# THE INFLUENCE OF GOVERNMENT SUPPORT AND AWARENESS ON M-GOVERNMENT ADOPTION IN RURAL TANZANIA: THE MEDIATING ROLE OF PERCEIVED CHARACTERISTICS OF INNOVATION

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By

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## DEDICATION

To my late father, may his soul rest in eternal peace.

My mother, my lovely wife, and my daughters

## ABSTRACT

### THE INFLUENCE OF GOVERNMENT SUPPORT AND AWARENESS ON M-GOVERNMENT ADOPTION IN RURAL TANZANIA: THE MEDIATING ROLE OF PERCEIVED CHARACTERISTICS OF INNOVATION

**Herman Eliawaha Mandari**

Mobile government is considered to be the best solution in providing public services in developing countries. Tanzania, without exclusive has adopted m-government services to improve accessibility of public services particularly in rural areas. However, literature has shown that lack of awareness and inadequate government support limit the acceptance of m-government in rural areas. This implies that it is difficult for the government and rural citizens to realise the potential of m-government if the current situation persists. Furthermore, literature has revealed that no evidence of any empirical behavioural study has examined factors influencing rural farmers' behavioural intention to adopt m-government services in Tanzania. Therefore, this study fills the existing gap by conducting an empirical behavioural study that examines factors which motivate rural farmers to adopt m-government services.

The study extended Innovation Diffusion Theory (IDT) with government support and awareness to examine the rural farmers' behavioural intention to adopt m-government services. The study employed stratification and multi-stage sampling techniques with simple random sampling to select units of

interest. A survey was conducted by using Drop Off / Pick Up method to collect 407 valid and reliable responses. Structural equation modeling was employed to test and confirm the study's hypotheses.

The findings show that government support, relative advantage, ease-of-use, compatibility, result demonstrability, and visibility have direct and positive significant influence on rural farmers' behavioural intention to adopt m-government services. Furthermore, the findings indicate that awareness has indirect and positive significant effect on rural farmers' behavioural intention through relative advantage, ease-of-use, compatibility, and visibility. The study expands the existing scholars' knowledge on adoption of m-government services in Tanzania and other developing countries. It provides useful implications for policy makers to increase the adoption of m-government in rural areas.

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Above all, may glory be to the Almighty God, our Lord!

## APPROVAL SHEET

This thesis entitled **"THE INFLUENCE OF GOVERNMENT SUPPORT AND AWARENESS ON M-GOVERNMENT ADOPTION IN RURAL TANZANIA: THE MEDIATING ROLE OF PERCEIVED CHARACTERISTICS OF INNOVATION"** was prepared by HERMAN ELIAWAHA MANDARI and submitted as partial fulfilment of the requirements for the degree of Doctor of Philosophy at Universiti Tunku Abdul Rahman.

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**SUBMISSION OF THESIS**

It is hereby certified that **HERMAN ELIAWAHA MANDARI** with ID No: **15ABD01271** has completed this thesis entitled "THE INFLUENCE OF GOVERNMENT SUPPORT AND AWARENESS ON M-GOVERNMENT ADOPTION IN RURAL TANZANIA: THE MEDIATING ROLE OF PERCEIVED CHARACTERISTICS OF INNOVATION" under the supervision of Dr. Chong Yee Lee from Faculty of Business and Finance.

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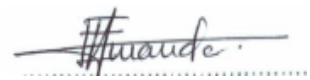
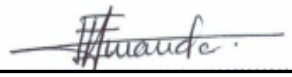


Herman Eliawaha Mandari

## DECLARATION

I **HERMAN ELIAWAHA MANDARI** hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.



HERMAN ELIAWAHA MANDARI

Date .....

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| | |
|---|---|
| AMOS | Analysis of Moment Structure |
| Att | Attitude |
| AVE | Average Variance Extracted |
| BI | Behaviour Intention |
| BC-CI | Biased Corrected Confidence Interval |
| CB-SEM | Covariance Based Structural Equation Modeling |
| CFA | Confirmatory Factor Analysis |
| CFI | Comparative Fit Index |
| CLF | Common Latent Factor |
| CMV | Common Method Variance |
| CR | Composite Reliability |
| CVI | Content Validity Index |
| C-TAM-TPB | Combined TAM and TPB |
| DOPU | Drop Off / Pick Up |
| EFA | Exploratory Factor Analysis |
| eGA | Electronic Government Agency |
| EM | Expectation Maximization |
| GSMP | Groupe Speciale Mobile Association |
| ICT | Information and Communication Technology |
| I-CVI | Item Content Validity Index |
| IDT | Innovation Diffusion Theory |
| IS | Information Systems |
| IVR | Interactive Voice Response |
| MCAR | Missing Completely at Random |
| mG2C | Mobile Government to Citizens |
| ML | Maximum Likelihood |
| MM | Motivation Model |
| MPCU | Model of Personal Computer Utilization |
| PBC | Perceived Behaviour Control |

| | |
|---|---|
| PCI | Perceived Characteristics of Innovation |
| PEOU | Perceived Ease of Use |
| PLS | Partial Least Square |
| PU | Perceived Usefulness |
| RGZ | Revolution Government of Zanzibar |
| RMSEA | Root Mean Square Error of Approximation |
| SCT | Social Cognitive Theory |
| SEM | Structural Equation Modeling |
| SMS | Short Message Services |
| SN | Subjective Norms |
| SRMR | Standardised Root Mean Square Residual |
| TAM | Technology Acceptance Model |
| TAM2 | Extended Technology Acceptance Model |
| TLI | Tucker-Lewis Index |
| TPB | Theory of Planned Behaviour |
| TRA | Theory of Reasoned Action |
| UCSAF | Universal Communication Services Access Fund |
| URT | United Republic of Tanzania |
| USSD | Unstructured Supplementary Service Data |
| UTAUT | Unified Theory of Acceptance and Use of Technology |
| VIF | Variance Inflation Factor |

# CHAPTER 1

# INTRODUCTION

## 1.1 Chapter Overview

This chapter provides background information on the adoption of mobile government services among the rural people in Tanzania. The chapter provides information on research problem, research questions, and objectives. Finally, it presents significance, scope, and organization of the thesis.

## 1.2 Background to the Study

Provision of public services and information is considered a vital element for social-economic development (Armah-Attoh, 2015; Xu, 2013). Different social economic activities rely on constant supply of public services and information that in turn improves citizens' wellbeing. Despite its importance, accessibility of public services and information is very challenging in developing countries (Ogunleye & Van Belle, 2014; Oni, Oni, & Gberevbie, 2015). Similarly, the United Republic of Tanzania (URT) has insufficient communication infrastructures particularly in rural areas (Mtega & Ronald, 2013; URT, 2014). Tanzania rural areas are highly populated with poor people and large percentage of them are farmers (URT, 2013c). Rural farmers are the largest producers in agricultural sector that contributes largely in Tanzania economy (Amani & Mkumbo, 2012; Siyao, 2012). Furthermore, agricultural sector is the largest

employer in Tanzania (Molony, 2009). This is to say the national farming activities dwell in the hands of rural farmers who are poor.

In Tanzania, the illiteracy rate of the population is considered to be 28% and 32% in rural areas which in turn affects best agricultural practices (Osorio, Percic, & Di Battista, 2014; URT, 2013c). Most of the rural farmers are depending on old ways of farming. Apparently, several studies have shown that most of rural farming productions are related to subsistence agriculture which limits various agribusiness opportunities (Salami, Kamara, & Brixiova, 2010; Wolter, 2008). Thus, in order to improve the literacy rate in farming activities, agriculture productions and economic welfare of the rural residents, the Tanzanian government needs to provide more access to information on the best farming practices (Balit, Calvelo, & Masias, 1996; Salami et al., 2010; Sokoya, Alabi, & Fagbola, 2014).

