INTENTION TO USE M-GOVERNMENT SERVICES: AGE, GENDER AND EDUCATION REALLY MATTER?

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ABSTRACT

With the highest level of mobile penetration rate, the globe is now moving rapidly into mobile government (M-government). Despite its benefits, the acceptance of m-government services in Malaysia is still not widespread. This study attempts to incorporate the Unified Theory of Acceptance and Use of Technology (UTAUT) model with perceived risk theory (security risk and privacy risk) to explore its impact towards the intention to use m-government services. Age, gender and education level were also adopted as moderator variables to provide in-depth understanding of citizens' preference in m-government services. Partial Least Square (PLS) Structural Equation Modelling method was conducted. The results indicate that the facilitating condition, performance expectancy, social influence, and security risk can be used as the predictor of m-government services adoption. These findings confirm the application of theory in the m-government context, which provide valuable insight to the government, citizens as well as future researchers to implement a successful m-government for a better communication between government and citizens.

Key Words: *Mobile Government, UTAUT, Security risk, Privacy risk*
JEL Classification: 032, 033

1. INTRODUCTION

With the advancement of mobile technology, it changes the form of public services globally. Today, mobile technology is no longer used for the purpose of communication and entertainment only, but it is also used to improve the competence, intelligibility, and accountability of government services. With its unique characteristics of mobility and wirelesses, mobile technology plays essential and growing roles in the government position to deliver reliable information and services anytime, anywhere and on any devices to meet the needs of people (Thunibat, Mat Zin, & Sahari, 2010). Mobile government (hereinafter called M-government) is the integral components of electronic government. It focuses on the use of mobile platforms in government operation and services (Al-Hujran, 2012). Effective M-government practices aid the government to advance the sustainable development and communication with citizens by providing better access to public services in health, education, labor as well as environment (Ohme, 2014; Waller & Genius, 2015). The influence of m-government has been witnessed in many developed and developing countries including Malaysia.

1.1 M-government services in Malaysia

With the increasing number of mobile users and high mobile penetration rate of 150%, it is a good opportunity to promote and implement M-government in Malaysia (Malaysian Communications and Multimedia Commission, 2015). Thus, a number of innovative initiatives have been launched by the government such as the No Wrong Door Policy in the Tenth Malaysia Plan and Mobile Community Transformation Centres to expand and strengthen the service quality of M-government to reach more people. To date, there are more than 77% of public services provided through the mobile technology such as mySMS, myMMS, myAPP, myUSSD and myPay. Table 1.0 shows the current mobile government service provided in Malaysia.

Table 1.0: Types of m-government services provided in Malaysia.

M-services	Number	Functions
mySMS	15888	Received short message service (SMS) on: • License application status • Alert on renewing road tax, driving license expiry and income tax return due date

		• Information about government housing loan balance, road safety tips, traffic summons and train schedules Send SMS complaints to the government agencies such as Social Security Organization (SOCSO) or (PERKESO)
myUSSD	*158#	Request respond via Unstructured Supplementary Service Data (USSD) such as provide a menu to check: • Status or result of public exam monthly pension payment • Application status of myKAD • Operation hour for marriage counter registration • Credit loan status
myMMS	15888	It is an enhancement of SMS, which allow public to share the Multimedia Messages (MMS) comprising the text, images, and video clips. It provides broadcast functions such as: • Sending alert message on missing child or • Complaints of traffic or vandalism.
myApp		It provides mobile application download. The current applications offered are: • myHealth - provide tips for health issues • myJakim – provide Solah information such as prayer time, mosque and Qibla locator • myKPDNKK – provide domestic trade information from Ministry of Domestic Trade, Co-operatives and Consumerism • mySPAD – provide public transport terminals, routes, schedules and fare such as rapid public bus routes, KTM commuter schedule, and Kuala Lumpur Monorail schedule.
myPay		It provides payment channel through mobile for the government service such as: • Traffic summons • Utility bills • Income tax payment

1.2 Challenges of M-government services in Malaysia and Research Questions

Despite the benefits, convenience and a number of initiatives adopted for m-government services, the acceptance rate is still far from the enormous utilization in Malaysia (Abdullah, Mansor, & Hamzah, 2013). Out of the 27.3 millions of mobile users in 2015, yet only 335,768 logins were recorded (Performance Management & Delivery Unit, 2016). Besides, Malaysia has a

dramatic drop from 40 to 52 in the ranking of world e-government development in the latest United Nations E-government survey (2014). As such, the Performance Management and Delivery Unit (2014) urged that the awareness activities remain essential to educate and alert the citizen about the significance of m-government services.

To realize the vision 2020 to transform Malaysia into a fully developed country, the key challenge for m-government is to ensure its quality and service delivery to transform a successful citizen centric of m-government (Abdulla, Mohd Noor, & Ibrahim, 2016). The success of government initiatives always heavily depend on the end users (Sharma, 2015). Hence, it is essential to understand the needs of citizens towards the m-government services to strengthen the service quality and delivery model which best suited the citizens' expectation.

The high acceptance of mobile devices for daily activities might not guarantee the acceptance of using this technology for government service (Venkatesh, Chan, & Thong, 2012). The past literatures on m-government services' acceptance mainly focused on Technology Acceptance Model (Belanche, Casalo, & Flavian, 2012; Wang, 2014; Liu, Lim Kostakos, Goncalves, Hosio, & Hu, 2014) and Theory of Planned Behavior (Hung, Chang, & Kuo, 2013). Yet, majority of all the above said models are not specifically designed for m-government and the past literature often faced difficulty in choosing the best model for government services. Moreover, Shafinah, Sahari, Sulaiman, Mohd Yusoff and Mohd Ikram (2013) claim that by solely grounding on theory or model, it is incomplete to understand the technology acceptance. To overcome it, Unified Theory of Acceptance and Use of Technology (UTAUT) unified eight popular models to examine the acceptance based on organizational context. It consists of four main determinants, which are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Condition (FC) to explain the technology adoption. It is a highly validated model, which tailors on the acceptance of technology.

