H1: Perceived usefulness significantly influences the intention to use e-government services.*

*H2: Perceived ease of use significantly influences the intention to use e-government services.*

The Diffusion of Innovation (DOI) is another theory used to explain users' adoption to new technologies. Rogers [15] defined diffusion as the process of communicating a new idea or an object through certain channels over time among the society members [15]. The main factors that affect the diffusion of an innovation model are: relative advantage, complexity (similar to TAM's PEOU factor), compatibility and observability. A continuation of this model is the perceived characteristics of an innovation model (PCI). Carter and Belanger [16] have noticed that the TAM and DOI models have overlapping factors. For example, the complexity factor in the DOI model is similar to the perceived ease of use in the TAM model. The same goes for the perceived usefulness in the TAM model where it is similar to the relative advantage in the DOI [16]. Based on this, we posit the following hypothesis:

*H3: Compatibility significantly influences the intention to use e-government services.*

Many researchers used different models and theories that influence the behavior of the users to test their adoption to new technologies (table 1). However, the TAM model has received extensive attention and application on different scenarios. There a number of limitations for the TAM such as not ignoring the trust issue, time and money constraints and not providing meaningful information about the behavioral acceptance of the users to technology due to its generality.

Consequently, a new model is developed to overcome these limitations, which is the Unified Theory of Acceptance and Use of Technology (UTAUT) [17]. The UTAUT is based on different theoretical models which are, TRA, TAM, motivational model, the theory of planned behavior, a model combining the TAM and the theory of planned behavior, model of PC utilization, DOI, and finally the social cognitive theory. It consists of several independent factors (performance expectancy, effort expectancy, social influence, awareness and facilitating conditions [18]. The most important contribution for the UTAUT is integrating the social influence and cultural factors to understand the adoption [17]. Based on this, we posit the following hypotheses:

*H4: Social influence significantly influences the intention to use e-government services.*

*H5: Awareness significantly influences the intention to use e-government*

*services. H6: Personal connections significantly influence the intention to use e-government services.*

*H7: Face-to-face interactions significantly influence the intention to use e-government services.*

Many other researchers considered other factors regarding the trust, awareness and pervious internet experience in their studies [19][10][2]. Based on this, we posit the following hypotheses:

*H8: Trust significantly influences the intention to use e-government services.*

*H9: Internet experience significantly influences the intention to use e-government services.*

Table 1: List of factors used for the conceptual model

References	Definition	Constructs
[9][10]	The degree to which a person believes that using a particular system would enhance his/ her performance.	Perceived Usefulness
[9][10]	The degree to which a person believes that using a particular system would be free of effort.	Perceived Ease of Use
[10][2]	The Innovation or technology is being compatible with the existing values, beliefs, experiences of adopters.	Compatibility
[18][17]	The individual’s belief of other people around him/her concerning the importance of using a certain technology.	Social Influence
[9][2][17]	People’s knowledge of technology and the availability of electronic services.	Awareness
[9][18]	People prefer to know someone who could help them to receive the service.	Personal connections
[19][4]	People prefer the service to be delivered through human interaction	Face-to-face interactions
[18][4]	The user’s beliefs or faith in that a specific service can be regarded to have no security and privacy threats.	Trust
[18][2][9]	Previous experience of using the internet and requesting services.	Internet Experience

### 3. Proposed Conceptual Model

Although many studies have analyzed the adoption of the user to e-government adoption [18][19][10], yet few studies have explored the citizen’s adoption to the m-government services (Azab, 2009) which demonstrate the gap existence. In order to answer the research question What are the factors that affect the youth adoption for m-government services in Sudan?, it is important to investigate different factors introduced in the

models discussed earlier. As each model has its strength and limitations, a combined framework of such models can be very beneficial in examining the youth intention to use e-government through mobile access where the overlapping factors can be used only once and the factors that are not significant in the case of Sudan can be ignored (table 1). In this paper, the proposed conceptual model (figure 1) explores how TAM, Society, individual, trust and cultural factors influence the intention to use m-government services.