The emergence of electronic government (e-government) has changed the way information is disseminated to stakeholders. In agriculture sector, e-government is objectively used to enable easy and timely accessibility of farming information in rural areas, increase farmers earning and allow more rural farmers to access other public services (Behera et al., 2015; Miah, 2012). Despite these potentials, surveys conducted by United Nations in 2014 and 2016 showed that Tanzania is not utilising e-government fully, particularly in rural areas (Qian & Aquaro, 2014; Zhu & Bathelemy, 2016). This implies that accessibility of public services and information to rural citizens is still limited.

Limited accessibility of information can be explained by two main reasons: (1) lack of sufficient fund that is mandatory in implementing e-government communication infrastructures (Bwalya, Chris, & Mandla, 2013); (2) Unavailability of legal operational framework that could guide the implementation of e-government strategy (Basu, 2004; Mengistu, Zo, & Rho, 2009). The persistence of these reasons implies that the main objective of using e-government to disseminate information particularly in agricultural sector cannot be attained.

Despite the challenges as mentioned above, several alternatives have been in place to achieve e-government objectives. One is the establishment of telecentres to disseminate information to rural citizens (Mtega & Malekani, 2009). However, the number of telecentres in rural areas is relatively insufficient to meet rural citizens' needs due to the economic status of the country that cannot hold enough establishment of telecentres in rural areas (Mtega & Malekani, 2009). Additionally, most of the telecentres are not dedicated to provide farming information because they were established as multipurpose telecentres (Mtega & Malekani, 2009; Mtega & Ronald, 2013). Accordingly, the performance of the available telecentres in providing public farming information to rural citizens is ineffective.

Other alternative channels such as radio, television, mobile phone and internet are also used to disseminate farming information to rural areas (Kwigizile, Chilongola, & Msuya, 2011; Lwoga, 2009; Mtega & Ronald, 2013). Radio can reach 55% of rural residents (URT, 2013a). However, most of the radio stations

are privately owned; hence, they are not prioritised to deliver agricultural information (Lwoga, 2009; Mtega & Ronald, 2013). Apart from that, radio is considered as one-way communication whereas most of the government communications require two-way communication (Jotischky & Nye, 2011).

Similarly, only 16% and 13% of the population own televisions and use internet services respectively (Africa Internet Users, 2015; James et al., 2013; URT, 2013a), and most of them live in urban areas. This is to say that majority of the rural population have limited ability to afford television and internet services due to high acquisition cost and service charges. In addition, lack of electricity and internet service providers in rural areas have limited the usage of the media (URT, 2013a). Also, only 2% of personal computer's ownership is recorded in rural areas (Stork, Calandro, & Gilwald, 2012).

Nevertheless, the ownership rate of mobile phone in Tanzania is considered to be very high. Statistics show that the possession rate has increased from 10% in 2005 to 79.9% of the population in 2016, and about 55% of the rural population own mobile phone (Castri & Gidvani, 2014; URT, 2017). Such a high penetration and usage of mobile phones have motivated public institutions to deliver their services through the use of mobile technologies (m-government services) (URT, 2015a). This is because m-government is considered as the best alternative channel in delivering public services and information in developing countries particularly in rural areas (Bwalya et al., 2013; Kushchu & Kuscu, 2003).

The increase use of m-government particularly in rural areas is because the technology enables the government to bypass different initial e-government investments in terms of time and fixed cost related to development of heavy communication infrastructures (Ghyasi & Kushchu, 2004). Therefore, with m-government services, the government can concentrate on strengthening the back office system infrastructures while taking advantage of available mobile infrastructures developed by private sector to deliver public services (Mtingwi, 2015). And thus, using mobile phone as a tool to disseminate agricultural information can be a wise choice. Similarly, Sife, Kiondo, and Lyimo-Macha (2010) suggested that mobile phone could be used to enable rural farmers in Tanzania to access usefully agricultural information at low cost.

The use of m-government services in Tanzania particularly in rural areas is attributed to two advantages: (1) compared to personal computers, mobile devices such as hand phone is relatively more accessible and economical to rural citizens (Mwirigi, Rho, Zo, & Park, 2017; URT, 2015a). Through mobile phone, more rural citizens can access government services by using unstructured supplementary service data (USSD), short message services (SMS) and interactive voice response (IVR) at anytime and anywhere. Through this way, more rural farmers can find better markets and prices for their agricultural products (Ntaliani, Costopoulou, & Karetsos, 2008; Sekabira & Qaim, 2017; Sife et al., 2010). (2) The government can customise services and information to map certain targeted group of citizens' requirements (Ahmad & Khalid, 2017; Wasan & Jain, 2017). Henceforth, the government can improve accessibility and usefulness of the agricultural information and save a huge amount of public

resources that is used to provide general information that may not be useful (Ntaliani et al., 2008). Nevertheless, to achieve effective utilisation of m-government services in Tanzania rural areas, there is a need to understand various dimensions related with adoption of m-government services.

## 1.3 Problem Statement

Despite the essence of mobile government in narrowing the communication gap between the government and citizens particularly in the rural areas, the adoption of m-government services in Tanzania and rural areas in particular has been sparse (Dewa & Zlotnikova, 2014; Kyem, 2016; Oreku & Mtenzi, 2012; Yonazi, 2013). Existing studies have been conducted to identifying and explaining challenges and barriers of implementing m-government services in Tanzanian context (Dewa & Zlotnikova, 2014; Hellström, 2008; Kyem, 2016; Munyoka & Manzira, 2014; Oreku & Mtenzi, 2012; Yonazi, 2013). However, there is no evidence for empirical behavioural studies that focus on investigating factors that may influence the acceptance of m-government services among Tanzanians. Studies show that success of technology adoption is highly depending on the willingness of potential adopters to adopt the technology (Carter & Belanger, 2005; Mun, Jackson, Park, & Probst, 2006). Therefore, there is a need for specific empirical behavioural study that could provide insights to scholars, practitioners, and policy makers on various dimensions of m-government services acceptance in rural Tanzania.

Studies have shown that lack of adequate government support in diffusion of e-government services is considered to be a major barrier in motivating Tanzanians to adopt m-government services (Kyem, 2016; Munyoka & Manzira, 2014; Yonazi, 2013). Most of the country's government institutions are not well prepared to provide e-government services including m-government because of the following reasons. Firstly, lack of adequate infrastructures such as computers and robust back-end information systems that are required to handle e-government transactions including mobile transactions (Munyoka & Manzira, 2014; Yonazi, 2013). This causes delays in processing of electronic transactions and eventually users fail to get information and feedback on time (Dewa & Zlotnikova, 2014). Secondly, the absence of policies, procedures and legal framework that can guide the operational and usage of m-government services have further discouraged the adoption of m-government services (Munyoka & Manzira, 2014; Yonazi, 2013). Consequently, most of citizens do not consider the use of electronic government channels as the legitimate source of information and services provision (Yonazi, 2013). Therefore, a need to strengthening government support could be essential in speeding up the provision and adoption of m-government services.

Different studies in Tanzania have shown that large number of Tanzanians particularly rural citizens are not aware of various information and communication technology (ICT) strategies used by government to disseminate public information (Dewa & Zlotnikova, 2014; Munyoka & Manzira, 2014; Yonazi, 2013). As a result, majority of rural citizens are not using e-government services including m-government services. Furthermore, it has been pointed that

citizens who are aware of e-government including m-government services lack some useful information on the benefits of using m-government services; how to use the available m-government services, and that they are not aware if the available services are relevant to their needs (Yonazi, 2013). As a result, even those who are aware of e-government initiatives have lost interest in using e-government services including m-government services. In this case, it is worthy investigating that if providing awareness information on the availability of m-government services can have direct effect on adoption of m-government services. Furthermore, it sounds imperative to examine if explaining various characteristics related to m-government services during awareness campaigns can change the adopters' attitude which in turn may influence the adoption of m-government services in Tanzania rural areas.