Moreover, risks are major problems faced in the government services. 97% of Malaysians think that security and privacy risks are the major obstacles for them not to use the m-government services (Thunibat, Mat Zin, & Sahari, 2010; Shafinah et al., 2013). The authors highlighted that security risk and privacy risk are the most crucial determinants in government services. However, majority studies have neglected the contribution of perceived risk (Shafinah et al., 2013). Hence, this study serves to narrow the research gaps by adopting the UTAUT and

perceived risk theory (Perceived Security Risk (SR) and Perceived Privacy Risk (PR)) to investigate the determinants of m-government services. It will also investigate the moderator impact of age, gender and education level on each of the causal relationship of all constructs. Accordingly, the research questions are:

RQ1: Can the determinants in UTAUT model be confirmed in M-government services context?

RQ2: Do the SR and PR have an impact on the ITU of M-government services?

RQ3: Do age, gender and education level moderate the causal relationship between these determinants?

2.0 Literature Review and Hypotheses Development

2.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

In the past decade, several theoretical models have been developed to explain the user's acceptance of technology usage. Among the models proposed, UTAUT is one of the popular models with most encompassing theory which provides a high explanation power of the intention of mobile technology adoption. Yet, Ohme (2014) highlighted limited studies that adopted UTAUT model in m-government services.

2.1.1 Intention to use of M-government Services

Intention is the individual's subjective probability to accept certain action. It is immediate antecedent of behaviour to indicate the individual's readiness to perform the said services (Lin, Tzeng, Chin, & Chang, 2010). In this study, the m-government services' intention is used as the proxy to measure the actual behaviour as it is the best indicator for actual user behaviour (Hew, Lee, Ooi, & Wei, 2015). The prior empirical studies related to the influence of the proposed constructs with the intention are presented in the following part.

2.1.2 Performance Expectancy (PE)

It is defined as one's belief on the usage of technology will assist him or her in achieving goal in the job performance (Venkatest et al., 2003). When the user perceives that the technology is able to enhance their goal and performance, it will cause a favourable preference towards the acceptance intention (Dwivedi, Shareef, Simintiras, Lal, & Weerakkody, 2015). PE has been in the limelight in the past literatures. Among the past studies, it is the strong determinant of

acceptance intention in organization context (Tung, Chang, Chou, 2008; Ng & Choy, 2013). Consistently, the following hypothesis was tested:
H1. PE significantly influences the intention to use M-government services.

2.2.3 Effort Expectancy (EE)

EE is one's perception of the degree of effortlessness associated with the use of technology (Venkatest et al., 2003). The users will intend to use m-government service if they believe that the technology is easy to control, operate and understand. Leong, Hew, Tan and Ooi (2013) also purported the significant association between EE and PE. This is supported in the empirical finding in Hew, Lee, Ooi and Wei (2015), which agreed that when the users found that the technology are convenient and easy to accessible, he or she will have high possibility to adopt the said technology and have a perception that the technology is useful. Thus, the following hypotheses are posited:

H2. EE significantly influences the intention to use M-government services.

H3. EE significantly influences the PE of M-government services.

2.2.4 Social Influence (SI)

SI is the degree of individual's perception on those who are important to them who think that he or she should accept the technology (Yi, Jackson, Park, and Probst (2006). The past studies concluded that it is an important indicator for acceptance intention of technology. One might learn and intend to adopt the technology when he or she observes the other carries the similar behaviour in the social group. According to Singh et al. (2010), individual will intend to adopt the mobile commerce service when they are influenced by friends, family or colleagues. The findings in Venkatest et al. (2003), Venkatest, Thong and Xu (2012), as well as Abdelghaffar and Magdy (2012) have proven that no matter in mandatory or voluntary setting, SI is the most significant determinant for acceptance intention of technology. Thus, the hypothesis is proposed as below:

H4. SI significantly influences the intention to use M-government services.

2.2.5 Facilitating Condition (FC)

FC is the degree of technical support or training that supports the use of technology (Venkatest et al., 2003). According to Venkatest, Thong and Xu (2012), FC significantly affects the acceptance intention as well as the user behavior towards technology. For instance, an individual is willing to accept the M-government service if there is a favourable set of FC such as training, tutorial or vendor support on the m-government services. Besides, Marshall, Mills and Olsen (2008) also found that with sufficient supports, users will be able to perceive the said technology as useful and easy to use/practical. However, limited

studies have focused on the association of FC with the PE and EE. In other word, the complex tri-dimensional between FC, PE, and EE remains ambiguous in the literature. Thus, this study proposes the following hypotheses:
H5. FC significantly influences the intention to use M-government services.
H6. FC significantly influences the PE.
H7. FC significantly influences the EE.

2.2.6 Perceived Risk Theory

Perceived risk refers to the uncertainty that potentially affects the users' confidence towards the services in a long term (Im, Kim, & Han, 2008). The authors further commented that perceived risk and anxiety are different whereby "anxiety can be mitigated" but perceived risk will remain unchanged for a long time. Government services are dissimilar with the m-commerce activities as it often involves highly sensitive and personal information (Venkatest, Chan, & Thong, 2012). Yu (2005) argued that citizens are highly concerned about the security and privacy risks when they are enjoying the government services. Hence, security and privacy are among the major aspects that require extra surveillance in the m-government services in order to foster the usage. To narrow down the literature gap, the perceived security risk (SR) and privacy risk (PR) are incorporated to test their significant influence towards the intention to use m-government services in Malaysia.

