THE INFLUENCE OF GOVERNMENT SUPPORT AND AWARENESS ON RURAL FARMERS' INTENTION TO ADOPT MOBILE GOVERNMENT SERVICES IN TANZANIA

INTRODUCTION

Communication styles between the government and citizens keep on changing due to the rapid changes in information and communication technologies. Most governments have shifted to the provision of public services and information through electronic government (e-government) platforms (Alateyah, Crowder, & Wills, 2012). Nevertheless, e-government is perceived to be ineffective in developing countries (Qian and Aquaro 2014; Liu et al. 2014). This is attributed to insufficient funds for implementing fixed communication infrastructures, particularly in rural areas (Bwalya, Chris, & Mandla, 2013; Qian & Aquaro, 2014). On the other hand, development of mobile technology has been considered as the complimentary strategy to e-government in developing countries (Bwalya et al., 2013; Ghyasi & Kushchu, 2004; Kushchu, 2007; Kushchu & Kuscu, 2003). This could be attributed by growing number of mobile ownership, availability of wireless technologies and low cost mobile (Bwalya et al., 2013; Qian & Aquaro, 2014). Through using m-government, governments could bypass massive and huge investments required for e-government infrastructures and thus provide public services and information in a convenient way (Ghyasi & Kushchu, 2004).

Tanzania has adopted m-government to serve citizens particularly those who are living in rural areas (URT, 2015a). However, several studies have shown that lack of awareness on e-government initiative including m-government and inadequate government support limits its acceptance (Dewa & Zlotnikova, 2014; Yonazi, 2013). Furthermore, Yonazi (2013) reported that there are no sufficient infrastructures, guidelines and operational frameworks to allow the smooth implementation and operations of e-government services Studies have also shown that most of the empirical investigation in Tanzania focused on examining factors which could influence adoption of e-government in general (Komba-Mlay, 2013; Komba & Ngulube, 2014), and in identifying challenges and barriers of m-government (Hellström, 2008; Kyem, 2016; Munyoka & Manzira, 2014). However, one factor that has shown to affect the successful implementation of technology is the willingness of adopters to accept the said technology (Carter & Belanger, 2005; Mun, Jackson, Park, & Probst, 2006) and this has not been investigated in the Tanzania m-government context. This nuance of examining the factors of rural farmer's technology adoption and use of mobile access for government services provides a unique perspective to be studied.

In order to achieve this objective, the current study extends Innovation Diffusion Theory (IDT) with government support and awareness to study the rural farmers' intention to adopt m-government services. This study has several significances. It seeks to provide a better understanding about the adoption of m-government in developing countries, particularly in Sub Saharan countries. This is because there is a limited number of studies in the region as m-government is still considered to be in its infancy (Bwalya et al., 2013). This study's extension of IDT with government support and awareness sees as integration unique to the m-government field. Therefore, results produced from this study could add to the current limited knowledge about IDT applications. The study examines the indirect influence of awareness through perceived characteristics of innovation that would provide better information on the influence of awareness through perceived characteristics. Finally, the study could provide more useful information to policy makers in their planning for the rural uptake of m-government services.

LITERATURE REVIEW

The need of Farming Information in Tanzania Rural Areas

Accessibility of public services and information has been a challenge in Tanzania particularly in rural areas. About 70.9% of Tanzanian live in rural areas and 89% of them are farmers (URT, 2013b). The country's economy depends largely on the agricultural sector and is the largest employer (Amani & Mkumbo, 2012). This suggest that the national economy is held by rural farmers. However, report shows that most of the rural farmers practice subsistence farming which limits various agribusinesses (Salami, Kamara, & Brixiova, 2010; Wolter, 2008). Therefore, in order to improve rural farmer's livelihood and extend national income, the government has to pay attention to the needs of the agricultural sector and rural farmers by providing improved access to useful farming information. This is because, the availability of farming information tends to improve farming methods and improve marketing strategies (Balit, Calvelo, & Masias, 1996; Mtega & Msungu, 2013). It also improves accessibility of markets and potential customers as well as storage of farming products throughout the year (Balit et al., 1996).

Since about 55% of citizens in rural areas own mobile phones (URT, 2015b); it was deemed prudent to provide their access to e-government services through a mobile enables platform (URT, 2015a). This was considered advantageous because a mobile enabled platform of m-government provides easy access to agriculturally relevant information such as meteorological information, crops paste and diseases information, products' market and price; and other advisory services on agriculture anytime, anywhere (Carroll, 2006; Georgescu, 2011; Kushchu & Kuscu, 2003; Shareef, Norm, & Dwivedi, 2012).

Technology Adoption Theories

Various theories such as Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT) and Innovation Diffusion Theory (IDT) have been widely used to examine technology adoption behavior (AlAwadhi & Morris, 2009; Yi-Hsuan, Yi-Chuan, & Chia-Ning, 2011). Each theory uses different set of variables to explain technology adoption behavior. TAM considers technological factors which are perceived usefulness and perceived ease of use as determinant factors of behavior intention (Davis, 1989). Nevertheless, TAM has been criticized for disregarding non-technological factors in examine technology behavior adoption (Abdelghaffar & Magdy, 2012; Al-Shafi & Weerakkody, 2010). The UTAUT was developed to address weaknesses found in other technology adoption theories (Venkatesh, Morris, Davis, & Davis, 2003). The UTAUT combines different variables from different theories to develop four variables: performance expectancy, effort expectance, social influence and facilitating conditions. However, TAM and UTAUT constructs are considered to be too general. UTAUT constructs combine different constructs with different meaning (van Raaij & Schepers, 2008) while TAM did not specifically specify the determinant factors of the two constructs (Venkatesh & Davis, 2000). On the other hand, IDT constructs are considered to be specific in addressing technology adoption behavior (Straub, 2009; Wisdom, Chor, Hoagwood, & Horwitz, 2014). Therefore, this study adopt IDT to create a conceptual framework for this study

IDT was purposely developed to address the adoption of agriculture innovation in rural areas (Rogers, 1983). IDT provides characteristics of innovation which are relative advantage, complexity, compatibility,

observability and Trialability. These characteristics are theorized to influence adopters' behavior intention on adoption of technology (Rogers, 1983). IDT constructs were further extended to be applied in information technology adoption. Modifications were done to lessen ambiguities in measuring the constructs, also there was no comprehensive instrument to measure the constructs (Moore & Benbasat, 1991). Based on these modifications the following constructs were developed: relative advantages, ease of use, compatibility, image, results demonstrability, visibility and trialability.

