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Modelling the factors that influence mobile government services acceptance

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This is an exploratory study on the mobile government (m-government) in Malaysia. M-government can be a powerful component of the e-government that could facilitate more and better services to the citizens. In recent years, the advancement of information and communication technologies (ICTs) and particularly the rapid changes in mobile technologies have led to the development of new applications and services. Furthermore, there is a possibility of changes in the current applications of the m-government services. Therefore, it is important to investigate the factors that influence the intention to use m-government services among Malaysians. This study integrates constructs from the technology acceptance model (TAM), theory of reasoned action (TRA), unified theory of acceptance and use of technology (UTAUT) and trust model. The study was conducted by surveying different groups of Malaysian community. A structured questionnaire was used to collect data from 566 respondents. Results of the study prove that the proposed model is comprehensive to study the acceptance of m-government service.

Key words: Acceptance, e-government, m-government services, mobile, technology acceptance model (TAM).

INTRODUCTION

The blending of mobile devices and internet has opened the doors for ubiquitous connectivity. The attractive and efficient features of 'WiFi' enabled mobile phones have attracted a lot of people into the world of wireless network. Public and private organizations have started offering a lot of services via mobile devices. Of late, apart from offering the basic voice communicational survives, the mobile phone service providers have started delivering other vital services such as health care, transportations, governance, public safety, tax and enterprisers. Periodical enhancements in the mobile devices have encouraged public and private sectors to use them as a platform to serve the citizens. It has been realized that mobile technology is crucial to finding solutions to some of the world's greatest challenges. The developments in the features of mobile phones are often witnessed by the world. However, it is difficult to measure the amount of changes that mobile phones have made in

the context of social and economic spheres. The private sectors have applied mobile technology in their services much earlier than the public sector.

Nevertheless governments have realized the importance of the ubiquitous nature of mobile technologies, and have begun to exploit this feature in order to maintain their control over, and contact with, their constituents. Mobility is the vital aspect that encourages and enables the public, business organizations and government officials to access, manipulate and accomplish their needs from anywhere and anytime. Therefore, mobile government (m-government) is the innovative concept, employed by governments to utilise mobile technologies to communicate and offer services to the citizens.

M-government implementation is still in its very early stages, indeed, a perfect m-government has not been shaped yet. Transition from electronic government (e-government) to m-government requires researches on the integration process between e-government and m-government. It also requires investigation of all the pressures that could affect the transition process. Such pressures differ between nations, depending on their

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technological and information infrastructure, mobile device penetration and acceptance, public and social pressures, and security (Kushchu and Kuscu, 2003).

In 2007, the government of Malaysia launched a new initiative under the e-government program known as eKL, aimed at integrating the delivery of effective and efficient services, across agencies for benefit of citizens and businesses within the Klang Valley area and its vicinity. The initiative of eKL is focused on the principle of "one government, many agencies", to establish a digitally connected Klang Valley, whereby services of all government agencies are linked. This joined-up approach enables the sharing of resources and information among government agencies and thus facilitates the provision of end-to-end interactive online services, 24 h a day and 365 days a year ($24\square365$) via multiple services channels. One of these channels is the mobile device. The short messaging service (SMS) mobile technology enables citizens to stay connected on the move with the government, news and services. It is a new channel for citizens to access government services. Within this context, the MySMS initiative was launched. It aims at standardizing the use of a single number, 15888, for accessing government news and services from renewal of driving licenses and summon(s) to making payment. In the year 2010, the MySMS added up 158 SMS services to facilitate few more payment services.

The ever growing penetration of WiFi enabled mobile devices in the Malaysian market and their increasing sales might add pressure to constitution of m-government. The users would like to have more mobile services from the government, apart from the existing services. If the Malaysian government meets this challenge successfully, it will result in the m-government activities more conveniently reaching a larger base (Kushchu and Kuscu, 2003).

According to Thunibat et al. (2009) the m-government services in Malaysia are very limited with a very low percentage of usage. In addition, the design of the official e-government portal does not allow the citizens to navigate through it and access the services that are supposedly facilitated through their mobile devices.

According to Carroll (2005, 2006), the success of m-government requires active engagement by both government and its citizens, hence providing services is one and only aspect of the m-Government equation. Besides this, the more challenging aspect is achieving acceptance and widespread persistent use of m-government by citizens. The acceptance of m-government services can be achieved with their proper design and implementation. Services should be delivered in the familiar ways to be actively adopted by users. In addition, the mobile phone is a perfect device for rapid and brief interaction. Hence, contents should be short, targeted and relevant. Security is the other significant parameter that should be taken into account while designing m-government services. The applications that require security must make minimal demands on the user.