Also, technological problems such as less usefulness, complexity, incompatibility and low visibility have been pointed out to contribute to low utilisation of e-government services in Tanzania (Dewa & Zlotnikova, 2014; Mtega & Ronald, 2013; Yonazi, 2013; Yonazi, Sol, & Boonstra, 2010). The studies have explicitly shown that among few Tanzanians who are aware of various ICT initiatives including m-government finds the e-government services not to be useful, difficult to use and incompatible with their needs. Studies that investigated the influence of technological factors (perceived characteristics of innovation) such as usefulness, ease-of-use, complexity, images, results demonstrability, visibility and trialability have concluded that these factors have direct influence on behavioural intention to adopt technology (Carter & Belanger, 2003, 2004, 2005; Lean, Zailani, Ramayah, & Fernando,

2009; Liu et al., 2014; Moore & Benbasat, 1991; Rokhman, 2011; Shareef, Norm, & Dwivedi, 2012). Since most of e-government services users in Tanzania are of the opinion that e-government services including m-government are not useful, not easy to use, incompatible and have low visibility (Dewa & Zlotnikova, 2014; Yonazi, 2013), investigating the direct influence of perceived characteristics of innovation can provide more insights to scholars, practitioners and policy makers on how to adoption of m-government services can be improved.

To redress the human behavioural problems related to the issue identified above, Technology Acceptance Model, Theory of Planned Behavioural, Theory of Reasoned Action, Innovation Diffusion Theory and Unified Theory of Acceptance and Use of Technology have been widely used as fundamental theories in information technology adoption literature.

Among the adoption behavioural theories, Innovation Diffusion Theory (IDT) was found suitable in this study as the theory specifically addresses the problems related to perceived characteristics of innovation (technological problems)(Wisdom, Chor, Hoagwood, & Horwitz, 2014). Also, it is interesting to note that IDT was essentially developed to enable the diffusion of agricultural innovation among the farmers in the rural area (Rogers, 1983). This supports the use of IDT in this study because factors that may influence the adoption of m-government services in Tanzania rural areas are examined. Furthermore, through IDT framework, service provider (in this case, government) can understand how the diffusion of technology innovation (m-government

services) takes place as well as evaluates the diffusion process from time to time within the targeted population (Rogers, 1983). Lastly, since m-government is an innovative way for the government to communicate with citizens though mobile technology; then, it is wise to use IDT in studying the adoption of m-government services in rural areas that explains the innovation diffusion of technology.

Although IDT has been extensively used in studying adoption of various technologies (Sahin, 2006), the theory shows that adoption of innovation depends only on perception of characteristics of innovations that are considered as internal factors. However, the decision to adopt technology may be influenced by external factors as well (Ajzen, 1985). Thereby, this study extended IDT by adding two variables: government support and awareness to address the remaining problems.

## 1.4 Research Questions

Based on the identified research problem, the following research questions were raised:

i. Does the government support and awareness create direct effect on rural farmers' behavioural intention to adopt m-government services?

ii. Can the IDT constructs - relative advantage, ease-of-use, compatibility, image, result demonstrability, trialability, and visibility

- mediate the effect generated by awareness on rural farmers' behavioural intention to adopt m-government services?

iii. Does IDT constructs create direct effect on rural farmers' behavioural intention to adopt m-government services?

## 1.5 Research Objectives

The main aim of this study is to develop a Model that can be used to facilitate the adoption of m-government services in Tanzania rural areas. Specifically, this study has the following objectives:

i. To evaluate the direct effect generated by government support and awareness on rural farmers' behavioural intention to adopt m-government services.

ii. To evaluate the mediation effects of IDT constructs on the relationship between awareness and rural farmers' behavioural intention to adopt m-government services.

iii. To evaluate the direct effect produced by IDT constructs on rural farmers' behavioural intention to adopt m-government services.

## 1.6 Significance of the Study

### 1.6.1 For Academia

Since m-government services is in an infant stage in most of the developing countries particularly in East Africa (Mwirigi et al., 2017), there is limited empirical behavioural studies on adoption of m-government services mostly in rural areas (Bwalya et al., 2013). Therefore, this study extends limited knowledge of scholars by providing more insights on factors that can influence rural citizens' behavioural intention to adopt m-government services.

The study extended IDT by adding two constructs: government support and awareness. Studies on the roles played by government support and awareness on encouraging the targeted adopters to use the m-government services have been taken for granted. This is because researchers tend to assume that governments have been providing necessary support and strategies to enhance adoption of e-government (AlAwadhi & Morris, 2009; Rokhman, 2011). However, most of Tanzania rural residents are not aware of various e-government initiatives and in addition, only minimal support are provided by the government to enable adoption of e-government in rural areas (Dewa & Zlotnikova, 2014; Mtega & Ronald, 2013; Yonazi, 2013; Yonazi et al., 2010). Therefore, by incorporating the two constructs into IDT, this study provides a unique integration model to m-government literature because both internal factors (which are reflected by IDT constructs) and external factors, which are government support and public awareness are examined under one conceptual framework.

Past studies have supported that there is direct and significant effect of awareness on the behavioural intention to adopt technology (Abdelghaffar & Magdy, 2012; Rambocas & Arjoon, 2012). However, there are limited studies that have shown empirically how awareness may be used to influence potential adopters' perception to adopt m-government services. Some studies have explained that awareness should be a pre-requisite element to form belief on different aspects of technology that in turn can lead to the adoption of technology innovation (Agarwal & Prasad, 1998; Shareef, Kumar, Kumar, & Hasin, 2009; Zaltman, Duncan, & Holbeck, 1973). Nevertheless, empirical studies that examine the influence of awareness on IDT constructs that in turn tend to affect potential adopters' behavioural intention to adopt the technology are less common in the m-government context. To fill this gap, this study empirically examines the indirect effect of awareness on rural farmers' behavioural intention to adopt m-government services through IDT constructs.

### 1.6.2 For Policy Makers

M-government has been recognised as a strategy to improve the nation's economic wellbeing through providing access to public services and information (Alomari, Elrehail, & Al Shibly, 2013). By identifying factors that influence rural farmers' behavioural intention to adopt m-government services in Tanzania, this study develops a useful m-government model that can help the government to reduce a significant amount of fund currently allocated to implement e-government services that are not fully consumed by the citizens (Kisusu, Bahati, & Kisusu, 2014). The model will improve government

information flow in rural areas that in turn will increase citizens' productivity and the national economy in general.

Furthermore, the findings on indirect role played by IDT constructs can assist policy makers to focus only on the factors that influence citizens' perception during awareness campaigns instead of providing general information that may produce minor or no impact on potential adopters' decision. In addition, such information will tend to reduce significant amount of resources invested in conducting awareness campaigns that produce less impact.

In addition, this study provides indications to policy makers from electronic government agency (eGA) and other government institutions to design sustainable policies and strategies that encourage the use of m-government service in rural areas. For instance (1) designing m-government systems and contents that are compatible with rural farmers' needs, and that use the local language Swahili. (2) Designing user-friendly (user-centered) mobile government systems that can enable rural farmers to quickly navigate and find required agricultural information. (3) Designing policy on availability of m-government systems for trial basis before actual usage. (4) Designing policy on training rural farmers on the usage of any new m-government services.