2.2.6(a) Perceived Security Risk (SR)

According to Ohme (2014), SR is the uncertainty of users towards the said technology due to the concern about the technical fraud by unauthorized third parties such as system hacking. When the citizens have a high doubt on the security of system, it is unlikely for the citizens to use the system. Venkatest, Chan, and Thong (2012) also agreed that when the users adopt the government services such as e-filling, they have a greater concern about the security since it involves high volume of personal and sensitive information. Hence, when the SR concern is high, the citizen will have lack of confidence towards the service which then contribute to the negative impact towards the usage of technology. Hence, the following hypothesis is put forward:
H8. SR significantly influences the intention to use M-government services.

2.2.6(b) Perceived Privacy Risk (PR)

Majority of past studies often combine the PR and SR in their research. Yet, PR and SR are different. SR focused on the technical fraud done by unauthorized third parties; while PR emphasized on the uncertainty arises from the misuse of personal information by the authorized parties (Ozdemir, Trott, & Hoecht, 2008). Ohme (2014) further commented that PR is the uncertainty or doubt on the authority or government handling the data transmitted during the m-government services. When the PR is high, the loss of trust towards the system and the technology in general is highly likely to occur. Based on the concern on privacy, the hypothesis is formulated:

H9. PR significantly influences the intention to use M-government services.

2.3 Moderating Effects: Age, Gender and Education level

From the observation of past literature reviews which adopted the UTAUT model, it can be concluded that the past studies have overlooked the moderating impact towards the constructs influence (Venkatesh, Thong, & Xu, 2012). To narrow the literature gaps as well as to enrich the UTAUT model in m-government context, this study proposes individual differences such as age, gender and education level as the moderating variables. Differences of individual characteristics such as age, gender, and education background have contradicted opinions in the technology intention (Venkatesh, & Morris, 2000). For example, Yang (2005) discovered that male is more inclined towards technology as compared to female. Mature adults will be more likely to concern about the risk of adopting the technology as compared to the young users. Young users tend to be risk takers, who are willing to use the new technology (Lian & Yen, 2014). Hew, Lee, Ooi and Wei (2015) highlighted that the past studies have neglected the moderating effects of individual's education level. Individual with high education level will tend to encounter fewer barriers to adopt new technology (Chopra & Rajan, 2016). Hence, with the supportive evidences, the following hypothesis is formed:

H10. Age, gender and education level moderate all relationships among the proposed constructs and intention of M-government services.

2.4 Proposed Conceptual Framework

With the above discussion of prior empirical studies, there are a total of six determinants: PE, EE, SI, FC, SR and PR to gauge the influence towards the behavioural intention of m-government services. To simplify the study, use behaviour was removed in this study. Figure 1 below presents the proposed conceptual framework for this study:

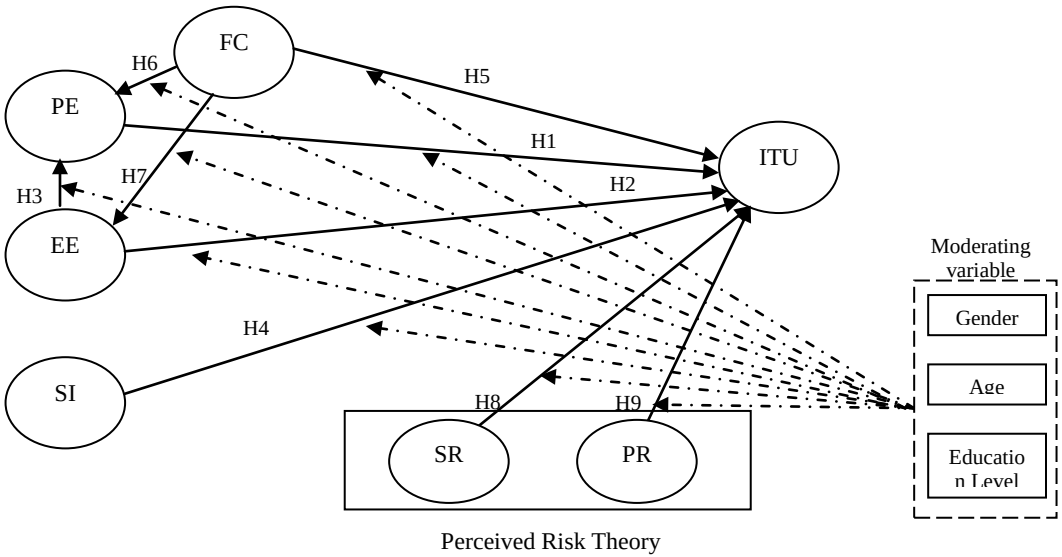

Figure 1: Proposed Conceptual Framework.

Note: PE=Performance Expectancy; EE=Effort Expectancy; SI=Social Influence; FC=Facilitating Condition; SR=Perceived Security Risk; PR=Perceived Privacy Risk; ITU=Intention to use.

3.1 Sampling technique and data collection method

Questionnaire survey was adopted for the purpose of data collection in this study. With national mobile users as the targeted population, quota sampling technique was used by narrowing our sampling target to four states with the highest number of mobile users in Malaysia (MCMC, 2015). They are Selangor (20.9%), Johor (12.7%), Kuala Lumpur (8.9%), and Perak (8.5%), hence making up a sum of 51% out of total population. Pre-test of the questionnaire was conducted with six dominant researchers in the M-commerce field in order to ensure its feasibility and validity.

3.2 Instrument Development

Then, 300 self-administrated questionnaires were distributed, and 265 complete responses were collected which were usable for the data analysis. The medium of language is English. Self-administration was incorporated with the hope to reduce interviewer's bias in terms of influencing the response of the questionnaire. The survey questionnaire was made up of two sections, i.e., demographic profile as well as 26 items responsible in measuring mobile user's perception on the constructs of the study. The items in the questionnaires were adopted from the past literature, in which each construct is measured by three to four items in a 7-point Likert scale format (Table 3.1). The reliability of the instrument is attested to be within acceptable threshold, and is hence satisfactory to proceed to descriptive and inferential analysis.