There is a growing body of academic research which has examined acceptance of technology among users but very few have focused on citizen's acceptance of m-government services. A number of theoretical models are available that attempt to explain the relationship between user's attitudes and beliefs in use of technology. These models include the theory of reasoned action (TRA), the theory of planned behavior (TPB), and the technology acceptance model (TAM). Among these, TAM is considered to be the most widely accepted model because of its parsimony and has the wealth of recent empirical support but it lacks in addressing some factors in m-Government adoption process. TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) of information technology (IT) are major determinants of its usage. Due to the complex nature of technology adoption process, there is a need to study additional determinants of m-Government acceptance and usage.

The objective of this study is: to propose a framework for the identification of m-government acceptance factors based on currently available technology acceptance model (TAM).

This research has made contribution to the existing understanding of mobile service acceptance by focusing on end users' general perception towards the m-government services. The proposed model for m-government service user acceptance has created a research environment from which more research can be triggered and launched. This research provides mobile service providers with a practical and communicable checklist of contextual and conditional factors, which are seamlessly integrated, and cover the end user's perspectives which should be considered as the cornerstone for any m-government project.

TECHNOLOGY ACCEPTANCE MODEL

TAM was proposed by Davis (1989a) and it introduced two important concepts – perceived usefulness (PU) and perceived ease of use (PEOU). The PU refers to "the degree to which an individual believes that using a particular system would enhance his/her job performance". The PEOU refers to "the degree to which an individual believes that using a particular system would be free of physical and mental efforts". In TAM, an individual's belief determines the attitude towards using the system and, in turn, the attitude helps to develop the intention to use. TAM is an adaptation of the theory of reasoned action (TRA) developed by Ajzen and Fishbein (1980). Comparatively, TRA is more generic, whereas TAM is more specific. TAM was chosen in this study for two main reasons. First, it is based on its predictive power which makes it easy to apply in different information system devices (Luarn and Lin, 2005; Pikkarainen et al., 2004; Wang et al., 2003; Kleijnen et al., 2 004; Nysveen et al.,

2005). Secondly, TAM helps to better understand the relationship between six important constructs of the study such as: notably, perceived usefulness, perceived ease of use, attitude, behavioral intention and actual use.

Many researchers have investigated and agreed that 'perceived usefulness' and 'perceived ease of use' are valid constructs in understanding an individual's intention to adopt information system (IS) (Guriting and Ndubisi, 2006; Luarn and Lin, 2005; Wang et al., 2003). When deeper explanation of user adoption intention is desired, TAM allows other factors to be incorporated easily into its basic model (Zarmpou et al., 2011). However, depending on the specific technology context, additional constructs are required to better reflect the application of emerging technologies (Amin, 2007).

Attempts to extend TAM have generally taken one of the three approaches: by introducing factors from related models, by introducing additional or alternative belief factors, and by examining antecedents and moderators of perceived usefulness and perceived ease of use. Amin (2007) suggested the need for acceptance models which are tailored to specific technologies. They argued that generic models may not be adequate to explain the adoption and use of different types of technologies and service channels where specific features of the technology may play an important role. Therefore, it is important to include other explanatory variables into TAM. Relating to the specific nature and uniqueness of m-government adoption, new variables have been included in the model.

This study is based on a modified version of TAM by adding: perceived risk (PR), cost of service (CS), services quality (SQ), perceived compatibility (PC), trust in technology (TOT), trust in government (TOG) and social influence (SI) as the independent variables. The modification of the model and the selection of variables are based on scenario of Malaysia and considering the fact that m-government is still at its early stage in Malaysia.

Related work

User adoption of mobile services has become a popular topic of several scientific arenas in the past few years. In order to get a good understanding of the current work in this field, we have reviewed some latest related works, as shown in Table 1.

Research framework

We have developed an integrated research framework (Figure 1) which identifies nine major factors as significant antecedents of the intention of citizens to use m-government. In developing the framework, we have relied on several sources such as: the theory of reasoned action (TRA), the unified theory of acceptance and use and the technology acceptance model (TAM) (Davis,

1989a); various theories in information systems, social psychology, economics, and culture; and recent published literature on mobile internet or service adoption (Dai and Palvi, 2009; Lu et al., 2003a, 2005; Rosenbaum and Kleber, 2004). Each construct and their items in the research model are described in Table 1 (Appendix A). The following hypotheses are postulated:

H_{1a}: The perceived usefulness of the m-government service has a significant effect on the attitude towards using m-government service

H_{1b}: The perceived usefulness of the m-government service has a significant effect on the behavioural intention to use m-government service

H_{2a}: The perceived ease of use of the m-government service has a significant effect on the attitude toward using m-government service.

H_{2b}: The perceived ease of use of the m-government service has a significant effect on the perceived usefulness of m-government service.

H_3: Attitude toward using m-government service has a significant effect on behavioural Intention to use m-government services.

H_4: Social influence has a significant effect on behavioural intention to use m-government services.

H_{4a}: Social influence has a significant effect on perceived ease of use of m-government services.