## 1.7 Research Scope

While different relevant empirical studies in Tanzania have concentrated in identifying factors that may influence adoption of e-government in general

(Komba-Mlay, 2013; Komba & Ngulube, 2014), this empirical study is specifically focusing on identifying motivation factors for adoption of m-government in Tanzanian rural areas. This is because various scholars have insisted on the need of independent studies that focuses solely on m-government services (Bwalya et al., 2013; Kushchu, 2007; Kushchu & Kuscu, 2003).

Literature shows that various types of m-government interaction do exist (Alotaibi, Houghton, & Sandhu, 2016). The present study focuses only on interaction between m-government services and citizens (mG2C) that enables accessibility of public services and information at anytime and anywhere to citizens. The study uses cross-sectional design to collect data from rural farmers as targeted population. Moreover, this is a quantitative study in nature; it focuses on investigating the influences of perceived characteristics of innovation, government support, and awareness on rural farmers' behavioural intention to adopt m-government services. Additionally, the current study focuses on the use of mobile phone only to examine m-government services adoption because mobile phone is more accessible in Tanzanian rural areas as compared to other mobile devices such as tablet, laptop and personal digital assistant (Mtega & Ronald, 2013).

## 1.8 Organization of the Thesis

This thesis comprises of five chapters. Chapter one presents the background of the study, issue and problems that deserve further attention, objectives, significances and scope of the study. Literature review on m-government

services; the general concept of m-government services and its current status in Tanzanian context, theories used in technology adoption are presented in Chapter two. The chapter also highlights on overview of relevant past studies research models, relevant past studies on research methodologies and data analysis techniques. Chapter three presents the current study's research conceptual framework and research hypotheses. It also presents research methodologies used in the present study. Chapter four presents the results and discussion. It provides descriptive and cross-tabulation analyses of the sample data. Additionally, the Chapter presents measurement model reliability and validity analysis. And finally, it presents and discusses all direct and indirect relationships between the variables. The conclusion is provided in Chapter five. This chapter summarises the accomplishment of research objectives. Further, it explain the theoretical and policy implications of the results, limitations, and recommendations for future studies.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

This chapter introduces the concept of m-government services, and discusses different behavioural theories which are widely used to examine information technology adoption behaviour. The chapter also provides; (1) insight explanation on selected adoption behavioural theory and highlights the modification required to suit the current study context. (2) Reviews relevant past studies' research models. (3) Analyses relevant past studies' research methodologies. It also identifies various literature gaps that create a roadmap of this study.

## 2.2 Overview of M-Government Services

### 2.2.1 Concept of M-government Services

Mobile technology has become one of the important technologies that affect day-to-day activities of people. Groupe Speciale Mobile Association (GSMA) shows that the number of global mobile users have tremendously increased from 2.3 billion in 2008 up to 4.8 billion in 2016 and it is estimated to increase up to 5.7 billion in 2020 (GSMA, 2017).

In sub-Saharan countries, mobile penetration rate was considered to be 44% early 2016 and it is expected to rise up to 50% by the end of 2020. This is because the cost to own a handset and use is getting lower, meanwhile mobile network coverage is getting wider to allow more residents in rural areas to use mobile services (GSMA, 2017).

This tremendous growth of mobile ownership has influenced public sector to utilise mobile technology for delivery of government services. Mobile government is an efficient communication tool in developing countries where communication infrastructures such as internet coverage is very limited (Kushchu & Kuscu, 2003). Through m-government platform, public services and information can easily be delivered and accessed by large number of users particularly in rural and isolated areas.

Scholars have defined the term "m-Government" in a different contexts (Bassara, Wisniewski, & Zebrowski, 2005; Kushchu & Kuscu, 2003; Scholl, 2005). The definition of m-government in the present study is based on Kushchu and Kuscu (2003), they define m-government services to be:

> "A strategy and its implementation involving the utilization of all kinds of wireless and mobile technology, services, applications, and devices for improving benefits to the parties involved in e-government including citizens, businesses and all government units" (Kushchu & Kuscu, 2003, p.2).

Since the present study is based on mG2C mode of communication, m-government services is defined as:

> A strategy that involves the utilization of all kinds of wireless and mobile technology, services, applications, and devices to extend e-government in delivery of public services and information to citizens.

Adaption of the definition needs to be undertaken because m-government services in Tanzania is still in an initial stage of development, and it is used as the final delivery channel of public services and information to citizens. Since Tanzania government is using a number of information systems to process and disseminate services and information to citizens; therefore, m-government can be considered as an extended e-government service: an alternative e-channel that is more convenient particularly to rural citizens.

### 2.2.2 E-Government and M-Government Services

Electronic government (e-government) involves the use of all ICT channels, specifically internet and World-Wide-Web to deliver public services and information to citizens (Qian & Aquaro, 2014). E-government is an efficient and effective service delivery channel because it can reduces government's operation costs, expedite the communication process between government and stakeholders, meanwhile enhancing transparency and accountability in government activities (Alshehri & Drew, 2010).

However, e-government has accessibility limitations. The government services and information can only be delivered and accessed through fixed–line network (internet) and station personal computer (Ogunleye & Van Belle, 2014). Different to that m-government services and information can be delivered and

retrieved through wireless technologies, mobile devices, and applications (Mengistu et al., 2009; Ogunleye & Van Belle, 2014). This means m-government is a subset of e-government services (Kushchu, 2007; Kushchu & Kuscu, 2003), the only difference is that m-government uses alternative way to fixed-line network in delivery of public services and information.

M-government services are considered as value-added-services to e-government services (Eldeeb, Farouk, & Mahdy, 2013; Turban, King, Lee, Liang, & Turban, 2015). This is because through m-government services and information can easily be accessible to large number of citizens at anytime and anywhere; this can enable users to make more informed decisions (Turban et al., 2015). In addition, m-government extends service accessibility by reaching areas that could be inaccessible through e-government due to its mobility and ubiquity. Moreover, m-government expands service accessibility by providing an alternative channel that can be used to access public services. Accordingly, m-government is a better option in providing public services and information particularly in rural and remote areas (Mengistu et al., 2009; Munyoka & Manzira, 2014).

### 2.2.3 Mobile and M-Government Services in Tanzania

Tanzania is a developing country with about 44.9 million population (URT, 2012). Most of people live in rural areas where public service and information accessibility is very limited due to insufficient communication infrastructures (URT, 2013c). Currently, e-government is one of the main channels used by

government to deliver public services and information to citizens. Despite that it requires different fixed ICT infrastructures such as personal computers and robust internet connectivity. Since the e-government infrastructures are expensive, inadequate and sometimes unavailable in some areas, then the government has adopted mobile technology to deliver public services and information (URT, 2015a). Statistics shows that from the year 2011 to 2015, the number of mobile phone users have increased and higher than fixed internet users in Tanzania (see Figure 2.1). This is a major driving force that has influenced Tanzania government to pursuit m-government channel in disseminating public services and information.