Several empirical studies have used IDT constructs to examine the adoption of information technology on different areas. Lee, Hsieh, and Hsu (2011) used IDT constructs to study acceptance of e-learning. Lee et al. (2011) concluded that compatibility, relative advantage, observability and trialability have significant effect on behavior intention. The results of Carter and Belanger (2003) study also revealed that relative advantage, image, compatibility tends to influence behavior intention to adopt e-government. Similarly, Rambocas and Arjoon (2012) applied IDT to investigate internet banking adoption in Trinidad and Tobago, the results showed that relative advantages and compatibility are determinants for adoption of internet banking. In summary, IDT constructs are best predictors in explaining the adoption of information technology. Therefore, applying IDT in this study could further extend its applicability in m-government context.

RESEARCH MODEL AND HYPOTHESES

The current study adapts IDT to create the conceptual research model (see Figure. 1). Behavioral intention to adopt m-government is used as the dependent variable in this study. This is because the study examines only rural farmers who are also non-users of m-government services. All perceived characteristics of innovations: relative advantages, ease of use, compatibility, image, results demonstrability, visibility and trialability are used as independent variables.

IDT was extended by including two variables which are government support and awareness to address the major issues identified in this study. Government support appears to be a key factor in the diffusion of e-government services (Al-Shafi, 2009). If the government provides facilitating environment for the citizens to adopt m-government, the adoption of m-government will be very easy and will increase (Goh, 1995). Likewise, awareness is considered to be very important in making citizens aware of the technology (Mat, 2011). For the citizens to adopt m-government, they must be aware of its existence, how it works as well as its benefits. As informed by these findings, the current study includes these two variables to propose a new framework that will be used to increase the adoption rate of m-government in Tanzania.

Furthermore, previous studies which examined the relationship between awareness and intention have concentrated on investigating the direct relationship only (Abdelghaffar & Magdy, 2012; Rehman & Esichaikul, 2012; Shareef, Kumar, Kumar, & Dwivedi, 2011). Direct relation of awareness does not specifically show which aspects should be considered during awareness campaigns in order to improve the perceptions of adopters (AlAwadhi & Morris, 2009; Beynon-Davies, 2005). Hence, indirect effects of awareness will be investigated. Shareef, Kumar, Kumar, and Hasin (2009) suggested that awareness should be the first element in which to improve adopters' perception on technology innovation. Therefore, as informed by these findings, the current study examines the indirect influence of awareness through all perceived characteristics of innovation.

Hypotheses Formulation

Relative advantage is defined as the degree to which m-government is perceived to be better than using other communication strategies in rural areas (Moore & Benbasat, 1991). Advantages such as accessibility of agriculture information anywhere, anytime is considered to outweigh barriers of other communication strategies. Previous empirical IS studies have shown that relative advantage influences behavior intention positively (Jebeile & Reeve, 2003; Mat, 2011; Rambocas & Arjoon, 2012; Richardson, 2009). Consequently, it was reasonable to suggest that if rural farmers perceive m-government to be better when compared to any other communication strategy they will form an intention to adopt m-government. Therefore, this study hypothesizes that:

H1: Relative Advantage will positively affect rural farmers' intention to adopt m-government services.

In the current study, ease of use demonstrates the extent to which m-government would be free from the physical and mental effort (Rogers, 2003). As the adopters perceive the technology to be easy to use, they are likelihood to adopt technology tends to increase. Further, past studies showed that ease of use has direct and positive effects on intention to adopt e-government (Althunibat, Alrawashdeh, & Muhairat, 2014; Carter & Belanger, 2005; Mat, 2011). Similarly, this study hypothesizes that:

H2: Ease of Use will positively affect rural farmers' intention to adopt m-government services.

Compatibility is defined as the degree to which m-government is considered to be consistent with rural farmers existing values, experience, and needs (Rogers, 1983). Compatibility has been proven to be a significant and influential factor on intention to adopt different technologies (Eri, Islam, & Daud, 2011; Mat, 2011; Rambocas & Arjoon, 2012). Since most rural farmers have different experience and needs, then it is rational to predict that compatible m-government will be an influential factor on their intention to adopt m-government services. Thus, in order to reflect these findings, the following hypothesis was developed:

H3: Compatibility will positively affect rural famer's intention to adopt m-government services.

In this study, Image is defined as the degree to which using m-government services is considered to enhance someone's status within the rural farmers' society (Moore & Benbasat, 1991). It was found that image has been proved to be significant factor in influencing adopter's intention to adopt e-government because being able to communicate government farming information accessible through the use of mobile phones tended to increase the user's prestige in rural farmers society (Lean, Zailani, Ramayah, & Fernando, 2009; Yong Liu et al., 2014; Ong, Poong, & Ng, 2008). This finding informs that, the study should hypothesize that:

H4: Image will positively affect rural farmers' intention to adopt m-government services