H_{4b}: Social influence has a significant effect on the perceived usefulness of m-government services.

H_5: The perceived service quality of m-government service has significant effect on behavioural intention to use m-government service.

H_6: Perceived cost has a significant effect on behavioural intention to use m-government service.

H_7: Perceived risk has a significant effect on behavioural intention to use m-government service.

H_8: Perceived trust in government has a significant effect on behavioural intention to use m-government service.

H_9: Perceived trust in technology has a significant effect on behavioural intention to use m-government service.

H_{10}: Perceived compatibility has a significant effect on behavioural intention to use m-government services.

H_{10a}: Perceived compatibility has a significant effect on perceived ease of use of m-government services.

H_{10b}: Perceived compatibility has a significant effect on the perceived usefulness of m-government services.

RESEARCH METHODOLOGY

A survey method was used for the study. An instrument was developed, tested and administered to a sample of the population. In this research, the purposive sampling is used as sampling technique. In purposive sampling, the researchers sample with a purpose in mind, they have one specific predefined group (Patton, 1990). For instance, the randomly selected respondent must fit in the age group and preferably are familiar with mobile services. Purposive sampling is appropriate because it involves the choice of subjects who are in the best position to provide the information required (Sekaran, 1984). Although it may restrict the

Table 1. Related work.

| Object	Dependent variable	Factors	Reference
Mobile services	Intention	Personal Initiatives and Characteristics, Trust, Perceived Usefulness, Perceived Ease of Use,	(Gao et al., 2008)
Mobile commerce	Intention	Perceived Usefulness, Perceived Ease of Use	(Xu et al., 2008)
Mobile services	Acceptance of mobile services	Perceived usefulness, perceived ease of use, subjective norms, perceived enjoyment, behavioral control, compatibility, cost, confidence.	(Mohamedpour et al., 2009)
Mobile services	Behavioral intention	Perceived Behavioral Control, perceived usefulness, perceived ease of use, Perceived Cost, Perceived Credibility	(Quan et al., 2009)
Mobile services / device	Usage	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Mobile device/service anxiety, Attitudes, Behavioural intention	(Carlsson et al., 2006)
Mobile coupons	Intention	perceived usefulness, perceived ease of use, Social influence, Perceived Credibility, compatibility	(Jayasingh and Eze, 2009)
Mobile user acceptance	Usage	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Mobile device/service anxiety, Attitudes, Behavioural intention, Contextual offering	(Zhou, 2008)
Wireless internet using mobile devices	Intention	Personal Innovativeness. Technology Complexity, perceived usefulness, perceived ease	(Parveen and Sulaiman, 2008)
Wireless internet via mobile technology	Intention to accept WIMT	Social influence, Facilitating conditions, perceived usefulness, Wireless Trust Environment, System Complexity, , perceived ease of use	(Lu et al., 2003a)
Mobile phone users acceptance	Intention to use mobile commerce	Perceived Value Added. Innovativeness, Perceived Usefulness Perceived Ease of Use, Perceived Cost, Compatibility Perceived Enjoyment, Subjective Norm, Privacy Perception, security Perception	(Dai and Palvi, 2009)
Mobile phone adoption	Actual use	Social influence, Facilitating conditions, perceived usefulness, Attitude , perceived ease of use	(van Biljon and Kotzé, 2007)
Mobile payment adoption	Intention	perceived usefulness, Trust, perceived ease of use	(Uchenna Cyril. Eze, 2008)
Mobile 3G services	User acceptance	perceived usefulness, , perceived risk , perceived ease of use, Perceived Service Quality, Subjective Norms, Apprehensiveness, Individual Characteristics, Lack of Knowledge, Intrinsic Motivation	(Sudha et al., 2010)
e-government services	Intention	Perceived Usefulness, Perceived Ease of Use, Attitude, Facilitating conditions, self efficacy, Subjective Norms, perceived behavioral control, interpersonal influence, external influence	(Suki et al., 2010)
e-government services	Intention	perceived ease of use, trust, reliability, compatibility and facilitating conditions ,images	(Fieu et al., 2010)
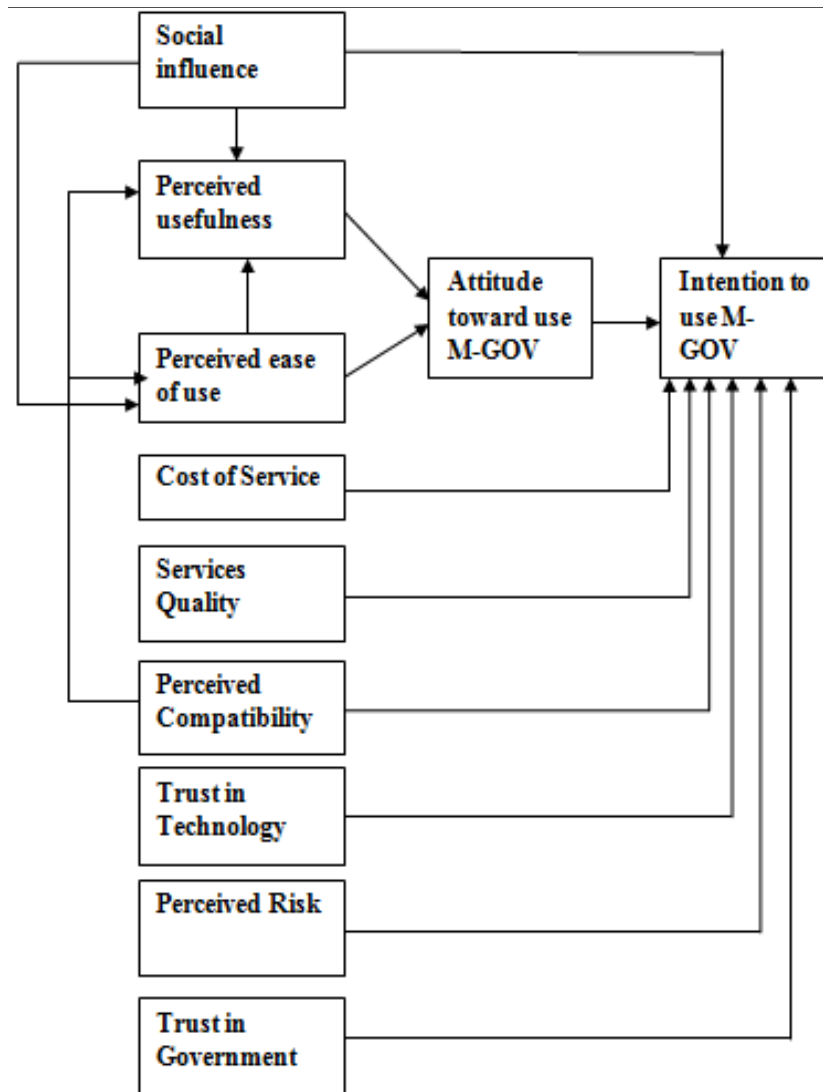
Figure 1. Theoretical framework.