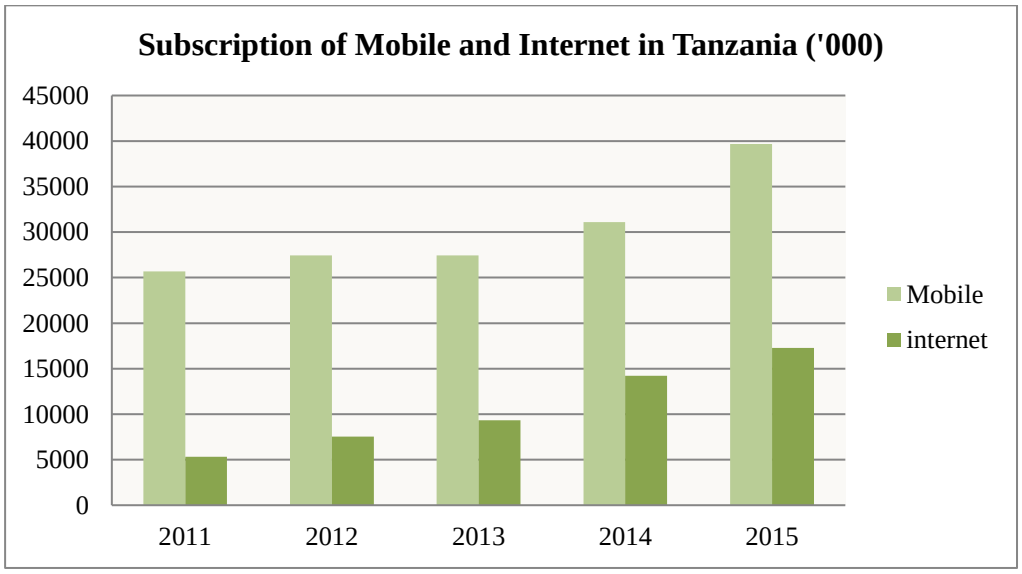



**Figure 2.1: Mobile and Internet Subscription in Tanzania**
Source: URT (2015)

eGA has developed e-government mobile platform which is used by various government institutions to provide public services and information (URT, 2015a). The platform accepts SMS push (server can send message to certain

mobile gadgets although receivers did not request the message delivery) and SMS pull (users can request certain services and receive feedback from server via SMS). These services allow ease communications between the government and citizens.

Apart from that, various public sectors such as police, education, electricity, revenue collection, health, pension, and agriculture in Tanzania have been using m-government applications in delivering public services and information. Specifically, agricultural sector applications such as e-agriculture, MAgriculture, M-Kilimo and mFarming have been deployed in partnership with private sector to provide rural farmers with agriculture information. Most of agricultural information provided includes metrological information, pest, and diseases, availability of product markets and prices and advisory services on the best agricultural practices.

In Tanzania, m-government services are provided through USSD, SMS, IVR, mobile internet, and mobile app. As most of the citizens are still using non-Smartphone particularly in rural areas, most m-government services are therefore dominated by USSD and SMS mode of communication. Despite all these developments, very little is known about the factors that can encourage the acceptance and adoption of m-government services in Tanzania.

## 2.3 Overview of Technology Adoption Theories

Individual adoption behaviour has been an exciting research area in technology adoption for a long time. Different theories have been applied to determine factors that influence an individual's behavioural intention and decision to adopt new products or technologies. Among the extensively used theories in information technology adoption include: Theory of Reasoned Action; Theory of Planned Behaviour; Technology Acceptance Model; Innovation Diffusion Theory; Extended Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology.

Most of these theories highlight various factors that determine behaviour intention or actual usage behaviour of non-users (potential adopters) or users of information technology respectively. Different modifications have been done to expand the original theories by adding new variables or integrating with other theories to create a more vigorous model for addressing various issues pertaining to technology adoption including m-government. In the subsequent sub-sections, the original and modified theories are discussed for a better understanding on which theory may be appropriate for the present study.

### 2.3.1 Theory of Reasoned Action (TRA)

Fishbein and Ajzen (1975) proposed TRA to explain that the individual behaviour is motivated by individual behaviour intention (BI). BI is defined as perceived strength of an individual intention to use technology. This theory is

widely used in social psychology to explaining the concept of user adoption in numerous aspects.

TRA theorises that if an individual form a solid intention to adopt technology, then it is more predicted that the user will adopt the technology. Two independent constructs that are attitude (Att) and subjective norm (SN) jointly determine the BI. Attitude is defined as perceived individual belief on the uses of technology. Meanwhile, subjective norm is defined as the perception of an individual on whether the nearer individuals think he/she should use technology (Fishbein & Ajzen, 1975) (see Figure 2.2).

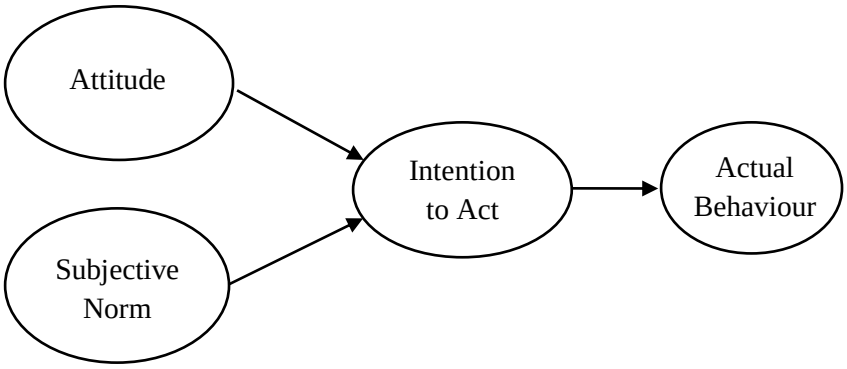



**Figure 2.2: TRA Theoretical Framework**
Source: Fishbein and Ajzen (1975)

In general, TRA shows that individual behaviour is rigorously voluntary. It shows that BI determines the actual behaviour of using technology, and BI depends on the sum of the weighted dimension of either Att or SN. The TRA assumes that an individual must have a clear state of mind and careful consideration in order to perform certain behaviour.

The main limitation of TRA comes from its main assumption on individual self-control. When individual forms an intention to act, that person will always act (Fishbein & Ajzen, 1975). However, according to Ajzen (1985), this is not always the case. There are other factors such as special skills, spontaneous, habitual and support from other people which can influence an individual adoption behaviour (Bentler & Speckart, 1979; Liska, 1984).

Individual may be interested in using technology, but he/she might be inhibited about forming an intention to adopt technology if such factors like inexperienced, unavailability of resources and or missing support from others persist. Such drawbacks limit TRA power to predict technological adoption behaviour and trigger researchers to further develop a theory so as to comprehensively address the limits.

### 2.3.2 Innovation Diffusion Theory (IDT)

IDT was developed by Rogers (1983) to explain as to why it is important to adopt an innovation, how innovation adoption may take place, and on what rate the innovation can be diffused within a population. The theory has been applied in rural sociological context to address the issues of adoption of agricultural innovation among farmers since the 1940s (Fliegel, 1993). Rogers defined innovation diffusion as the process in which innovation is communicated through certain channels over time among society members. Therefore, diffusion process is based on four main elements that are innovation characteristics, communication channels, time, and social systems.

Diffusion takes place under innovation decision process which is described as the process of motivating adopters so as to reduce the uncertainty of adopting innovation by providing different useful information (Roger, 1983). The innovation decision process involves five main phases which are knowledge, persuasion, decision, implementation, and confirmation.

Rogers (1983) argued that the rate of potential user's decision to accept or reject an innovation is based on the perception of innovation characteristics instead of affective response that mediate between beliefs and BI. Rogers listed main five characteristics of the innovation that may influence individual adoption behaviour as relative advantage, complexity, compatibility, observability, and trialability. Moore and Benbasat (1991) refined Rogers' characteristics of innovation to develop secondary characteristics of the innovation that have been used specifically to study information technology innovation adoption.

IDT has received criticisms for not considering the influence of external factors in making decision to adopt the technology (Al-Zoubi, 2013; Lippert & Govindarajulu, 2006; "School of Public Health", 2013). The theory depends on user's self-evaluation in making adoption decisions. However, external factors are also considered to be significant in adoption of information technology (Ajzen, 1985). Therefore, it is imperative to consider the influence of external factors when IDT is used to address adoption of information technology.