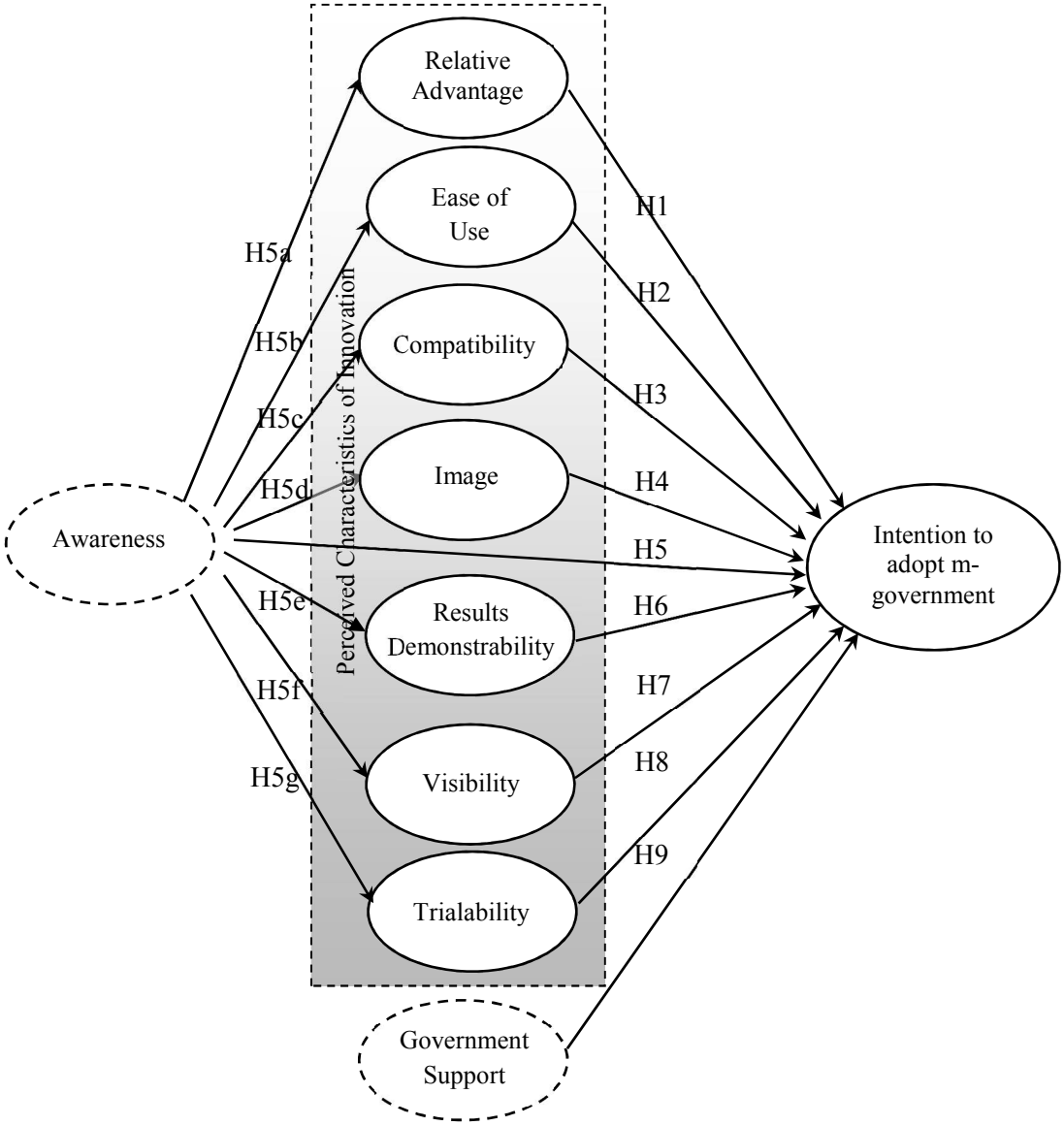

Figure. 1: Conceptual Research Model

In the current context, awareness may be defined as scope of knowledge and recognition of rural farmers over m-government services (Meftah, Gharleghi, & Samadi, 2015). Guiltinand and Donnelly (1983) argued that awareness is important factor in the innovation adoption process. Similarly, previous empirical results have showed that awareness was a significant factor on intention to adopt m-government and e-government (Abdelghaffar & Magdy, 2012; Meftah et al., 2015). Congruently, it was reasonable to infer the following hypothesis:

H5: Awareness will positively and directly affect rural farmers' intention to adopt m-government services.

Various scholars highlighted a concern on the ability of awareness to influence technology adoption (Brennan, Canning, & McDowell, 2010; Jung, Chan-Olmsted, Park, & Kim, 2012). A growing argument

is that adopters may be aware of the technology innovation but they may not be interested (Brennan et al., 2010; Jung et al., 2012). This suggests that an awareness may not necessary influence adoption. However, the interest of adopters was shown to have increased as awareness of different aspects of the technology innovation increased (AlAwadhi & Morris, 2009; Jaruwachirathanakul & Fink, 2005). Rogers (1983) reflected that, by providing more information on various characteristics of innovation, the likelihood of adopting the innovation tends to increase. Various studies have analyzed the influence of awareness on attitude by providing more information (Mashau, 2016; Mohammadi, 2015; Noor, Che-Azmi, & Ramalingam, 2014), their results showed that providing more information on specific innovation attributes may positively affect the decision of adopters. In the current study, it was believed that providing more information on various characteristics of m-government will tend to influence adopters perception positively. It was therefore appropriate to hypothesize that:

$H5_a$: Awareness will positively affect rural farmers' perception regarding m-government advantages

$H5_b$: Awareness will positively affect rural farmers' perception regarding m-government ease of use

$H5_c$: Awareness will positively affect rural farmers' perception regarding m-government compatibility

$H5_d$: Awareness will positively affect rural farmers' perception regarding image

$H5_e$: Awareness will positively affect rural farmers' perception regarding results demonstrability

$H5_f$: Awareness will positively affect rural farmers' perception regarding m-government visibility

$H5_g$: Awareness will positively affect rural farmers' perception regarding m-government Trialability

In the current context, results demonstrability is defined as a degree to which m-government results are perceived to be tangible and communicable to other members of the rural farmers' society (Karahanna, Straub, & Chervany, 1999). If members are able to communicate the positive results of using m-government, others people may be interested and their likelihood to use m-government may increase. Various past studies have shown that, results demonstrability has significant positive relationship with intention to adopt different technologies (Jebeile & Reeve, 2003; Njuguna, Ritho, Olweny, & Wanderi, 2012; Richardson, 2009). Consequently, this study predicted that:

H6: Results Demonstrability will positively affect rural farmers' intention to adopt m-government services.

Visibility is defined in the current study as the degree to which the use of m-government is perceived to be visible to other members within the rural farmers' society (Agarwal & Prasad, 1997). Empirical evidence showed that visibility has significant relationship with intention to adopt e-learning technologies (Jebeile & Reeve, 2003; Richardson, 2009). Since m-government is new technology in rural area (Bwalya et al., 2013), visibility may positively impact rural farmers' behavior intention. Therefore, it was rational to hypothesize that:

H7: Visibility will positively affect rural farmers' intention to adopt m-government services.