generalization of the findings, it is the only viable sampling method to obtain information from a specific group of people. The survey was conducted in Selangor, Malaysia. The questionnaire was developed in both English and Malay language.

Pilot study

A pilot study was conducted at Universiti Kebangsaan Malaysia (UKM). 30 students and faculty staff were asked to complete the questionnaire. At the same time, the respondents gave verbal and written feedback. The instrument was finalized after making minor changes based on the feedbacks.

Data collection

A total of 566 citizens responded to the questionnaire survey but 15 were rejected due to incomplete data. The data from 551 respondents were analyzed using SPSS. The size of sample for the

acceptance studies depends on the type of research; in our case, this study is an exploratory study (Legris et al., 2003), thus, the sample size is sufficient to represent the citizens' perspective. The demographic distribution shows that 45.2% of the respondents were male and the remaining 54.8% were female. With respect to age, most of the respondents (67.4%) were between 18 to 34 years. This age group has potential to become users of m-government because of their familiarity with the latest mobile technologies (Laforet and Li, 2005; Moore and Rutter, 2004). With regards to educational level, 3.4% had primary and 16.7% had secondary education, 36.1% were diploma holders, 40.7% had degrees and above (Table 2).

Questionnaire development

The items were formulated as Likert-type statements anchored by a five -point scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Wherever possible, we have adopted or modified existing measures for our study. Table 1 (Appendix A) provides a list of all

Table 2. Demographic descriptions.

Attribute	Demographic distribution	
	Frequency	**Percent**
Gender		
Male	249	45.2
Female	302	54.8
Age		
under 18	51	9.3
18-24	223	40.5
25-34	148	26.9
35-49	101	18.3
50-65	28	5.1
Education level		
Primary school	19	3.4
secondary school	92	16.7
Diploma	199	36.1
Degree and above	224	40.7
Other	17	3.1
Income per month		
Less than RM1,000	267	48.5
RM1,000–RM 3,000	146	26.5
>RM3,000 but less than RM5,000	104	18.9
RM5,000 and above	34	6.1

Table 3. Reliability testing (alpha coefficients).

Construct	Alpha α
SQ	0.8252
CS	0.7444
FC	0.7172
PR	0.7733
PTT	0.7035
PTG	0.7518
SI	0.7648
PEOU	0.8128
PU	0.7442
BI	0.8373
ATT	0.7001
PC	0.7746
Total	0.9406

items and their sources.

Table 3 presents the results of alpha coefficients for each construct with reliability analysis. Conbach's alpha values of each construct are from 0.71 to 0.90, indicating a level above 0.70, the threshold recommended by Nunnally (Nunnally et al., 1967). Most of them were above 0.7, it indicates good internal consistency of the questionnaire items.