Table: 3.1 Survey Instruments

Latent constructs	Indicators	Coding	Source
Performance Expectancy (PE)	I would find the m-government services useful in my daily life.	PE1	Venkates , Thong, & Xu (2012)
	Using m-government services increases my chances of achieving things that are important to me.	PE2	
	Using m-government services helps me accomplish things more quickly.	PE3	
	Using m-government services increases my productivity.	PE4	
Effort Expectancy (EE)	Learning how to use m-government services is easy for me.	EE1	
	My interaction with m-government services is clear and understandable.	EE2	
	I find m-government services easy to use.	EE3	
	It is easy for me to become skillful at using m-government services.	EE4	
Social Influence (SI)	People who are important to me think that I should use m-government services.	SI1	
	People who influence my behavior think that I should use m-government services.	SI2	
	People whose opinions that I value prefer that I use m-government services.	SI3	
Facilitating Condition (FC)	I have the resources necessary to use m-government services.	FC1	
	I have the knowledge necessary to use m-government	FC2	

	services.		
	M-government services are compatible with other technologies I use.	FC3	
	I can get help from others when I have difficulties using m-government services.	FC4	
Security Risk (SR)	I fear that while I am using m-government service, I might make mistakes since the correctness of the inputted information is difficult to check from the screen.	SR1	
	I fear that while I am using m-government services, the battery of the mobile phone will run out or the connection will otherwise be lost.	SR2	Rakhi & Mala (2014)
	I fear that while I am using m-government services, I might tap out the related information wrongly.	SR3	
	I fear that my password may be lost and end up in the wrong hands.	SR4	
Privacy Risk (PR)	I think m-government service providers could provide my personal information to other companies without my consent.	PR1	
	I think subscribing to m-government services increases the likelihood of receiving spam/ spam SMS.	PR2	
	I think m-government service providers endanger my privacy by using my personal information without my permission.	PR3	
	I think m-government service providers will send SMS advertisement without user's consent.	PR4	
Intention to Use (ITU)	I intend to use m-government services in the future.	ITU1	Venkatesh et al. (2012)
	I will always try to use m-government services in my daily life.	ITU2	
	I plan to use m-government services frequently.	ITU3	

4.0 Data Analyses

4.1 Demographic Profile of respondents

Table 4.1 shows all the demographic profiles of the 265 target respondents. It is reported that majority of the respondents are female with the age group of 20-30 years old. Majority of them achieved Bachelor degree with the monthly income within the range of RM 2001 to RM 3,000. All of the target respondents owned at least one mobile device.

Table: 4.1 Demographic profiles of respondents

		Total	Percentage
Gender	Female	149	56.2
	Male	116	43.8
Age	Below 20	0	0
	20 to 30 years old	202	76.2
	31 to 40 years old	48	18.1
	Above 40 years	15	5.7
Highest education completed	Secondary School	68	25.7
	Diploma	29	10.9
	Degree	128	48.3
	Others	40	15.1
Income level	Below RM1000	32	12.1
	Between RM1000 and RM2000	49	18.5
	Between RM2001 and RM3000	100	37.7
	Above RM3000	84	31.7
Own mobile phone	Yes	265	100

4.2 Results of statistical analyses

Smart-PLS 2.0 of partial least square (PLS) structural equation modelling (SEM) method was used to analyse the said model in Figure 1. According to Santhanamery and Ramayah (2015), PLS is a pertinent technique for analyzing predictive models with multiple-item constructs. Hair et al (2014) also commented that the variance-based SEM provides better efficiency in parameter estimated which is manifested in advance statistical power than the covariance based SEM. For such rationales, the PLS-SEM is the one that fits for this study. Two-step analytical procedures suggested by Santhanamery and Ramayah (2015) and Anderson and Gerbing (1988) are used to analyze the empirical findings. The reliability and validity measurement model were first evaluated, followed by the structural model assessment and hypotheses testing. According to Wu and Chen (2014), the desired sample size for PLS is ten times of the number of indicators associated or the highest number of antecedent constructs. Thus, the sample size of 265 is considered adequate for the study.

4.2.1 The Measurement Model Evaluation

The measurement model is presented in Figure 4.1 as below:

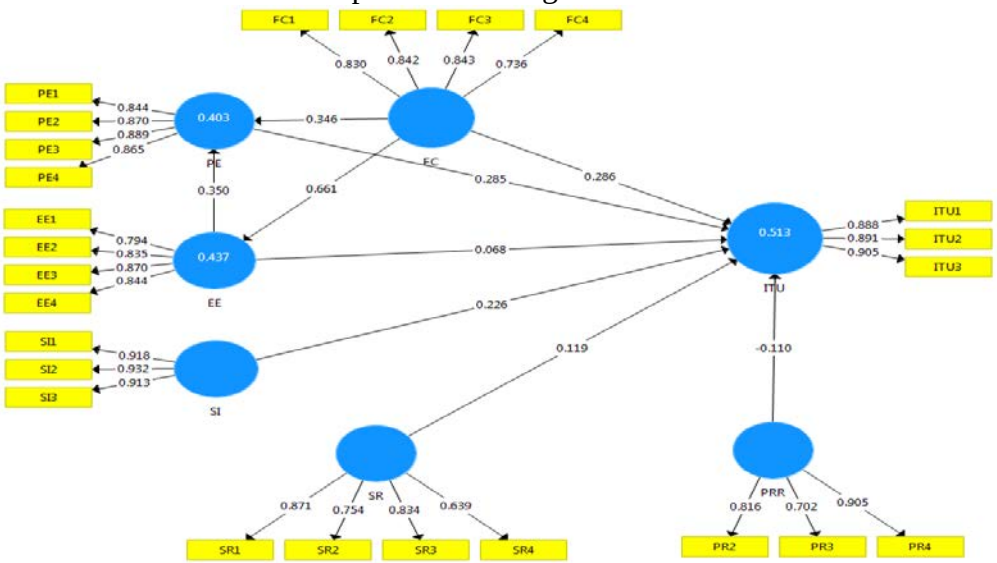

Figure: 4.1 Measurement model

The assessment of measurement model focuses on both reliability and validity of the study. Firstly, to examine the reliability for all constructs, Cronbach's alpha and composite reliability (CR) are assessed. Hair et al. (2014) advised that the CR and Cronbach's alpha's value should be greater than 0.7 in order to demonstrate a high internal consistency of scales used in each constructs. Table 4.2 showed that both the CR and Cronbach's alpha value for all constructs are looking good.

Next, validity for constructs was evaluated by the convergent validity and discriminant validity. Convergent validity denotes as the degree to which two or more attempts share a high proportion of variance in common and it can be confirmed by the factor loadings and average variance extracted (AVE). According to the rules of thumb suggested by Hair et al. (2014), the factor loading should exceed 0.70 and AVE should be greater than 0.50. Table 4.2 presents the factor loading and AVE for each construct which has been attained. For the PR1

under the perceived privacy risk, as the factor loadings is smaller than 0.7, hence the item PR 1 will be dropped.

On the other hand, discriminant validity serves as the extent to which a construct is truly discrete from others constructs. As suggested by Fornel and Lacker (1981), discriminant validity test is conducted to determine the correlation between the constructs and square root of AVE for that construct. Referring to Table 4.3, the square root of AVE as presented in the bolded value for each construct is higher than the correlations between constructs. Hence, discriminant validity is achieved. As recorded in Table 4.2 and 4.3, we can conclude that all constructs exhibited acceptable reliability and validity.

The structural model shows the relationship between the findings of the hypotheses testing proposed in this research model. It was assess by running bootstrap procedure using five thousand samples in SmartPLS and the findings for structural model are presented in Table 4.5 and Table 4.6. All the hypotheses proposed are supported except for H2 and H9. Firstly, the antecedents to intention to use M-government services in Malaysia were evaluated. The path coefficient for direct effects model indicated that PE (β =0.285, $p<0.001$), SI (β =0.226, $p<0.001$), FC (β=0.286, $p<0.001$) and SR (β=0.119, $p<0.05$) has a direct positive influence on the intention to use the m-government services. Whereby, the influence of EE and PR are not statistically significant to the intention to use, thus not supporting H2 and H9. The R square (R^2) revealed that 51.30 percent of the variation in intention to use M-government services can be explained by explanatory constructs. Besides, the results show that the FC has a direct and positive influence towards the PE (β=0.346, $p<0.001$, R^2 =0.403) and EE (β=0.661, $p<0.001$, R^2=0.437). All these R^2 are higher than the rule of thumb 0.35 suggested by Cohen (1988) and the FC is found as the strongest predictor of intention to M-government services.

Table: 4.2 Indicator factor loadings, Cronbach's alpha, composite reliability, and AVE of constructs

Constructs		Factor Loadings	Cronbach's Alpha	Composite Reliability (CR) [a]	Average Variance Extracted (AVE) [b]: Covergence validity
	PE1	0.841	0.890	0.924	0.752
PE	PE2	0.873			
	PE3	0.887			
	PE4	0.866			
	EE1	0.791	0.857	0.903	0.699
EE	EE2	0.835			
	EE3	0.870			
	EE4	0.847			
	FC1	0.830	0.829	0.887	0.663
	FC2	0.842			
FC	FC3	0.843			
	FC4	0.736			
	SI1	0.918	0.911	0.944	0.848
SI	SI2	0.932			
	SI3	0.913			
SR	SR1	0.871	0.805	0.859	0.607
	SR2	0.754			
	SR3	0.834			
	SR4	0.639			
PR	PR1	0.541	0.749	0.831	0.559
	PR2	0.818			
	PR3	0.720			
	PR4	0.869			
	ITU1	0.888	0.876	0.923	0.801
ITU	ITU2	0.891			
	ITU3	0.905			

Table: 4.3 Discriminant Validity Test

Discriminant Validity	PE	EE	FC	SI	SR	PR	ITU
PE	**0.867**						
EE	0.578	**0.836**					
FC	0.578	0.661	**0.814**				
SI	0.471	0.522	0.533	**0.921**			
SR	0.192	0.098	0.096	0.048	**0.779**		
PR	0.238	0.182	0.235	0.090	0.333	**0.748**	
ITU	0.594	0.532	0.603	0.545	0.184	0.091	**0.895**

Note: PE=Performance Expectancy; EE=Effort Expectancy; SI=Social Influence; FC=Facilitating Condition; SR=Perceived Security Risk; PR=Perceived Privacy Risk; ITU=Intention to use. The diagonals (bolded) represent the square root of the AVE while the off-diagonals are correlations among constructs. Diagonal elements should be larger than off-diagonal elements in order to establish discriminant validity.