Trialability is defined as the extent to which m-government can be tested by rural farmers within a given time (Rogers, 2003). Providing a trial period for testing technology before adoption is considered to be an influential factor on technology adoption (Rogers, 2003). Empirical evidence from previous studies showed that trialability is positively influencing an intention to adopt different technologies (Kee, Omar, & Mohamed, 2012; Richardson, 2009; Tanakinjal, Deans, & Gray, 2010). Since m-government is a new

technology in Tanzania rural areas, it was reasonable to provide a trial period to rural farmers who also are IT illiterate to enhance their skills of using m-government. Consequently, the following hypothesis was developed:

H8: Trialability will positively affect rural farmers' intention to adopt m-government services

Government support is considered to be one of the influential key factor in adoption of various technologies (Goh, 1995). Government can support the adoption of m-government by investing in required m-government infrastructures, providing regulations, and framework which supports the use of m-government (Kushchu & Kuscu, 2003). Massive m-government investment has been witnessed in countries like United State and United Arab Emirates in which a large percentage of citizens have adopted m-government (Qian & Aquaro, 2014). A study conducted by Rambocas and Arjoon (2012) and Tan and Teo (2000) revealed that government support influenced the adoption of mobile banking. Similarly, it was thought that if rural farmers perceive that the government is providing enough support for them to adopt m-government, their likelihood to adopt m-government may increase. Consequently, it was proposed as a hypothesis that:

H9: Government support will positively affect rural famers' intention to adopt m-government services.

METHODOLOGY

Population, Sample Size and Sampling Techniques

The population of interest are farmers living in Tanzania's rural areas. They are main contributors in Tanzania's economy through the agricultural sector (Amani & Mkumbo, 2012). Only rural farmers aged 15 to 64 years were considered in the sample frame. This is a working group which is actively involved in economic activities (URT, 2013a). Furthermore, only respondents who can read and write in either Swahili or English were considered, these are official languages used in providing public services in Tanzania. Sample size of this study was computed by using Yamen (1967) formula, which is based on finite population. This is because rural farmers population in Tanzania is considered to be finite as well as homogeneous in terms of public services accessibility (URT, 2014). Based on the above requirements, a minimum of 400 rural farmers were considered to be enough to represent the entire rural farmers population (Yamane, 1967).

The study employed stratified sampling and multi-stage sampling with simple random sampling to select rural farmers from representative areas of Tanzania's mainland. Stratification was conducted to create five strata which included north, lake, coast, southern-highland and central. This enables representation of all Tanzania rural farmers' population (Meng, 2013). Each stratum contained several regions with similarities in geographical environment and economic activities. Multi-stage sampling was used to create level from region, district, ward and village. Multi-stage was employed due to unavailability of complete list of rural farmers in regions, districts, and wards which could make selection of respondents to be difficult (Shimizu, 2005). One criteria was that in each strata only regions and districts in which more than half of their wards are categorized as rural were considered to make a sample frame. This is because public services are inaccessible in rural wards due to insufficient communication infrastructures (Temu, Nyange, Mattee, & Kashasha, 2005).

Since all regions in region sample frame under each stratum are considered to be homogeneous, then only one region was randomly selected. A proportional stratified sampling technique was used to compute

number of respondents to be selected in each region. This method allows a region with large population of rural farmers to have higher representation on the sample (Fottrell & Byass, 2008).

In each selected region, one district under district sample frame was also randomly selected, this is because all districts under the sample frame are considered to be homogeneous. In each selected district, only rural wards were considered to make a sample frame and one ward was randomly selected. In each selected ward, all villages were listed and one village was randomly selected. In each selected village, a list of household was accessed from village main offices where random selection was done to select the number of required households based on the proportionate sample of each region. In each household, only one respondent with the above characteristics was selected.

Questionnaire Design and Development

The study used a self-reported questionnaire to collect data. The questionnaire contained three main parts namely; introduction, respondents' demographic information and measurement items. A total of 45 measurement items were borrowed from previous studies and modified to suite the current study. Since this study is conducted in rural areas, a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5) was used. This is because 5-point could reduce some inconvenience such as fatigue from responding which may produce large missing values (Lehmann & Hulbert, 1972). Translational validity was conducted by using six e-government and m-government experts as recommended by Lynn (1986) and Sangoseni, Hellman, and Hill (2013). Two items were dropped in translational validity due to low Items Content Validity Index (I-CVI) which were below the threshold of 0.78 (Lynn, 1986). The questionnaire was translated into Swahili because most of the rural citizens in Tanzania are fluent in Swahili.

The study conducted an informed pre-testing to improve the questionnaire (Ticehurst & Veal, 2000). Sampling techniques discussed in the previous section were used to select a total of 37 rural farmers from one village. Minor ambiguities were identified in understanding instructions and some of the Swahili terms and words and were corrected so as to facilitate easy understanding. The pilot study was also conducted to check if the indicators could properly measure the corresponding constructs, therefore Exploratory Factor Analysis (EFA) was conducted (DeVon et al., 2007). A total of 182 respondents were selected by using the above sampling techniques from five villages, this is because a minimum of 100 is considered to be acceptable for EFA (Hair, Black, Babin, & Anderson, 2009). The EFA results show that two items produced factor loading below 0.4 and thus were deleted as recommended by Kline (2014). Furthermore, Cronbach Alpha values ranges from 0.75 to 0.88 were produced, indicating high consistency of the items in measuring the variables (Fornell & Larcker, 1981). Finally a questionnaire with 41 measurement items was generated and used for the main survey.

Data Analysis Technique

Structural equation modeling (SEM) was employed to analyze the data. This is because SEM takes care of measurement errors in measurement items (Astrachan, Patel, & Wanzenried, 2014; Wang & Wang, 2012). Furthermore, SEM analyzes all of the inter-dependence relationships in single analysis (Astrachan et al., 2014). Therefore, SEM tends to produce error-free results. Since this is a confirmatory study, Covariance Based SEM was employed to analyze the relationship between variables (Hair, Hult, Ringle, & Sarstedt, 2014). A two stages analysis, which includes measurement and structural models were employed to analyze reliability, validity and test the hypotheses. In order to facilitate this, IBM SPSS 20 and AMOS 22.0 were used in preliminary data testing and hypotheses testing.

Main Survey Administration

A survey was conducted using a Drop Off/ Pick Up (DOPU) method to collect required data. This was done with help of two research facilitators from February 2016 to May 2016. Rural farmers are very busy with farming, domestic and social activities, therefore applying DOPU method could provide flexibility to them in responding to the questionnaire (Steele et al., 2001). A total of 500 questionnaires were distributed and 427 were returned back which produced 85% response rate.