### 2.3.3 Theory of Planned Behaviour (TPB)

TPB was developed by Ajzen (1985) to address the restrictive limitations identified in TRA. Ajzen argued that individual behaviour is not always 100% self-controlled; it may be controlled by other external factors that can predict a person's BI without the person's self-control. Ajzen (1985) proposed an improvement on the BI power through additional of perceived behavioural control (PBC) as an independent variable. PBC is considered as an individual's belief that performing a given behaviour can be easier or difficult (Ajzen, 1985). Ajzen asserted that PBC influences both BI and actual behaviour of using information technology (see Figure 2.3).

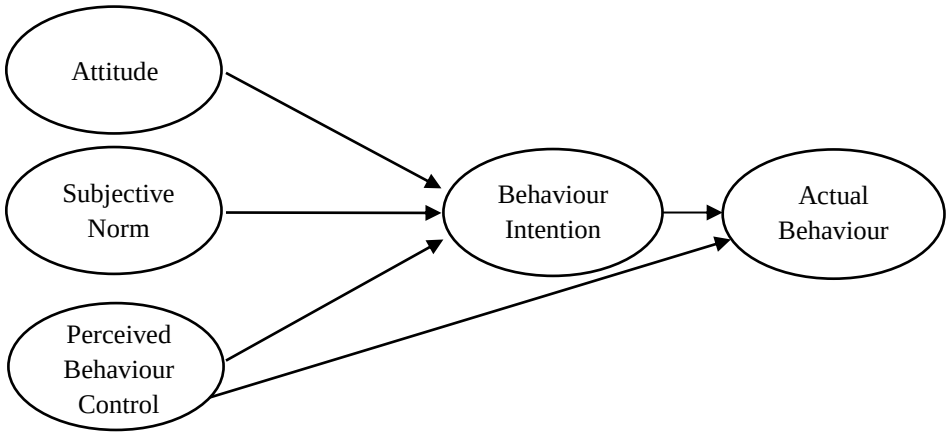



**Figure 2.3: TPB Theoretical Framework**
Source: Ajzen (1985)

The TPB framework provides a wide mechanism to test the effects of external variables on individual BI. Despite its strength, several researchers have argued that the PBC construct may create biases in predicting BI and actual behaviour (Pedersen, 2005; Taylor & Todd, 1995b). Their argument is that PBC should specify operational factors such as availability of resources, knowledge, and

support as control factors. Specification of general constructs only makes it difficult in predicting BI and actual behaviour of adopting information technology. It is recommended that detailed factors should be provided to measure PBC so as to remove biases (Pedersen, 2005; Taylor & Todd, 1995b).

### 2.3.4 Technology Acceptance Model (TAM)

In 1985, Davis Fred extended TRA by developing TAM model that is specific for acceptance and usage of information technology in organisations. TAM explains that the adoption of information technology depends on user's self-motivation whereas user's self-motivation depends on several external factors. TAM omits SN in original TRA and proposed two self-motivation factors: perceived usefulness (PU) and perceived ease-of-use (PEOU) which motivates individual's attitude. However, attitude construct was later dropped because it was considered to have minor mediating effect between salient beliefs and BI (see Figure 2.4) (Davis, Bagozzi, & Warshaw, 1989; Davis, 1989).

PU is defined as the degree of perception to which an individual believes that using a particular system will improve his/her job performance (Davis, 1985). While PEOU is defined as the degree of perception to which an individual believes that there will be no any mental or physical struggle in using a particular system (Davis, 1985).

In TAM, one's actual technology usage is significantly predicted by BI. PU and PEOU jointly determine BI while PEOU is theorised to influence PU as well.

Several past studies have considered PEOU to be a significant antecedent of PU (Lee, Kozar, & Larsen, 2003; Osman, 2013). This tends to occur in most of the cases where organization priority is about the usefulness of the technology. In such situation, PEOU tends to affect PU direct and it is considered to affect BI indirectly through PU.

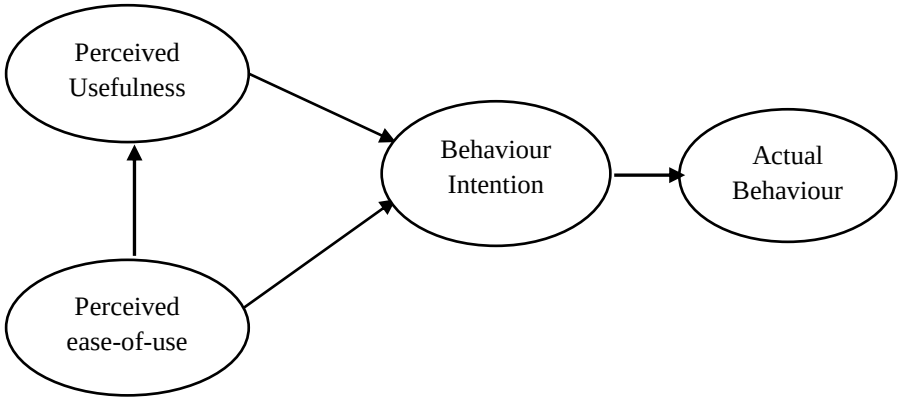



**Figure 2.4: TAM Theoretical Framework**
Source: Davis (1989)

TAM is the most widely used theory in predicting information systems adoption behaviour (Amoako-Gyampah & Salam, 2004; Xue, Liang, & Wu, 2011). This is because the model's constructs can identify the causal structure relationship in predicting technology adoption behavioural intention (Bagozzi, 2007; Davis et al., 1989; Davis, 1985). Furthermore, empirical evidences have shown that PU and PEOU are consistently producing a significant amount of variance in predicting BI and actual usage behaviour of technology (Abukhzam & Lee, 2010; Horton, Buck, Waterson, & Clegg, 2001; Mathieson, 1991).

Despite its high explanatory power in predicting technology adoption behaviour (Althunibat, Alrawashdeh, & Muhairat, 2014; Luarn & Lin, 2005), the theory is criticised for: (1) students were the main respondents in most of the TAM developments (Lee et al., 2003; Legrisa, Inghamb, & Collerettec, 2003). Therefore, the theory may be difficult to be applied to population with different characteristics to students. (2) It does not consider social influence factors in predicting BI (Benbasat & Barki, 2007; Bouwman, Hoof Van den, Van den Wijngart, & Van Dijk, 2005) and (3) control behaviour factors such as trust issues, time, money are excluded (Abdelghaffar & Magdy, 2012; Al-Shafi & Weerakkody, 2010; Malhotra & Galletta, 1999; Taylor & Todd, 1995a).

### 2.3.5 Extended Technology Acceptance Model (TAM2)

Venkatesh and Davis (2000) extended TAM model to relax TAM's limitations. TAM remains silent on why an individual would perceive a technology to be usefulness (Karahanna & Straub, 1999). In other words, there are no specific determinants which can be used to govern the determinations of the core TAM's constructs. In addressing this weakness, Venkatesh and Davis (2000) proposed two main categories of determinants that can contribute to individuals' judgment on perceived usefulness construct: (1) social influence processes which includes SN and image; and (2) cognitive instrumental processes which includes job relevance, output quality, result demonstrability and PEOU. In a mandatory aspect, TAM2 theorised that cognitive instruments measure an individual mental judgment on technology ability in getting the job done according to requirements.

In TAM2, SN, job relevance, image, output quality, and result demonstrability are theorised to influence PU while SN is also theorised to have a direct influence on BI in a mandatory environment. Experience and voluntariness are regarded as moderating factors that tend to moderate the relationship between SN and BI. TAM2 theorises that the power of SN tends to decrease as an individual gains experience on the use of technology. Venkatesh and Davis (2000) concluded that all proposed TAM2's variables are positively significantly influencing user acceptance (see Figure 2.5).