4.2.2 The Structural Model Evaluation

The structural model is shown in Figure 4.2 below:

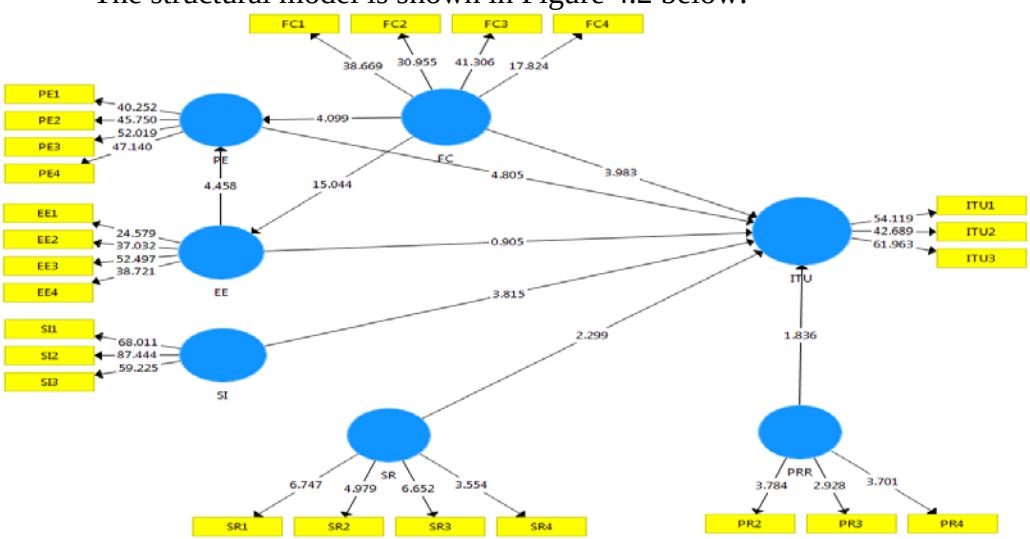

Figure: 4.2 Structural Model

4.2.3 Moderating Effects of gender, age and education level

Multigroup analysis via PLS-SEM was carried out to examine the moderating effects of gender, age and education level in all paths of the proposed research model (Figure 1). Firstly, the female is coded as 1 and male is coded as 2 for gender perspective. Age and education level was re-grouped into two main categories; younger and lower education level was coded as 1 and eldest and with higher education level was coded as 2 according to the median. The method is consistent with the technique recommended in Hew, Lee, Ooi, and Wei (2015) and Rahman, Taghizadeh, Ramayah, and Ahmad (2015) studies. The result in Table 4.4 reported that the gender was found to have significant moderating effect on PE → ITU; EE →PE, SI → ITU, and FC → PE. Whereby, age was found to be significantly moderate in the relationship between EE →PE, FC → PE; FC → EE and PR → ITU. Lastly, education level also found to have significant moderating effect in the path between SI → ITU, FC→ PE; FC→ EE and PR → ITU. Hence, H10 is partially supported.

Table: 4.4 Moderate effects: multiple group analysis

	Gender	**Male**	**Female**	**T-statistics**	**p-value**	**Significant**
H1	PE → ITU	0.438082	0.170333	4.387	0.000	**Yes**
H2	EE → ITU	0.04326	0.078158	0.314	0.754	No
H3	EE → PE	0.222675	0.436938	2.443	0.015	**Yes**
H4	SI → ITU	0.162829	0.307243	2.169	0.031	**Yes**
H5	FC → ITU	0.187162	0.312181	1.488	0.138	No
H6	FC → PE	0.545462	0.192236	4.368	0.000	**Yes**
H7	FC → EE	0.677596	0.657721	0.342	0.732	No
H8	SR → ITU	0.136482	0.054425	1.087	0.278	No
H9	PR → ITU	-0.124079	-0.0309	1.117	0.265	No
	Age	**Younger**	**Older**	**T-statistics**	**p-value**	**Significant**
H1	PE → ITU	0.309938	0.334822	0.256	0.798	No
H2	EE → ITU	0.152808	0.175122	0.228	0.820	No
H3	EE → PE	0.336113	0.097844	3.398	0.001	**Yes**
H4	SI → ITU	0.21182	0.287115	0.891	0.374	No
H5	FC → ITU	0.490458	0.496003	0.090	0.928	No
H6	FC → PE	0.525503	0.754231	2.682	0.008	**Yes**

H7	FC ➔ EE	0.61812	0.79478	3.737	0.000	**Yes**
H8	SR ➔ ITU	0.125106	0.091875	0.650	0.516	No
H9	PR ➔ ITU	-0.028922	-0.277952	2.358	0.019	**Yes**

Education Level		**Low**	**High**	**T-statistics**	**p-value**	**Significant**
H1	PE ➔ ITU	0.315244	0.267973	0.676	0.500	No
H2	EE ➔ ITU	0.178751	0.218448	0.508	0.612	No
H3	EE ➔ PE	0.311505	0.395437	1.011	0.313	No
H4	SI ➔ ITU	0.30468	0.20721	2.520	0.012	**Yes**
H5	FC ➔ ITU	0.450446	0.513521	1.096	0.274	No
H6	FC ➔ PE	0.422665	0.647364	3.419	0.001	**Yes**
H7	FC ➔ EE	0.534193	0.712939	3.293	0.001	**Yes**
H8	SR ➔ ITU	0.087081	0.139668	0.554	0.580	No
H9	PR ➔ ITU	-0.225269	-0.052213	2.207	0.028	**Yes**

Notes: PE=Performance Expectancy; EE=Effort Expectancy; SI=Social Influence; FC=Facilitating Condition; SR=Perceived Security Risk; PR=Perceived Privacy Risk; ITU=Intention to use.

Table: 4.5 Results of structural model analysis

Hypotheses	**Structural path**	**Path coefficients**	**T-statistics**	**Decision**	**f^2**
H1	PE ➔ ITU	0.285	4.805***	Supported	0.09
H2	EE ➔ ITU	0.068	0.905	Not supported	0.01
H3	EE ➔ PE	0.350	4.458***	Supported	0.12
H4	SI ➔ ITU	0.226	3.815***	Supported	0.07
H5	FC ➔ ITU	0.286	3.984***	Supported	0.08
H6	FC ➔ PE	0.346	4.099***	Supported	0.11
H7	FC ➔ EE	0.661	15.044***	Supported	0.78
H8	SR ➔ ITU	0.119	2.299**	Supported	0.03
H9	PR ➔ ITU	-0.110	1.836	Not supported	0.02

Notes: ***p<0.001; **p<0.05; PE=Performance Expectancy; EE=Effort Expectancy; SI=Social Influence; FC=Facilitating Condition; SR=Perceived Security Risk; PR=Perceived Privacy Risk; ITU=Intention to use.