RESULTS

Descriptive Analysis

Table 1 shows the frequency distribution of the sample data used in this study. Males account for a large percentage (53.4%) of the sample. The youth age group (15-35 years) contributes a large percentage of the sample (50.4%). Majority of rural farmers are familiar with Swahili. Mobile ownership is shown to be 78%. This is a good indication for the government as it is evident that most citizens can access public services through their mobile phones. The sample also indicates that most of the rural farmers have low income and most of them (56%) are educated up to basic level which is primary school.

Table 1: Demographic profile of the sample

Demographic characteristics	Groups	Frequency	%	Cumulative %
Gender	Male	228	53.4	53.4
	Female	199	46.6	100
Age	15-35	215	50.4	50.4
	36-59	186	43.6	94.0
	60- 64	26	6.0	100
Language	Swahili	418	97.9	97.9
	English	9	2.1	100
Mobile Ownership	Yes	334	78.0	78.0
	No	93	22.0	100
Income (Tshs)	Below 200,000	110	25.8	25.8
	200,000 – 300,000	156	36.5	62.3
	300,001 – 400,000	70	16.4	78.7
	Above 400,000	87	20.4	99.1
	Missing values	4	0.9	100
Education	No Formal Education	23	5.4	5.4
	Primary	239	56.0	61.4
	Secondary	150	35.1	96.5
	Diploma	7	1.6	98.1
	Bachelor	2	0.5	98.6
	Missing values	6	1.4	100

Notes: Sample size (N) = 427; Tshs: Tanzania Shillings

Missing Data, Normality and Outliers assessment

Data were tested for missing values, normality and outliers in order to produce valid and reliable results (Kline, 2011). In a missing data assessment, twenty cases were discarded due to the large percentage (more than 30%) of missing values and suspicious patterns. Other 30 cases had a small number of missing values of which MCAR test was conducted to analyze its effects (Rubin, 1976). The analysis shows that, the missing values effect was non-significant (χ^2 (297) = 326, ρ = 0.113). Therefore, all missing values were replaced by using Expectation Maximization algorithm (Pigott, 2001). All subsequent analyses used 407 valid cases.

A univariate normality assessment was conducted by checking skewness and kurtosis. Table 2 shows that all items are within the acceptable range of 2 and 3 for skewness and kurtosis respectively (Awang, 2015). However, literature reported that availability of univariate normality does not guarantee multivariate

normality (West, Finch, & Curran, 1995). Therefore, a multivariate normality was also accessed. Table 2 shows that the multivariate critical ration value is 16.02 which is above the recommendation value of 5 (Awang, 2015). This clarifies that there is multivariate non-normality.

Table 2: Assessment of normality

Construct	Items	min	max	skewness	c.r.	kurtosis	critical ratio
Awareness	AW1	1	5	-0.744	-6.130	-0.327	-1.349
	AW2	1	5	-0.734	-6.049	-0.552	-2.274
	AW3	1	5	-0.777	-6.398	-0.535	-2.202
	AW4	1	5	-0.415	-3.419	-1.164	-4.792
	AW5	1	5	-0.529	-4.358	-0.985	-4.055
Behavior	BI1	1	5	-0.683	-5.627	0.708	2.916
Intention	BI2	1	5	-1.169	-9.630	1.898	7.817
	BI3	1	5	-0.899	-7.408	1.225	5.046
	BI4	1	5	-0.894	-7.366	0.867	3.572
Compatibility	CMP1	1	5	-0.505	-4.162	-0.100	-0.410
	CMP2	1	5	-0.718	-5.916	-0.019	-0.079
	CMP3	1	5	-0.673	-5.543	0.029	0.120
	CMP4	1	5	-0.715	-5.890	-0.116	-0.477
	CMP5	1	5	-0.801	-6.600	0.088	0.362
Ease of Use	EOU1	1	5	-0.662	-5.451	-0.403	-1.658
	EOU2	1	5	-0.447	-3.684	-0.823	-3.388
	EOU3	1	5	-0.230	-1.891	-1.166	-4.800
	EOU4	1	5	-0.379	-3.124	-1.084	-4.463
Government	GS1	1	5	-1.208	-9.946	1.089	4.483
Support	GS2	1	5	-1.114	-9.172	0.504	2.075
	GS3	1	5	-1.159	-9.549	0.691	2.845
	GS4	1	5	-1.195	-9.845	0.816	3.360
Image	IMG1	1	5	-0.822	-6.767	0.636	2.619
	IMG2	1	5	-0.840	-6.915	0.600	2.469
	IMG3	1	5	-0.975	-8.030	1.032	4.251
	IMG4	1	5	-0.672	-5.533	-0.885	-3.645
Relative	RA1	1	5	-1.125	-9.265	0.559	2.303
Advantages	RA2	1	5	-0.993	-8.175	0.466	1.920
	RA3	1	5	-0.862	-7.102	-0.072	-0.298
	RA4	1	5	-0.687	-5.657	-0.761	-3.133
	RA5	1	5	-0.849	-6.996	-0.573	-2.358
Results	RD1	1	5	-0.756	-6.228	0.431	1.774
Demonstrability	RD2	1	5	-0.523	-4.305	-0.621	-2.555
	RD3	1	5	-0.298	-2.454	-0.854	-3.516
Trialability	TR1	1	5	-1.171	-9.643	1.136	4.677
	TR2	1	5	-1.043	-8.591	0.686	2.824
	TR3	1	5	-1.385	-11.408	1.884	7.760
Visibility	VS1	1	5	-0.331	-2.724	-0.828	-3.409
	VS2	1	5	-0.339	-2.790	-1.082	-4.454
	VS3	1	5	-0.346	-2.852	-0.796	-3.278
	VS4	1	5	-0.390	-3.209	-0.715	-2.946
	Multivariate					**95.407**	**16.207**

To address the multivariate non-normality problem, the mahalanobis distance was analyzed to check for existence of multivariate outliers (Tabachnick & Fidell, 2007). The results revealed the existence of a small number of multivariate outliers. The effect of the available outliers was analyzed using Cook's Distance (Cook, 1977). The results revealed that the available outliers have non-significant effects in the current study. This is because the maximum cook's distance produced is below 1.0 which is the recommended threshold (Stevens, 1992). Furthermore, literature suggested that, for a study with large sample size (greater than 200), the effects of slightly non-normality data is considered to be negligible (Tabachnick & Fidell, 2001). In addition to that, this study adopted the bootstrap estimation method. This method is considered to be robust to non-normality data (Nevitt & Hancock, 2001).