Hypothesis testing

Due to the making up of items, the instruments scales were tested to ensure that they form strong unities and demonstrate good measurement properties (construct validity and reliability), the constructs in the model testing is acceptable (Gefen et al., 2000). As the research model involves more than one dependent variable,

the multiple regression analysis is used to test the hypotheses. In addition to this, the linear regression cannot test all the relationships in a single statistical test; therefore, it is necessary to use three separate regressions to test the model fully (Gefen et al., 2000).

In the first regression analysis, it was run for H_{1b}, H_3, H_4, H_5, H_6, H_7, H_9, and H_{10}, BI is the dependent variable while SI, services quality (SQ), PU, attitude toward use (ATT), CS, PC, PTT, PTG and PR are the independent variables. The coefficient of determination (R^2) measures the proportion of the variance of the dependent variable about its mean that is explained by the independent or predictor variables (Hair et al., 1998). The higher the value of R^2, the greater the explanatory power of the regression model. The regression model R^2 value for the dependent variable behaviour intention (BI) is 0.813, meaning that 81.3% of the variance in behaviour intention is explained by the regression model. This value is considered high and thus the power of the regression model is very good. The model is statistically significant (F=261.419, p<.001). The values of the regression coefficients and their significance determine the variables included in Table 4.

Table 4 presents these first regression variables. The results show that all determinants of BI – SI, services quality (SQ), PU, attitude toward use (ATT), CS, PC, PTT, POG and PR – were found to be significant in predicting perceived BI of m-government services. The regression model supports the following hypotheses:

H_{1b}: Perceived usefulness of the m-government service has a significant effect on the behavioural intention to use m-government service (β=0.047, p<0.005).
H_3: Attitude toward using m-government service has a significant effect on behavioural Intention to use m-government services (β=0.116, p<0.001).
H_4: Social influence has a significant effect on behavioural intention to use m-government services (β=0.102, p<0.005).
H_6: Perceived service quality of m-government service has significant effect on behavioural intention to use m-government service (β=1.150, p<0.001).
H_8: Perceived cost has a significant effect on behavioural intention to use m-government service (β=0.057, p<0.005).
H_9: Perceived risk has a significant effect on behavioural intention to use m-government service (β=1.330, p<0.001).
H_{10}: Perceived trust in government has a significant effect on behavioural intention to use m-government service (β=0.044, p<0.005).
H_{11}: Perceived trust in technology has a significant effect on behavioural intention to use m-government service (β=0.245, p<0.001).
H_{13}: Perceived compatibility has a significant effect on behavioural intention to use m-government service (β=0.776 p<0.001).

In the second regression analysis, it was run for H_{2b}, H_{4b} and H_{10b}. PU is the dependent variable while PEOU, SI and PC are the independent variables. Table 5 presents these second regression variables. The results show that perceived ease of use (PEOU) and social influence (SI) have a significant effect in predicting of PU. The regression model R^2 value for the dependent variable usefulness (PU) is 0.157, meaning that 15.7% of the variance in usefulness is explained by the regression model. The model is statistically significant (F=33.963, p<0.001). The second regression model supports the following hypotheses:
H_{2b}: Perceived ease of use of the m-government service has a significant effect on perceived usefulness of the m-government service (β=0.231, p<0.001).
H_{4b}: Social influence has a significant effect on the perceived usefulness of m-government services (β=0.201, p<0.001).

The third regression analysis was run for H_{4a} and H_{10a}. Perceived ease of use (PEOU) is the dependant variable while SI and PC are the independent variables. Table 6 presents the third regression

model variable. Results show that the two determinants of PEOU were found to be significant in predicating PEOU m-government services. The regression model R^2 value for the dependent variable PEOU is 0.240, meaning that 24% of the variance in PEOU is explained by the regression model. The model is statistically significant (F=86.340, p<0.001). The third regression model supports the following hypotheses:

H_{4a}: Social influence has a significant effect on perceived ease of use of m-government services (β=0.338, p<0.001).
H_{10a}: Perceived compatibility has a significant effect on perceived ease of use of m-government services (β=0.259, p<0.001).

The fourth regression analysis was run for H_{1a} and H_{2a}. Attitude toward use (ATT) is the dependant variable while PEOU and PU are the independent variables. Table 7 presents the fourth regression model variable. Results show that the two determinants of ATT were found to be significant in predicating ATT toward use m-government services. The regression model R^2 value for the dependent variable ATT is 0.348, meaning that 34.8% of the variance in ATT is explained by the regression model. The model is statistically significant (F=27.114, p<0.001). The fourth regression model supports the following hypotheses:

H_{1a}: Perceived usefulness of the m-government service has a significant effect on the attitude toward using m-government service (β=0.215, p<0.001).
H_{2a}: Perceived ease of use of the m-government service has a significant effect on the attitude toward using m-government service (β=0.148, p<0.005).