4.2.4 Predictive Relevance and Effect Size

Sullivan and Feinn (2012) urged that the statistical significance (p-value) does not disclose the statistical power of the research model (substantive significant, effect size). According to Cohen's (1988) rules of thumb, the

magnitude of effect size (f^2) of 0.02, 0.15 and 0.35 indicate the small, medium and large effect size respectively. Based on the result in Table 4.5, it can be observed that all the relationships have a passable effect size. Further to that, Table 4.6 also reported the predictive relevance of the endogenous latent variable via blindfolding procedures. Cohen (2013) suggested that Q^2 should be greater than the value of 0 and 0.02, 0.15 and 0.35 denoting small, medium and large predictive relevance. Table 4.6 reported that the ITU (Q^2=0.40) has large predictive relevance with Q^2 more than 0.35, whereby the PE (Q^2=0.298) and EE (Q^2=0.299) which have medium predictive relevance. Therefore, it is concluded that the research model proposed has a material predictive power in explaining the ITU to use M-government services.

Table 4.6 Predictive relevance and effect size of the endogenous latent construct

	R^2	Q^2
ITU	0.513	0.400
PE	0.403	0.298
EE	0.437	0.299

Notes: PE=Performance Expectancy; EE=Effort Expectancy, ITU=Intention to use.

5.0 Discussions

With the PLS-SEM analysis, the empirical results found that all constructs have positive and significant relationship with the ITU m-government services, except the constructs of EE and PR. Among the constructs proposed, FC is seen to be the most important determinant which has stronger influence on ITU. Fundamentally, all paths from the UTAUT have been confirmed in this study except the EE and PR.

5.1 Performance Expectancy (PE)

Based on the empirical result, PE is the second strongest predictor for the ITU of m-government services. The finding is in agreement with the findings of Venkatesh, Morris, Davis and Davis (2003); Hew, Lee, Ooi and Wei (2015); and Chopra and Rajan (2016). Hence, only when the citizens viewed that the m-government services are productive and useful for their daily life, it leads to high intention to adopt the said services. This is particularly in view of the benefit

brought about by the m-government services in term of fast and beneficial transaction.

5.2 Effort Expectancy (EE)

The result shows a surprising and interesting fact, that EE has insignificant influence towards the ITU of m-government services. This opposes the findings by Venkatest et al. (2003); Venkatest, Chan, and Thong (2012); and Leong, Hew, Tan and Ooi (2013) which suggested the EE has a significant effects towards the ITU. The inconsistent finding might be due to the fact that the target respondents are techno-savvy who perceive mobile services as friendly to them (Yu, 2012). Consequently, EE would not affect the citizens' intention to adopt the m-government services. However, the significant relationship between EE and PE is confirmed. Leong, Hew, Tan and Ooi (2013) suggested that to boost the adoption and usage of technology, the high level of convenience should be highly regarded as it results in the positive perception on the usefulness, or else users might perceive it as difficult and a hassle instead. Consequently, the purpose of adopting the m-government services will be defeated.

5.3 Social Influence (SI)

SI has been confirmed as significant determinant of ITU. It is comparable with to the majority of past studies such as Yi, Jackson, Park, & Probst (2006); and Abdelghaffar and Magdy (2012). It is believed that family, colleagues, peers and friends' recommendation or word of mouth have a powerful impact on the individual intention to use the m-government services.

5.4 Facilitating Condition (FC)

FC is confirmed as the most significant determinant of ITU in this study. The empirical result also confirmed that there are positive association between FC to PE and EE. These results therefore support the importance of technical support in m-government services whereby it creates favourable preference among citizens towards the implementation of m-government. When there is sufficient technical support, the citizens will have trust towards the m-government services for they are useful and easy to use (Marshall, Mills, & Olsen, 2008; Venkatest, Chan, & Thong, 2012). Thus, this study shall contribute to the significant association between FC to PE as well as EE which are neglected by the majority of past studies.

5.5 Perceived Security Risk (SR)

SR's empirical finding is in line with the past studies by Ohme (2014) and Nasir, Wu, Yago, and Li (2015). Yet, it was surprisingly found that the SR has positively influenced the ITU of M-government services as this direction of result contradicts the past literature reviewed. This finding provides relevant insight that the higher the SR concern, the higher one's intention to use the m-government services. Roger (1995) reasoned this finding as majority of the target respondents fall between 20 to 30 years old, a group that can be classified as technology savvy. This might explain why the citizens intent to adopt the m-government services, even after some reports or incident about the security violation has been reported.

5.6 Perceived Privacy Risk (PR)

PR was not found to have any significant influence towards the ITU of m-government services. This finding is in line with Tan, Qin, Kim and Hsu (2012) and Ohme (2014), who agreed that with the improvement of m-government policy, the citizens might have sufficient confidence towards the government in handling the data. Therefore, as compared with the SR, PR is no longer the major concern for the citizens.