Assessment of Measurement Model

A Variance-covariance input matrix with maximum likelihood methods were employed to estimate parameters (Hair, Anderson, Tatham, & Black, 1998). Model fit was evaluated using chi-square ($\chi 2$) with its associate degree of freedom (*df*). Since $\chi 2$ is sensitive to sample size (de Carvalho & Chima, 2014), then normed chi-square ($\chi 2/df$) also was used. Furthermore, Root Mean Square Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR) were also used. These are the most recommended fit indices because they represent different categories of model fit and they are insensitive to sample size (Boomsma, 2000; Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999). A measurement model is considered to demonstrate adequate fit if; CFI and TLI values are greater than 0.9, $\chi 2$/df value is less than 3 and RMSEA and SRMR values are less than 0.08 (Awang, 2015; Kline, 2005).

A confirmatory factor analysis (CFA) was carried out to validate a pooled measurement model with 41 items. The initial measurement model did not attain unidimensionality due to low factor loading (below 0.5) produced by four items namely RA5, RA4, AW3, and IMG4 (Awang, 2015). Therefore, all four items were deleted in four iterations (Hair, Black, Babin, Anderson, & Tatham, 2006). An adjusted measurement model was produced with all of the remaining items demonstrating adequate loading values. Further, the adjusted measurement model achieved construct validity since all required fitness indices produced adequate goodness-of-fit thresholds (χ^2/df = 1.358, RMSEA = 0.03, SRMR = 0.043, CFI = 0.96, TLI = 0.95).

Table 3 shows that, the Average Variance Extracted (AVE) produced for all constructs are above 0.5. This suggest that convergent validity was also attained (Awang, 2015). Furthermore, Table 4 shows that the square root of AVE is greater than the values in its respective columns and rows. This denotes the achievement of discriminant validity (Fornell & Larcker, 1981). Construct reliability was assessed by checking internal reliability of the construct. Composite Reliability (CR) was used instead of Cronbach alpha. This is because CR is considered to be more accurate in evaluating internal consistence of the construct (Peterson & Kim, 2013). Table 3 shows that reliability was attained because, all CR's values are above 0.6 which is the recommended threshold (Hair, Black, Babin, & Anderson, 2008).

Table 3: The CFA results for the current study's measurement model

Constructs	Item	loading	CR	AVE
Behavioral Intention	BI1	0.71	0.824	0.54
	BI2	0.73		
	BI3	0.77		
	BI4	0.73		
Awareness	AW1	0.68	0.814	0.523
	AW2	0.70		
	AW4	0.73		
	AW5	0.77		
Image	IMG1	0.63	0.763	0.522
	IMG2	0.84		
	IMG3	0.69		
Government Support	GS1	0.75	0.818	0.531
	GS2	0.78		
	GS3	0.74		
	GS4	0.65		
Trialability	TR1	0.69	0.758	0.511
	TR2	0.69		
	TR3	0.76		
Ease of Use	EOU1	0.66	0.848	0.584
	EOU2	0.76		
	EOU3	0.81		
	EOU4	0.81		
Relative Advantage	RA1	0.76	0.755	0.508

Constructs	Item	loading	CR	AVE
	RA2	0.73		
	RA3	0.65		
Visibility	VS1	0.73	0.815	0.520
	VS2	0.80		
	VS3	0.72		
	VS4	0.63		
Compatibility	CMP1	0.70	0.882	0.599
	CMP2	0.82		
	CMP3	0.83		
	CMP4	0.75		
	CMP5	0.77		
Results Demonstrability	RD1	0.80	0.769	0.536
	RD2	0.84		
	RD3	0.52		

Table 4: Mean, Standard Deviation and Discriminative validity index summary

	M	SD	1	2	3	4	5	6	7	8	9	10
1	4.15	0.644	**0.735**									
2	3.62	0.977	0.335	**0.723**								
3	3.94	0.704	0.268	0.383	**0.722**							
4	3.96	0.892	0.06	-0.078	0.054	**0.729**						
5	4.18	0.714	0.202	0.061	0.16	-0.053	**0.715**					
6	3.62	0.926	0.458	0.294	0.309	-0.135	0.301	**0.764**				
7	3.80	0.857	0.285	0.161	0.16	0.049	0.084	0.046	**0.713**			
8	3.41	0.95	0.374	0.311	0.12	-0.11	0.23	0.403	-0.063	**0.726**		
9	3.66	0.859	0.294	0.164	-0.011	-0.138	0.051	0.212	0.039	0.372	**0.774**	
10	3.77	0.766	0.126	-0.008	0.056	0.165	0.199	0.015	0.054	-0.121	-0.074	**0.732**

Where M: Mean; SD: Standard Deviation; 1: Behavioral Intention; 2: Awareness; 3: Image; 4: Government Support; 5: Trialability; 6: Ease of Use; 7: Relative Advantage; 8: Visibility; 9: Compatibility; 10: Results Demonstrability.

Assessment Structural Model

After the adjusted measurement model demonstrated goodness-of-fit, a structural model was assessed to examine relationships between the variables. Figure 2 shows that, structural model attained the model fit since all factors loading were above 0.5 (Awang, 2015), and all indices attained the required fitness indices thresholds (RMSEA= 0.118, CFI = 0.223, TLI = 0.222, χ^2/df= 6.659 and SRMR = 0.1442). This provides a room to examine the relationship between the variables.

Figure 2 shows that, all significant predictors explained about 37% of the total variance. Furthermore, Table 5 shows that, H5a, H5b, H5c, H5d and H5f were found to be statistical significant. This means awareness could motivate positive attitude of adopters on relative advantages, ease of use, compatibility, image and visibility. However, H5d, H5e and H5g were not supported. Likewise, Table 5 shows that HI, H2, H3, H6, H8 and H9 produced positive and direct statistical significant results. This suggest that rural farmers' intention to adopt m-government could be directly influenced by relative advantage, ease of use, compatibility, results demonstrability, visibility and government support. On the other hand, H4, H5 and H7 were not supported.