RESULTS AND DISCUSSION

Building on the existing technology acceptance theories such as: TAM, TRA and UTAUT, this study proposes a research framework that explains the perception of citizen acceptance of m-Government services. Overall, strong support was found for the proposed framework using a sample of 551 potential m-government adopters. The findings from this study have a number of important implications to both researchers and practitioners. Since this is the first known study that investigates citizen's m-government services acceptance behaviours, it will provide the theoretical foundation for researchers to develop future studies. For practitioners, understanding the key constructs in the proposed research framework is crucial in the design and development of m-government services with high citizen acceptance.

The results showed that citizen acceptance of m-government services were determined by nine factors: social influence (SI), services quality (SQ), perceived usefulness (PU), perceived risk (PR), cost of service (CS), perceived compatibility (PC), trust in government (TOG), trust in technology (TOT) and attitude toward use (ATT). Among these nine factors, services quality (SQ) factor not included in TAM. We added services quality (SQ) in the proposed framework due its importance in m-government services adoption; furthermore, services quality (SQ) was found to have the strongest influence on adoption of m-government.

The services such as delivery service or citizen support provided by m-government and services quality will affect

Table 4. BI regression model.

Variable	Beta	t	Sig
(Constant)		-4.584	0.000
SI	0.101	3.209	0.001
PTG	0.044	2.046	0.041
PU	0.047	2.229	0.026
ATT	0.116	5.677	0.000
CS	-0.057	-2.223	0.027
SQ	10.150	23.072	0.000
PC	0.776	19.911	0.000
PR	-10.330	-22.486	0.000
PTT	0.245	8.704	0.000

Dependent variable: BI

Table 5. PU regression model.

Variable	Beta	t	Sig.
(Constant)		10.934	0.000
PEOU	0.231	5.142	0.000
SI	0.201	4.538	0.000
PC	0.064	1.469	0.142

Dependent variable: PU.

Table 6. PEOU regression model.

Variable	Beta	t	Sig.
(Constant)		2.174	0.030
SN	0.338	8.562	0.000
PC	0.259	6.552	0.000

Dependent variable: PEOU.

Table 7. ATT regression model.

Variable	Beta	t	Sig.
(Constant)		8.804	0.000
PU	0.215	4.970	0.000
PEOU	0.148	3.417	0.001

Dependent variable: ATT.

on willingness of citizens to pay for or desire to get the service through the website again. Unfortunately, both have not yet attained a satisfactory level in Malaysia. Delone and Mclean (2003) indicated that "information quality" and "system quality" are both important factors to measure the success of a single system. They have updated their Model to include "service quality" as another key variable in the world of Internet. Our results also confirmed that service quality plays an important role

in influencing m-government acceptance in Malaysia.

The second strongest influence on BI is PR; it negatively affects user's intention to accept m-government services. Relying on an unfamiliar technology by the users generate uncertainty around m-government services. Risk reduction should be given priority, especially during the early stages of introduction as an early negative experience with m-government services can affect the adoption of future m-government services

innovations. Rogers (1995) termed this phenomenon as 'Innovation Negativism', which means "the degree to which one innovation failure conditioned a potential adopter to reject future innovation"; therefore, m-government services solution providers must adequately address the issues revolving around the PR construct. Cox (1967) identified two major categories of perceived risk; performance and psychosocial. He divided performance risk into three types (i) economic, (ii) temporal, (iii) effort; while psychosocial risk has two types: (i) psychological and (ii) social. Cunningham (1967) further typified perceived risk as having six dimensions: (1) performance, (2) financial, (3) opportunity/time, (4) safety, (5) social, and (6) psychological loss. A rich literature stream exists that supports the usage of these risk facets to understand consumer product and service evaluations and purchases. Pilot tests of the current study indicated that a combined perceived risk variable is useful to better understand m-government services adoption. This construct considers the six types of risks that an m-government services user is likely to face collectively. The growing concerns regarding issues such as identity theft and hacking are likely to make consumers think twice before adopting an unfamiliar services option whose security issues have not been fully addressed (Chen, 2008). The citizens surveyed in this study showed great concerns about the security issues related to m-government services.

In addition, perceived compatibility (PC) was found to have the strong influence on adoption. Compatibility refers to the extent to which m-government services are consistent with the prospective user's lifestyle and the way he or she prefers to get the services. The compatibility is reflected in the m-government's ability to complement the user's behaviours and lifestyle, as well as enhance the user's lifestyle image. As Abbad et al. (2009) suggested an idea that more compatible was less uncertain to the potential adopter; therefore, its adoption could be accelerated. He also stated that the more compatible an innovation was, the less of a change in behaviour it represented. This suggested that the design of the m-government services is vital to its acceptance by citizens. New m-government services should be seamlessly integrated into citizen transaction without requiring extraneous steps, equipment and training. The m-government services experience should also be fun and help to enhance citizen's lifestyle image.