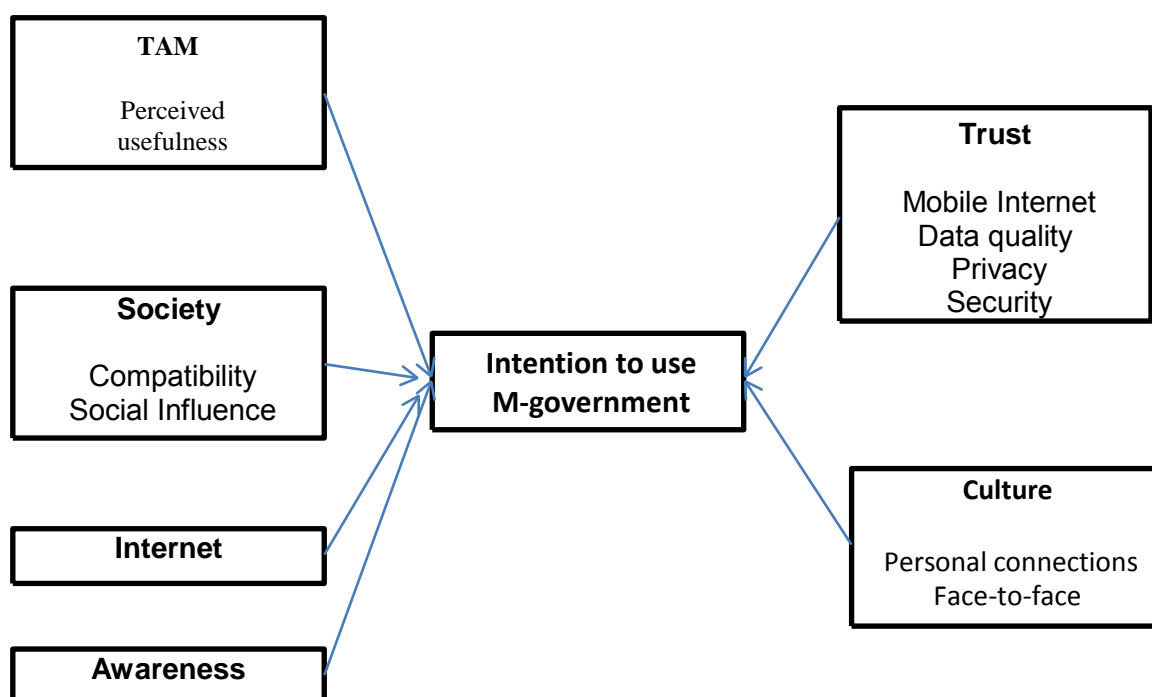


Figure 1: Proposed conceptual model

## 4. Research Methodology

### 4.1 E-government & M-government in Sudan

The Sudanese e-government program officially started in 2001 [20] with a mission of delivering Innovative and value added solutions to deliver government services to citizens and business with a superior quality [21]. Currently, there are more than 100 transactional services provided to the Sudanese [22]. With the expectation to expand in the future and reach up to 700 services [22], the e-government portal's structure was designed to accommodate this huge number of services in two languages (English and Arabic) [22]. The e-government offered a very limited number of services via mobile devices such as sending voting information by SMS [23][7]. In Sudan, getting a fixed telephone line takes long time and is considered costly which encouraged many Sudanese to get a mobile phone connection [7]. For many Sudanese this choice seems better due to its low cost which leads to a very high mobile phone penetration. In Sudan, the mobile phone penetration rate is (69%) and is considered very high compared to the fixed lines rate (13.3%) and internet penetration rate via dial up and DSL (20.8%) [7].

### 4.2 Sample

Sudan has been selected for investigation as a good example of a developing country which has a running e-government program since 2001 and offers many transactional services [20]. Although the high number of services offered online, limited numbers of users are using the services [22]. Since, the mobile penetration in Sudan is considered very high [7], there is a potential for many citizens to use government services via their mobile devices. Since young people are more eager (early adopters) to use new technologies, the youth are the main focus of this research. Empirical research via a survey research method is considered to be an appropriate approach to test the research model. The questionnaires targeted the youth in Sudan with ages ranged from 16 to 25. In order to reach a good sample of youth in Sudan, universities were identified to distribute the questionnaires in. To reach representative sample from different students' classes, four different universities were selected for the distribution. Two of them are public universities owned by the government and the other two are private universities. Furthermore, the universities selection was considered to be in three different governorates to reach more representation of the youth. An equal number of the questionnaires were distributed randomly to students enrolled in each university. Out of 120 questionnaires were distributed, 100 valid responses were collected and fully answered. All participants of the study were living in

Sudan. In order to justify the sample of the study, similar studies were done by Carter and Belanger [16] targeted students in United States universities and had a sample ranged from 105 to 140 students [16][10].

### 4.3 Questionnaires Design

A questionnaire was designed to gather the necessary information. Each item in the model had a corresponding question(s). The questionnaire was subjected to pretesting through a pilot survey administered to a small sample of respondents and corrective modifications were made the questions in the questionnaire mainly had two types. The first is the five point scaled questions (i.e. strongly disagree, disagree, neutral, agree, strongly agree) and the second type of questions is the normal MCQ format questions (i.e. Yes and No).

### 4.4 Demographic Data

Most of the participants are between 16- 23 years of age who are undergraduate students. 64% of respondents were females while 36% were for males. 42% of the sample was for students in public universities while 58% were for students in private universities (table 1).