To examine the mediating role of perceived characteristics of innovation, Biased Corrected Confidence Interval method proposed by Preacher and Hayes (2008) was used. This method is considered to be robust to data normality while taking care of Type I error (Preacher & Hayes, 2008). Table 6 shows that only four intervening variables (ease of use, relative advantage, compatibility and visibility) mediated the relationship between awareness and intention. However, the study did not find any empirical evidence which shows that image, results demonstrability and trialability are mediating variables in this study.

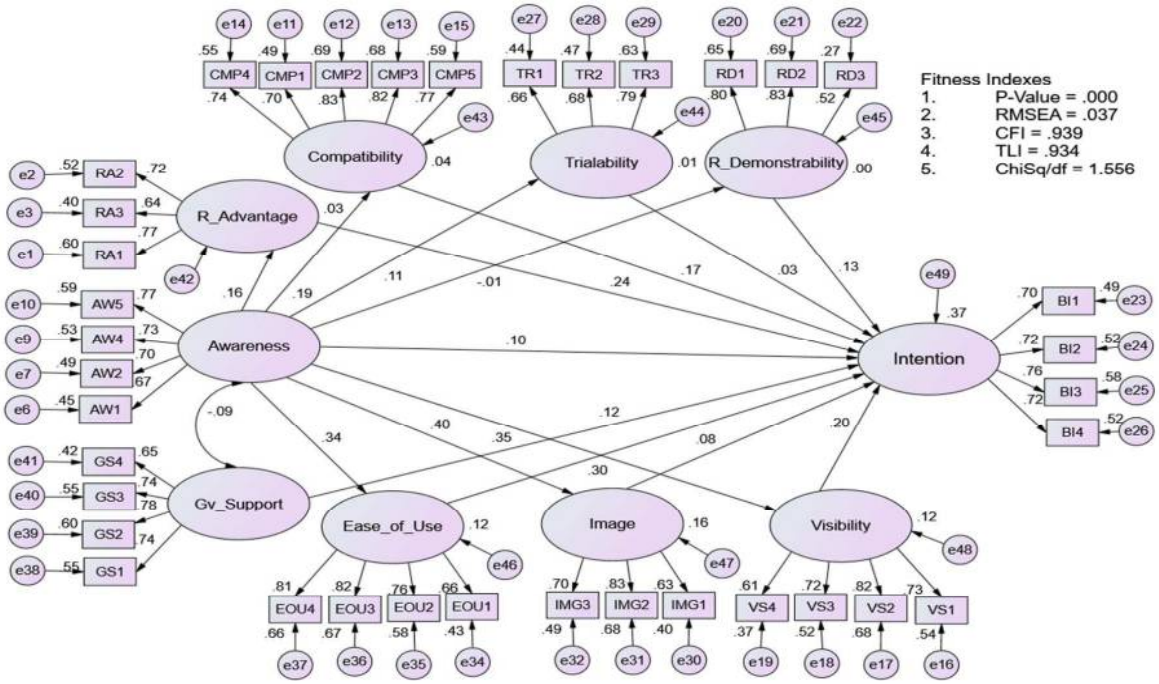

Figure 2: Structural model

Table 5: Structural paths analyses and hypotheses testing

Hypotheses	Structural path			Path Coefficient		S.E	C.R
				Standardized	Unstandardized		
H5	AW	→	BI	0.1	0.061	0.043	1.409
H5a	AW	→	RA	0.162**	0.171	0.067	2.569
H5b	AW	→	EOU	0.342***	0.289	0.054	5.398
H5c	AW	→	CMP	0.194***	0.162	0.049	3.280
H5d	AW	→	IMG	0.398***	0.274	0.047	5.775
H5e	AW	→	RD	-0.012	-0.010	0.049	-0.198
H5f	AW	→	VS	0.345***	0.362	0.066	5.462
H5g	AW	→	TR	0.107	0.075	0.044	1.706
H1	RA	→	BI	0.241***	0.140	0.033	4.170
H2	EOU	→	BI	0.305***	0.220	0.044	5.058
H3	CMP	→	BI	0.173***	0.126	0.039	3.274
H4	IMG	→	BI	0.078	0.069	0.053	1.299
H6	RD	→	BI	0.126*	0.094	0.040	2.377
H7	TR	→	BI	0.029	0.025	0.047	0.534
H8	VS	→	BI	0.198***	0.115	0.034	3.411
H9	GS	→	BI	0.121*	0.068	0.030	2.288

Where: AW: Awareness; BI: Behavioral Intention; RA: Relative Advantage; EOU: Ease of Use; CMP: Compatibility; IMG: Image; RD: Results Demonstrability; TR: Trialability; VS: Visibility; GS: Government Support; S.E: Standard Error; C.R: Critical Ratio

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 6: Indirect effects of awareness on Behavioral intention

IV		Mediator		DV	LB-BC	UB-BC	TTS-BC	Remarks
AW	→	Relative Advantage	→	BI	0.009	0.083	0.014*	Mediate
AW	→	Ease of Use	→	BI	0.053	0.186	0.001***	Mediate
AW	→	Compatibility	→	BI	0.008	0.072	0.007**	Mediate
AW	→	Image	→	BI	-0.018	0.094	0.201	No Mediation
AW	→	Results Demonstrability	→	BI	-0.021	0.014	0.705	No Mediation
AW	→	Trialability	→	BI	-0.004	0.029	0.408	No Mediation
AW	→	Visibility	→	BI	0.028	0.141	0.002**	Mediate

Where: IV: Independent Variable; DV: Dependent Variables; AW: Awareness; BI: Behavioral Intention; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; LB-BC: Lower bounds biased-corrected; UP-BC: Upper Bounds biased-Corrected; TTS-BS: Two tailed Significance biased corrected.