Perceived usefulness (PU) and perceived ease of use (PEOU) were the original constructs in TAM, and they have been found to influence user acceptance of technology-enabled products and services by many prior studies. Therefore, it is not surprising to find that they also affect citizen's acceptance of m-government services. Failures to demonstrate these advantages to potential citizens will likely result in a low rate of acceptance.

Previous researchers (Adams et al., 1992; Davis,

1989a) have suggested that the inclusion of attitude is not meaningful; our research findings suggest otherwise. We argue that attitude should continue to be used in subsequent TAM research. Attitude toward use (ATT) was from the original constructs in TAM, and they have been found to influence behaviour intention, ATT was found to have a strong influence on behaviour intention. The antecedents of ATT are: PU and PEOU; and the high predicator of attitude towards use (ATT) is PEOU.

In addition, cost of services (CS) was found to negatively affect the user's intention to adopt m-government services, Even explicit price and cost factors are missing from all earlier technology adoption models primarily designed for organizational adoption, in the context of citizen behavior, price is considered as a very important factor. The current generation of surviving elderly people is highly price sensitive and considers spending carefully. Comparing prices between different service providers and operators can be very difficult, to know which services are priced according to time, and which according to the amount of data transferred. The result suggested that the cost of m-government services is important to the citizens, therefore government should pay more attention to this issue.

Trust in government (TOG), trust in technology (TOT) and PU, were also found to positively affect the user's intention to adopt m-Government services. The result showed that PTT and PTG were found to have a positive effect on BI to use m-government services; PTG refers to one's perceptions regarding the integrity and ability of the agency providing the service (Becerra and Gupta, 2003; Ganesan and Hess, 1997; Jarvenpaa et al., 1998; Lee and Turban, 2001; Mayer et al., 1995; McKnight et al., 2002). Many people refer to the government as ''big brother,'' a ubiquitous presence that infringes upon constituents' personal lives. Since technology enables expedited collection and advanced analysis of data, users of m-government services want to engage in transactions with agencies that will protect and respect their private data. Citizens must believe that government agencies provide m-government services for the purpose of benefiting and not monitoring the society. PTT is consistently identified as a key predictor of m/e-service adoption (Carter and Bélanger, 2005; McKnight et al., 2002; Pavlou, 2003; Warkentin et al., 2002; Welch et al., 2005). This type of trust is frequently labelled institution-based trust. Institution-based trust refers to an individual's perceptions of the institutional environment, including the structures and regulations that make a safe environment (McKnight et al., 2002). Pavlou and Gefen (2004) suggest that institution-based trust is one of the most important forms of trust in impersonal financial environments where the sense of a community with shared values is lacking. They also posit that such a community currently exists on the technology because of varying cultural norms, expectations and values. The institutional view of trust has been widely adopted by

e-commerce and e-government research (Carter and Bélanger, 2005; McKnight et al., 2002; Pavlou, 2003; Pavlou and Gefen, 2004; Warkentin et al., 2002; Welch et al., 2005).

CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This study was designed to explore the issues of citizen acceptance of m-government services in Malaysia. A research framework based on TAM model was proposed and empirically tested. The results from a survey of 551 potential m-government services users indicated that the framework was able to explain the factors that determine citizens' acceptance of m-government services. The research framework not only offered new theoretical grounds for future research in m-government services but also provided m-government services providers with a list of determinants of m-government services acceptance by citizens.

One specific interesting avenue for future work would be to explore further into the antecedents to citizens acceptance of m-government services found in this study, namely SI, SQ, PU, PR, CS, PC, PTG, PTT and ATT. Another area of user-centric research in m-government services would be to determine the characteristics and behaviours of citizens in various m-government services adopter categories. The research by Rogers (1995) has identified five adopter categories: innovators, early adopters, early majority, late majority and laggards. These five categories of adopters differ in terms of their socioeconomic status, personality variables, communi-cation, innovation decision process and adoption behaviours; therefore, understanding their characteristics will enable practitioners to introduce m-government services more effectively to different audiences. In con-clusion, as the research and practice in m-government services are still in their infancy, research opportunities in the realms of technology, e-government process and citizen's behaviours are abundant today. The develop-ment and testing of a framework of citizen acceptance of m-government services in this paper advances theory and research on this important topic. The result shows that there is a promising future for m-government services in Malaysia. Perceived risk, services quality, trust, social influence, perceived compatibility and cost of adoption are great concerns. The outcome of this study would be beneficial to private and public services, various government service providers, business community, and people of Malaysia.

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APPENDIX A

Table 1. Constructs definitions and items.