Table 1: Demographic Statistics

Percentage	Characteristics
	<b>Gender</b>
64%	Female
36%	Male
	<b>Age</b>
9%	16-17
55%	18-20
36%	21-23
	<b>High School Education</b>
34%	International General Certificate of Secondary
19%	American Diploma
47%	National Secondary School
	<b>Type of University</b>
42%	Public
58%	Private

## 5. Data Analysis

Almost 89% of the participants have experienced the internet for more than five years which is quite an impressive percentage (table 2). As it was previously mentioned that the internet experience of the participants is spectacular although their ages range from 16 to 23 his is considered to be a good indication that the participants do surf the internet on daily basis (table 2).

Another issue that needs to be considered is the most frequently used functionality of the mobile devices.

Table 2: Internet and Mobile Statistics

Percentage	Characteristics
	<b>Internet Experience</b>
8%	0 to 2 years
1%	2 to 3 years
1%	3 to 4 years
1%	4 to 5 years
89%	More than 5 years
	<b>Type of Internet Connection</b>
14%	Dial-Up
67%	DSL
5%	USB Modem
14%	Mobile Internet (using mobile device)
	<b>Frequently used Mobile Functionality</b>
34%	Phone calls
39%	Messaging and Phone calls
4%	Messaging only
12%	Messaging, Phone calls, Gaming, Downloading files
11%	Other services

22% of the participants had only accessed the Sudanese e-government portal and only 23% of them used one of the e-government services. The participants who did use the portal had inquired information, conducted a held by the youth in Sudan. According to table (2), the most frequently used functionality is the messaging and phone calls (73%). transaction, or downloaded a form. However, none of them used

the m-government services. To get more depth understanding if respondents used their mobile devices for online transactions, they were asked about the activities they conducted on their mobile devices. The respondents have suggested more options than the available ones in the question like shopping for clothes (e-commerce transactions), browsing the web and checking their e-mails and facebook accounts. This indicates that they did transact through their mobile devices.

### 5.1 Validity and Reliability

Convergent validity was assessed in terms of factor loadings onto the underlying construct and Average Variance Extracted (AVE) [23]. Convergent validity, which measures the amount of variance captured by the construct in relation to the amount of variance attributable to measurement error, requires a factor loading greater than 0.50 and an AVE no less than 0.50. Findings show that all items had significant factor loadings which are higher than 0.50 (table 3).

The composite reliability of each construct was assessed using Cronbach's alpha. A reliability coefficient of 0.70 is marked as a lowest acceptable limit for Cronbach's Alfa [24]. Findings show that values ranged from 0.768 to 0.901 (table 3) which is acceptable.

Discriminant validity is assessed to measure the extent to which constructs are different. To evaluate discriminant validity, the AVE is used. All constructs have an AVE of at least 0.5 [23] and all the square roots of each AVE value are higher than the off-diagonal correlation elements (table4).

Table 3: Ratability and Factor Loading

Average Variance Extracted (AVE)	Cronbach's alpha	Items	Constructs
0.682	0.824	2	Internet Experience
0.787	0.842	2	Awareness
0.692	0.781	5	PEOU
0.660	0.805	4	PU
0.808	0.928	3	Compatibility
0.684	0.864	2	Social Influence
0.708	0.857	4	Trust
0.859	0.768	2	Face-to-face interactions
0.782	0.901	2	Personal connections
0.912	0.964	1	Intention

Table 4 Correlations (\* Bold elements in the main diagonal are the square roots of AVE)

<b>10</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	
									<b>0.826*</b>	<b>Internet Experience</b>
								<b>.887</b>	.057	<b>Awareness</b>
							<b>.832</b>	.011	.202	<b>PEOU</b>
						<b>.812</b>	.246	.076	.218	<b>PU</b>
					<b>.899</b>	.106	.230	.099	.114	<b>Compatibility</b>
				<b>.827</b>	.134	.197	.214	.012	.195	<b>Social Influence</b>
			<b>.841</b>	.222	.367	.203	.174	.026	.056	<b>Trust</b>
		<b>.927</b>	-.013	.183	.031	.114	-.038	.149	.042	<b>Face-to-face</b>
	<b>.884</b>	.206	.008	.033	.153	.042	.121	-.045	-.080	<b>Personal connections</b>
<b>.955</b>	-.087	-.309	-.117	-.346	-.263	-.242	-.203	-.236	-.186	<b>Intention</b>

Since multicollinearity might exist in regression analysis and negatively affects the predictive ability, computing the variance inflation factor (VIF) of each variable might help to detect multicollinearity [25]. If the VIF of an explanatory variable exceeds 10, the variable is considered to be highly collinear and it can be treated as a candidate for exclusion from the regression model [26]. Findings show that VIF range from 1.43 to 2.87 suggesting that multicollinearity is not an issue with this data set.