5.7 Moderating effect of Age, Gender and Education Level

In this study, the moderating effects of age, gender and education level were examined in all constructs. Remarkably, the empirical result demonstrated that gender has moderating effects on relationship of PE → ITU; EE →PE, SI → ITU, and FC → PE, which is parallel with the study of Venkatesh et al. (2003). It is agreed that male tend to be more task-oriented. Thus, when they perceive the m-government services as useful (PE) and have sufficient technical support (FC), they will be more likely to adopt the services. For female, they are more sensitive to others' recommendation and focus more on the degree of effort involved (Venkatesh & Morris, 2000). Therefore, SI and EE are more prominent for them. Next, individual with from different ages are found to have significant moderating impact on the relationship between EE →PE, FC → PE; FC → EE and PR → ITU. Older citizens tend to face more difficulties in adopting new technology; they are less innovative and more concern about the risk. As a result, the older citizens tend to emphasize on the technical supports (FC) and PR in adopting the m-government services. For younger citizens, they tend to focus more of the

degree of effort and usefulness, which results in a greater moderating influence in relationship between EE and PE. Lastly, difference of education level of the citizen yields moderating effect in causal relationship between SI → ITU, FC→ PE; FC→ EE and PR → ITU. It is concluded that citizens with higher education level will tend to depend more on the FC which leads them to a better control and knowledge towards the m-government services. They believe that the system is convenient and useful with sufficient resources and support. On the other hand, citizens with lower educational level are more conscious, will consider more on the details and privacy of the data and has a higher level of risk concern before making any technology adoption (Chopra & Rajan, 2016). As a result, SI and PR are more salient in the m-government services' adoption.

6.0 Implications

6.1 Theoretical Implications

Shafinah et al. (2013) suggested that prevalence of m-government services, often referred to as the users' behavioural intention and citizens' demands and needs, and are vary. However, limited studies showcased the complete constructs as well as the moderating effects proposed by the UTAUT model. This study incorporates the UTAUT and perceived risk theory to explore the conceptual connection between the proposed variables and the behavioural intention of the m-government services among the citizens. From the theoretical point of view, all the constructs proposed have been successfully justified in this study. All of the constructs such as perceived expectancy, social influence, facilitating condition and perceived security risk have been examined and found as the salient predictors for intention to use m-government services. Furthermore, this study serves to narrow the existing literature gaps by incorporating the moderating effects of age, gender and education level in the proposed model to yield better insight in explaining the intention to use m-government services. Successful incorporation of UTAUT model and perceived risk theory (PR and SR) is another accomplishment made by this study which explained 51.3 percent of the variances in intention to use m-government services in Malaysia. The new research model would serve as a baseline for future researchers in the m-government service study.

6.2 Managerial Implications

With the vision 2020, Malaysian government is aiming for a better, more effective and higher quality government services to the citizens. With the unique characteristic of mobile devices and high level of mobile penetration, there are clear opportunities for the SMART (Social, Mobile, Analytics, Radical Openness and Trust) m-government in Malaysia. The managerial implications of this study are crucial and comprehensive to the m-government service providers. The government should be aware of the impact of performance expectancy, social influence, facilitating condition, and security risk upon the implementation of the m-government services. In order to improve the communication between government and citizen, Malaysian government must ensure that the service is in the highest level of usefulness, with sufficient technical support, and limited security flaws.

Out of all predictors, facilitating condition contributes the highest influence power towards the intention to use. Technical support is always important. Therefore, close attention should be given to the technical support and resource in m-government services in Malaysia. Government should provide demonstration, animated tutorial as well as real time assistance to facilitate the citizens in using the m-government services. Next, performance expectancy is the second strongest predictor leading to the intention to use the m-government services. The m-government services should be able to cater the daily lives of citizens and see how it could be assimilated with the citizens' routines. Survey should be conducted from time to time to understand the citizens' needs to improve the usage of m-government services. Inter-government agencies as well as private sectors at the national or global level should be invited and engaged to provide an extensive m-government services. Given with the unlimited access to media nowadays, it is very important to promote the usage of m-government services via mass media and social network channels.

Next, citizens are worried about the increasing use of m-government services which will result in the increasing vulnerability of sensitive information as well as the security flaws. By recognizing the significant contribution of security risk, the m-government service providers in Malaysia must safeguard security principles and review the existing regulations in order to address the security concerns. Due diligence must be implied to ensure that the citizen sensitive information is protected in a secured system access, user identification and other advanced security measures. The service providers must always bear in

mind that insufficient data security will greatly pose an influence on the citizen's uptake of m-government service.

The moderating effects of age, gender and education level indicates the need for market segments to provide explicit consideration for different citizens' characteristics. One size suits all strategies is not applicable in the m-government services. Male and older citizens with high education are more concerned about the usefulness and technical resource or support of m-government services. Female are more sensitive with the words of mouth and the degree of efforts in which they want the system to be more convenient and easy to use. All these findings can serve as momentum for the Malaysian government to be aware of the citizens' preferences and needs to develop a successful m-government service.

7.0 Limitations and Recommendations

Even if the study contributes a new insight into the m-government services adoption, it is limited in which the study was carried out only in Malaysia. Hence, the findings can only been transferable to country with similar culture and m-government infrastructure. A comparison with cross country or cross culture study on m-government services should be conducted in future research. On a side note, this study did not integrate mediator into the research model. It will be exciting to examine the mediating effects in the constructs to contribute deeper insight for the service provider.

8.0 Conclusion

The study has successfully examined the predictors of m-government services by incorporating the UTAUT and risk theory. The effects of FC, SR, and EE are quite surprising because the results differed from the expected outcomes. FC has been proven as the most important predictor of m-government services which leads the citizens to perceive that the services are useful and convenient to use. Moreover, instead of having negative effects on ITU of m-government services, SR was found to have positive influence towards the ITU. For EE, the findings also showed that the convenience of m-government services is no longer a major impact towards the ITU. This might be due to the targeted citizens who are technology savvy and risk takers with high level of innovation. Even though there might be a high security concern, citizens are still willing to use the m-government services. As a conclusion, citizens prefer useful m-government

services with adequate technical assistance and support and zero security flaw to benefit them.

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