Construct	Definition	Items	Reference
Service quality (SQ)	Focusing on users' judgment about overall excellence or superiority of service.	For m-government services to be effective it is important for the service to be accurate (error free). For m-government services to be effective it is important for the service to be reliable (always available). For m-government services to be effective it is important for the service to be adequately fast (fast download). For m-government services to be effective it is important for the content to be easy to navigate. For m-government services to be effective it is important for the content to be understandable. For m-government services to be effective it is important for the content to be current (up to date). It is important that m-government services are personalized to understand my needs.	(Chen et al., 2004; Chen and Tan, 2004; Cronin Jr and Taylor, 1992)
Cost of service (CS)	Perceived cost refer to: services are priced according to time, and which according to the amount of data transferred.	I think the equipment (e.g., mobile device) for M Government services cost is expensive. I think the access cost for m-government services is expensive. I think the transaction fee for m-government services is expensive.	(Li and Lv, 2007; Sudha et al.)
Social influence (SI)	Define social influence as the "degree to which an individual believed that others thought they should use m-government services"	People who can influence my behavior would think that I should use m-government services People who are important to me would think that I should use m-government services People who are important to me would find using m-government services beneficial	(Becker and Luthar, 2002; Chen and Dhillon, 2003; Malhotra and Galletta, 1999; Schierz et al.; Shim et al., 2001; Venkatesh and Morris, 2000)

Table 1. Contd

Perceived risk (PR)	Defined as the citizen's subjective expectation of suffering a loss in pursuit of a desired outcome.	The m-government services might not perform well and create problems with my privacy information or money. The security systems built into the m-government services are not strong enough to protect my privacy information or money. Internet hackers (criminals) might take control of my personal information or money if I used m-government services. The decision of whether to use a government service is risky In general, I believe using M-government services over the mobile network is risky I'm sure that if I decided to use m-government services and something went wrong with mobile transactions, my friends, family and colleagues would think less of me. It would take me lots of time to learn how to use m-government services.	(Bélanger and Carter, 2008; Chen, 2008; Featherman and Pavlou, 2003)
Perceived trust of technology (PTT)	Defined as an expectancy that the promise of an individual or group can be relied upon.	I would expect that the quality of the m-government service would be good. I would be able to control the costs of m-government service. I trust in the technology m-government services is using. I trust in the ability of m-government services to protect my privacy. Using m-government services is financially secure. I am not worried about the security of m-government services.	(Bélanger and Carter, 2008; Gao et al.)
Perceived trust of government (PTG)	Refers to one's perceptions regarding the integrity and ability of the agency providing the service.	I think I can trust state government agencies State government agencies can be trusted to carry out m-government services transactions faithfully I trust state government agencies keep my best interests in mind In my opinion, state government agencies are trustworthy	(Bélanger and Carter, 2008; Lean et al., 2009)
Perceived ease of use (PEOU)	Defined as "the extent to which a person believes that using a technology will be simple".	Learning to use m-government services would be easy for me. M -Government services would be clear and understandable to use. It would be easy for me to get services I need from m-government services	(Davis, 1989a; Davis, 1989b; Moore and Benbasat, 1996; Taylor and Todd, 1995; Venkatesh and Davis, 2000)

Table 1. Contd.

Perceived Usefulness (PU)	Defined as "the extent to which a person believes that the technology, under investigation, will enhance his/her productivity or job performance".	Using m-government services would help me accomplish things more quickly. Using m-government services would make my life easier. I find m-government services would be useful in my life. Using the m-government services would increase my productivity.	(Davis, 1989a; Davis, 1989b; Moore and Benbasat, 1996; Taylor and Todd, 1995; Venkatesh and Davis, 2000)
Behavioral intention (BI)rf	Defined as "the strength of the prospective user's intention to make or to support the adoption of m-government innovation".	I intend to use m-government services to do my work I will return to m-government services often I intent to use m-government services frequently to get services from government.	(Davis, 1989a; Davis, 1989b; Moore and Benbasat, 1996; Taylor and Todd, 1995; Venkatesh and Davis, 2000)
Attitude toward using (ATT)	Defined as 'the user's desirability of his or her using the system'	Using m-government services would be beneficial I have a generally favorable attitude toward using M-government services I believe it is (would be) a good idea to use this m-government services to get services from government.	(Davis, 1989a; Davis, 1989b; Moore and Benbasat, 1996; Taylor and Todd, 1995; Venkatesh and Davis, 2000)
Perceived compatibility (PC)	Defined compatibility as the degree to which an innovation is consistent with existing facilities and practice. Compatibility implies whether a user perceives an application/service to be compatible with his/her needs or lifestyle.	Using m-government services technology fits with the way I work Using m-government services technology fits with my practice preferences Using m-government services technology fits with my services transactions	(Agarwal and Prasad, 1998; Carter and Bélanger, 2005; Chen, 2008; Hung et al., 2006; Rogers, 1995)