The multiple regression analysis is used to test the hypotheses. The purpose of the regression analysis is to relate the dependent variable to a set of independent variables. To determine the relationships among the variables,  $\beta$  is very important as it compares the contribution of each independent variable for explaining the dependent variable. For example, the social influence (0.250) has the largest  $\beta$  value which makes it the strongest contribution to the intention to use m-government followed by face-to-face interactions with  $\beta$  = .240 (table 5).

Table 5: Hypotheses results

Support	Significance	$\beta$	Variable	Hypotheses
Yes	.081	.175	Perceived Usefulness	H1
No	.676	.048	Perceived Ease of Use	H2
Yes	.072	.185	Compatibility	H3
Yes	.010	.250	Social Influence	H4
Yes	.051	.182	Awareness	H5
No	.945	-.007	Personal connections	H6
Yes	.016	-.240	Face-to-face interactions	H7
No	.690	.040	Trust	H8
No	.434	.074	Internet Experience	H9

It was found that perceived usefulness, compatibility, awareness, social influence and face-to-face interactions *significantly* contribute to the prediction of the intention to use m-government. Whereas the internet experience, perceived ease of use, trust and personal connections *insignificantly* contribute to the prediction of the intention to use m-government.

## 6. Discussion

Findings from the empirical study provide some insights to researchers by contributing to the literature which factors affect the youth intentions towards m-government services. Also, the study provides some recommendations to practitioners in the e-government program to have successful e-government services via mobile internet.

The study found that increasing the youth awareness (H5,  $\beta=.182$ ) significantly affects the youth intentions to use m-government services. Awareness is the first step for users to know that the e-government delivers its services via mobile internet. Awareness of the services should be combined with the feeling that there are perceived usefulness (H1,  $\beta=.175$ ) from using such services. The usefulness of the m-government services can be achieved through providing certain number of services that users mostly need such as providing vehicle fines information via SMS. Findings showed that ease of using hypothesis (H2,  $\beta=.048$ ) is insignificant. An explanation could be that Sudanese users are more concerned with how they will benefit from the services delivered regardless the website or application usability.

Social influence (H4,  $\beta=.250$ ) had a great contribution to the youth intention to use m-government services. The reason is that the Sudanese is widely affected by their families and friends. If they noticed that more people conduct online m-government transactions successfully then they will be encouraged to use it. The findings are similar to other research done in Qatar [18]. The results of both studies come to an agreement in terms of the social influence because both of them conducted in developing countries (in Sudan and Qatar). Not only social influence, but also the compatibility to the life style has a significant impact on m-government usage (H3,  $\beta=.185$ ). The compatibility hypothesis proved that Sudanese users do prefer to transact and interact with a m-government system that complies with their culture and level of experience. In a similar study done to students' university, Carter and Belanger [16] found that the compatibility factor has a significant impact on the youth intention to use e-government services.

The face-to-face interaction hypothesis is supported (H7,  $\beta=-.240$ ). The face-to-face interactions have roots in the Sudanese society. The Sudanese got used to make all the government transactions in a face-to-face manner for many decades (Sudanese E-Government Portal, 2004). This is not the case for Sudan only, but also a similar study done in Kuwait reached the same findings that some users still prefer to get their services face-to-face [9]. To overcome this barrier, the government has to stress on that requesting government services via its portal is similar to the traditional method as long citizens request their services via the e-government portal.

The internet experience (H9,  $\beta=.074$ ) was not supported. In accordance with the results presented previously, 89% of the sample has an internet experience of more than five years. Logically, they should have adopted by now e-government initiatives and starting using them, but very few who did so. This indicates that the internet experience factor does not mean that users will use e-government services and consequently m-government. Findings agreed with findings from Abdelghaffar [27] study for the e-government in Sudan.

Finally trust (H8,  $\beta=.040$ ) and personal connections (H6,  $\beta=-.007$ ) hypotheses were not supported. The explanation for this is that users have to request services from the government regardless the degree of trust. Therefore, it is more important for the government to focus on providing more useful services for users rather than focusing on increasing trust between users. When users use their services, they will trust it later on.

From the previous discussion, in order to achieve more adoption of m-government services it is recommended that e-government practitioners to rearrange their priorities regarding which factors to focus on. Practitioners should focus on identifying which services are mostly useful for citizens and focus on delivering them rather than focusing on having easy service interface. Consequently, some users will start using these services.

## 7. Conclusions

This paper investigated the youth intention of using m-government services. A proposed framework has been identified through reviewing different models and theories of technology adoption and user's behavior towards technology. In order to test the proposed framework, a quantitative approach – questionnaire – was conducted targeting undergraduate students in four universities located in Sudan. It was found that the perceived usefulness, compatibility, awareness, social influence, and face-to-face interactions significantly contribute to the prediction of the intention to use m-government. Whereas the internet experience, perceived ease of use, trust and personal connections insignificantly contribute to the prediction of the intention to use m-government.

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