DISCUSSION

The results of this study shows that ease of use is the strongest determinant factor for the rural farmers' intention to adopt m-government ($\beta = 0.305$). This suggest a less complex and effortless m-government system will be more likely used by rural farmers. This result is consistent with previous IS studies (Liu et al., 2014; Shareef et al., 2012). Relative advantages is also found to have a positive and direct effect on intention ($\beta = 0.241$). Most of the rural farmers seemed to be interested in the benefits which can be acquired by using m-government. It was thought that an m-government which is accessible anywhere, anytime with rich of required agricultural information will be more likely to be adopted. This result is consistent with previous IS studies (Carter & Belanger, 2004; Shareef et al., 2012). Also, visibility is shown to have direct and positive influences on rural farmers' intention to adopt m-government ($\beta = 0.198$). This suggests that as effects become more visible in rural areas, rural farmers become more familiar with applicability and benefits of using m-government. As a result, most of them will tend to adopt the technology. The result of this study corroborates previous IS studies (Jebeile & Reeve, 2003; Richardson, 2009). Congruently, compatibility has positive and direct effect on intention to adopt m-government ($\beta = 0.173$). This implies that, rural farmers are more influenced to have a compatible m-government. This result is consistent with previous m-government studies (Abdelghaffar & Magdy, 2012; Al-Busaidi, 2012)

Results demonstrability is also found to be a significant influencer for the adoption of m-government ($\beta = 0.126$). Communicating the consequence of using mobile phones in accessing government farming information is very important to rural citizens. This is because most of the rural citizens are considered to be poor and they are interested to know the outcome of using m-government before incurring any cost. This result is consistent with Yaacob and bin Yusoff's (2014) findings. Moreover, government support is also found to be a significant determinant factor for rural farmer's intention to adopt m-government ($\beta = 0.121$). When rural farmers perceive that the government is providing necessary facilitating conditions such as the availability of regulation and policies and reduce the cost of mobile ownership, their likelihood to adopt m-government will increase. This finding supports previous IS studies (Rambocas & Arjoon, 2012; Tan & Teo, 2000).

In addition, Table 6 shows that awareness has strong relationship with ease of use ($\beta = 0.342$), relative advantage ($\beta = 0.162$), compatibility ($\beta = 0.194$), visibility ($\beta = 0.345$) and image ($\beta = 0.398$). These results are similar to previous IS studies (Che-Azmi, Ang, Talib, & Irani, 2016; Kim, Freling, & Eastman,

2013; Noor et al., 2014). Furthermore, Table 6 which presents an indirect results test, shows that only ease of use, relative advantage, compatibility and visibility mediates the relationship between awareness and intention to use m-government. This suggest that providing strategic awareness campaigns by explaining the above aspects will tend to improve adopters' perceptions. This in turn will increases the likelihood of adopting m-government services.

CONTRIBUTION AND IMPLICATION

The existing m-government studies in developing countries have been conducted in countries with high technologies (Liu et al., 2014). Therefore, the results provided by this study will add to the limited knowledge about m-government adoption by helping developing countries, particularly Sub Saharan countries with less access to modern technologies to understand the motivation factors for adoption of m-government services (Qian & Aquaro, 2014). Furthermore, the findings of this study provided a new insight about m-government literature. This is because, models which integrate IDT, awareness and government support were very limited in m-government context. Therefore, extending IDT with awareness and government support will assist scholars to understand the influence of awareness and government support. This study also extended limited knowledge about the indirect effect of awareness through perceived characteristics of innovation. Most of the previous studies have devoted much effort to study direct relationship between awareness and intention. This study is unique because it examined the indirect effect of awareness. Therefore, by examining the indirect effect, this study thoroughly fills the existing knowledge gap.

The findings of this study has several implications to policy makers. The empirical results of this study have shown that government support is more important in influencing adoption of m-government. Therefore, government should invest in providing adequate and required infrastructures to support m-government operations. This could done be by providing a robust back-end system which could handle large number of requests from mobile users. Likewise, the government should establish legislation and procedures to support m-government operations. By doing so, citizens will be confident that m-government is the legitimate channel for accessing public services and information. Moreover, the monetary cost of using m-government for citizens should be reduced or free. This is because most of the rural farmers are considered to be poor and introducing high cost m-government services could discourage its adoption and utilization.

Policy makers should make sure m-government system are very easy to use. System designers and developers should develop system which requires less effort to use. This could be done by providing clear instructions, clear navigational steps and a "Help" option. System designers could involve citizens in designing m-government to improve its usability. Similarly, system designers should improve its usefulness. This could be done by providing the required agricultural information through m-government system. It is important to improve accessibility of m-government by making sure the m-government is available anywhere, anytime. Furthermore, information should be customized and provided according to the user's request. This is because providing too general information, may be considered to be useless and discourage them from using m-government services. Government should also install a robust back-end system which provides faster responses to citizens' request. This will improve the system's usefulness by removing unnecessary delay.

Policy makers should also concentrate on making sure m-government systems are compatible to rural citizens past experience and needs. System and content designers should devote more time to understand the need of the rural farmers in order to provide required and more relevant content. Furthermore, systems designers should consider the use of similar best layout designs from previous mobile services in order to have compatible services. Visibility and results demonstrability were also found to be important factors. One way for policy makers to achieve this is by making m-government more visible in rural areas. In addition to that, village leaders, famous famers and other influential people in rural areas can be used as change agents. This is by letting them adopt m-government services and then communicate the consequences of m-government to other rural farmers.

The results have shown that awareness has an indirect influence through ease of use, relative advantage, visibility and compatibility. Therefore, policy makers should emphasize more in addressing the above aspects in awareness campaigns. Addressing these aspects may improve adopters' perception about technology and the benefits of using m-government services. Further awareness may be provided by sending customized SMS, training and conducting different conferences in rural areas to explain the different types of information and services available through m-government.

CONCLUSION, LIMITATION AND FUTURE STUDIES

The objective of this study was to identify factors which could influence adoption of m-government in Tanzania rural areas by using extended IDT with government support and awareness. The sample data were collected and used to empirically test the research model of this study. The results produced a number of useful implications to scholars, m-government practitioners and policy makers.

Although this study achieved its main objectives, the study has several limitations. This is a cross-sectional study, therefore the results of this study should be used with great care. This is because, the data were collected at only one point of time. This means with changes in time, rural farmers could have gain more knowledge which may affect the use of these results. This provides opportunity for future research which could be a longitudinal study. Such a study may produce better results which better reflects the changes in behavior of farmers over time.

This study examined the behavioral intention of rural farmers to adopt m-government. However, behavioral intention may not necessary influence actual behavior due to different circumstantial factors (Ajzen, 1985). Therefore, a study which examines actual usage behavior may be more important in the future. Similarly, the coefficient of determination produced in this study is 37%. This could be considered as a small variance. Since only two variables were added in this study, then, a future study could add more variables such as trust and perceived risk to produce a better model with higher explanatory power.

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