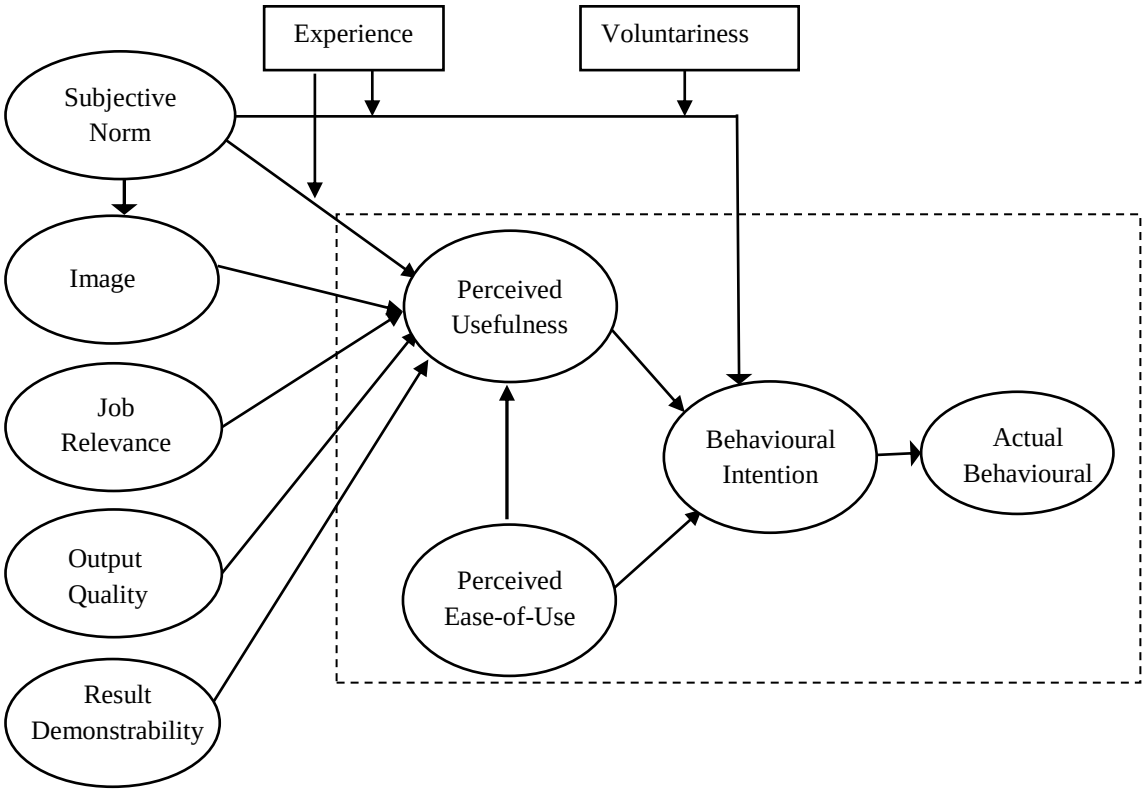



**Figure 2.5: TAM2 Theoretical Framework**
Source: Venkatesh and Davis (2000)
*Note: diagram in the dashed box is the original TAM*

Though TAM2 addresses the determinants of PU, the modification considers an extension of PU construct only and remains silent on the determinants of PEOU. This theory therefore still needs to be refined further to explain the specific external variables which can be used in determining PEOU construct (Venkatesh, 2000; Venkatesh & Bala, 2008).

### 2.3.6 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh, Morris, Davis, and Davis (2003) proposed UTAUT theory that addresses some of the limitations found in other behavioural theories. Jen, Lu, and Liu (2009); and Venkatesh et al. (2003) asserted that selecting specific behavioural theory is challenging due to the fact that the use of one theory ignore the applicability of other useful constructs found in other alternative theories. Furthermore, various behavioural models produce low explanatory power (below than 60%) in explaining adoption behaviour (Sun & Zhang, 2006). To address these problems, Venkatesh et al. (2003) combined different constructs considered to have similarities from different behavioural theories to lessen the weakness found in each behavioural theory and develop UTAUT which is used in organisational contexts.

The UTAUT is a complicated theory that combines TRA, TAM, Motivation Model (MM), TPB, Combined TAM-TPB (C-TAM-TPB), Model of Personal Computer Utilization (MPCU), IDT and Social Cognitive Theory (SCT). Venkatesh et al. (2003) developed the following four constructs of the UTAUT theory as shown in Table 2.1: (1) performance expectancy refers to as the

perception of an individual to believe that the use of technology will increase his or her job performance. (2) Effort expectancy refers to as the perception of an individual to believe that it will be very easy for him/her to use technology. (3) Social influence is defined as the degree to which an individual believes that important people to him/her think he/she should use the technology. (4) Facilitating conditions is perception of an individual to believe that he/she will get full support when using technology. With these four constructs it is explained that forming a construct by combining several constructs from different theories allow the researchers to investigate BI in a more holistic and comprehensive manner.

**Table 2.1: UTAUT Constructs Composition**

| UTAUT 's Constructs | Composes the following Constructs | Original Theory of the Construct |
|---|---|---|
| Performance expectancy | Relative advantage | IDT |
| | Outcome expectation | SCT |
| | Perceived usefulness | TAM/C-TAM-TPB |
| | Job-fit | MPUC |
| | Extrinsic motivation | MM |
| Effort expectancy | Perceived ease-of-use | TAM |
| | Complexity | MPCU |
| | Ease-of-use | IDT |
| Social influence | Subjective norm | TPB/C-TAM-TPB/TAM2 |
| | Social factor | MPCU |
| | Image | IDT |
| Facilitating conditions | Perceived behaviour control | TPB/C-TAM-TPB |
| | Facilitating conditions | MPCU |
| | Compatibility | IDT |

Source: Venkatesh et al. (2003)

All UTAUT's constructs except facilitating conditions had been theorised to influence individual's BI to use technology while BI and facilitating conditions is theorised to have a direct influence on actual usage behaviour. Personal variables related to age, gender, experience, and voluntariness were theorised to moderate the relationships of the relevant UTAUT's constructs (see Figure 2.6).

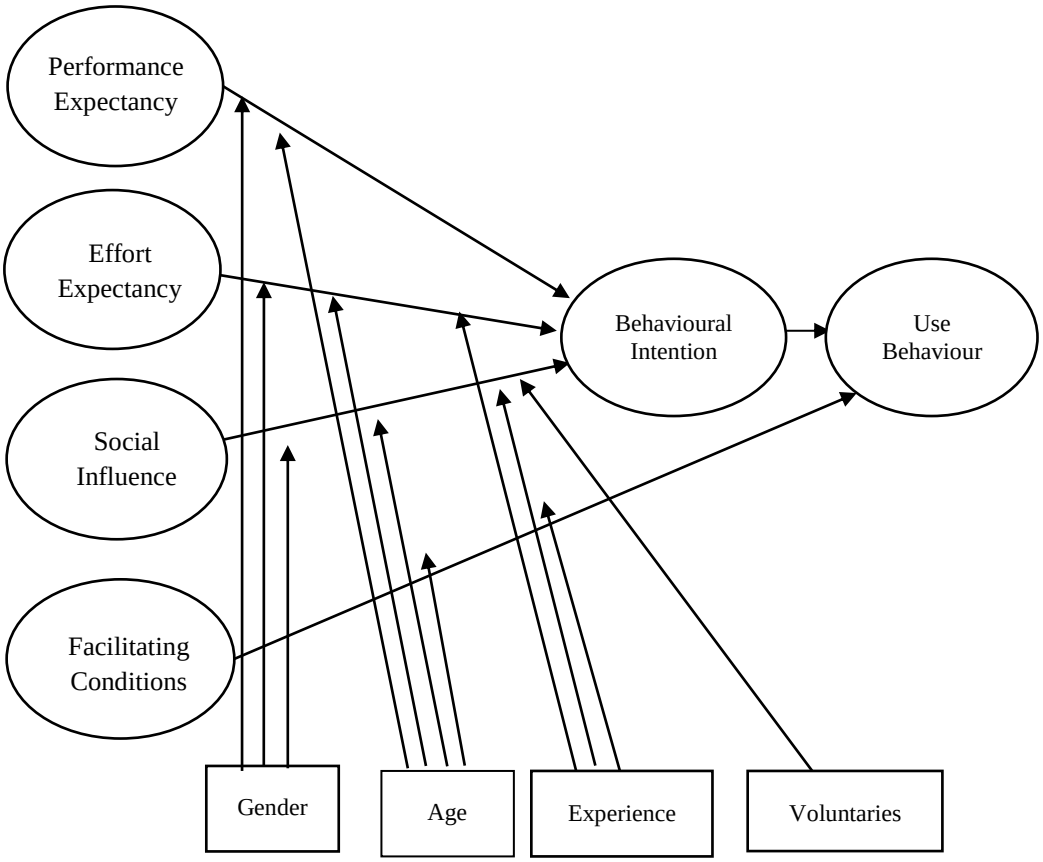



**Figure 2.6: UTAUT Theoretical Framework**

Source: Venkatesh et al. (2003)

Venkatesh et al. (2003) explained that the most significance contributions of UTAUT include: (1) it produces up to 70% amount of variance in predicting BI and actual usage behaviour of technology that surpassing other theories; and (2) it combines various constructs from different theories in determining

technology adoption behaviour. However, van Raaij and Schepers (2008) criticised the UTAUT for being less parsimonious than TAM and TAM2 because UTAUT's high coefficient value is only attainable when key relationships are moderated with four categorical variables. Furthermore, grouping of several constructs from different theories to formulate single construct is criticised (van Raaij & Schepers, 2008). For example, social influence combines three different constructs that are SN, social factors and image that explain different concepts in technology adoption behaviour; therefore, it is criticised to combine the above three constructs to create a single one.

In general, each theory has various applicability limitations. The modifications on the theories that have been undertaken by past researchers intend to reduce the weaknesses so that the theories can be applied in different aspects as shown in Table 2.2. Therefore, this study selected IDT theory to be applied in examining determinants of behavioural intention on adoption of m-government services in Tanzania rural areas.

**Table 2.2: Weaknesses and Modifications on Adoption Behaviour Theories**

| Name of the theory | Weaknesses of the theories | Modifications undertaken by past researchers |
|---|---|---|
| Theory of Reasoned Action (TRA) | Assumed that an individual will act if that person has the intention to act [a]. | Recommend an additional of PBC construct that can address external support for a person to act [b]. |
| Innovation Diffusion Theory (IDT) | Some IDT constructs are discriminative which results into inconsistency results [c].<br><br>Does not consider the influence of external factors in making decision | Propose Perceived Characteristics of Innovation (PCI) that refined IDT main constructs [d]. |
| Theory of Planned Behaviour (TPB) | Assume that only one additional variable is the solution to all problems.<br><br>Did not specify specific constructs' factors to be used in predicting behaviour [e]. | Decomposed TPB was introduced to give more explanation on variables and how can they be applied in predicting intention behaviour and actual usage [f]. |
| Technology Acceptance Model (TAM) | Assumes only technology factors are enough in predicting technology adoption intention behaviour [g].<br><br>Assume that uses of Technology is voluntary [i] | Extension of Perceived usefulness by adding cognitive factor and social influence factors [h]. |
| Extended Technology Acceptance Model (TAM2) | Did not specify external variables which influence perceived ease of use [j]. | Anchor and adjustment were proposed in TAM3 to extend perceived ease of use variable [k]. |
| Unified Theory of Acceptance and Use of Technology (UTAUT) | The theory contains about 41 independent variables used in predicting intention and at least 8 independent variable in predicting behaviour, which make difficult in adoption decision making [l]. | Proposed the technology user acceptance decision making core model which tend to address decision making process in technology adoption [m] |

*Table 2.2 continue next page*

| Name of the theory | Weaknesses of the theories | Modifications undertaken by past researchers |
|---|---|---|
| | The theory is less parsimonious; to achieve high coefficient of determination ($R^2$) , relationships should be moderated with up to four variables [n]. | |
| Sources | [a] Ajzen and Fishbein (1980)<br>[b] Ajzen (1985)<br>[c] Rogers (1983)<br>[d] Moore and Benbasat (1991)<br>[e] Ajzen (1985)<br>[f] Taylor and Todd (1995b)<br>[g] Davis (1985)<br>[h] Venkatesh and Davis (2000) | [i] Seymour, Makanya, and Berrange (2007)<br>[j] Venkatesh and Davis (2000)<br>[k] Venkatesh and Bala ( 2008)<br>[l] Venkatesh et al. (2003)<br>[m] Bagozzi ( 2007)<br>[n] Van Raaij and Schepers (2008) |

### 2.3.7 Justification of Choosing IDT in this Study

Apply theories such as TRA, TPB and TAM may produce biased results, because their constructs are considered to be too general. The theories do not specify specific operational factors to be used in addressing adoption behaviour as compared to IDT (Abbasi, Shah, Doudpota, Channa, & Kandhro, 2013; Che-Azmi, Ang, Talib, & Irani, 2016).

Similarly, the UTAUT constructs are also considered to be too general because they combine different constructs which have different conceptual meaning (van Raaij & Schepers, 2008). In addition, TAM model considers technological factors only in addressing adoption behaviour. Nevertheless, in adoption of technology, other factors apart from technological ones have to be considered as well (Benbasat & Barki, 2007).

Comparatively, IDT theory is found to be more appropriate to this study because it uses perceived characteristics of innovation which are relative advantage, ease-of-use, compatibility, image, result demonstrability, visibility, and trialability. These characteristics are considered to be specific in addressing issues of technology adoption (Black, Lockett, Winklhofer, & Ennew, 2001; Polatoglu & Ekin, 2001). Therefore, IDT constructs could specifically address the technological issues pertaining to this study.

Additionally, IDT was purposely developed to address the diffusion of agricultural innovations in rural areas (Fliegel, 1993) whereas other theories were developed to address adoption of innovation and technology in general. Therefore, given the context of this study, IDT was found to be more appropriate in examining the adoption of m-government services among the rural farmers.

Despite its applicability in examining adoption of m-government among rural farmers, IDT is not free from criticisms because it does not consider the influence of external factors (Al-Zoubi, 2013). As a result, the theory cannot be used as it is to address all identified issues (including inadequate government support and lack of awareness on existence of m-government services) in this study. In addressing these problems, the present study extended IDT by adding two constructs namely the government support and awareness to deal with identified key problems in adoption of m-government services among the rural farmers in Tanzania.

## 2.4 Development of Innovation Diffusion Theory

### 2.4.1 Original Innovation Diffusion Theory

IDT was developed by Rogers (1983), originated from sociology and was developed to examine how agriculture innovation can be diffused and adopted within the rural sociology. Rogers (1995) defined the term diffusion as the process by which innovation is communicated through different channels over time among members of the society. In brief, the theory focuses on why people should adopt an innovation, how people will adopt the innovation and at what rate an innovation can spread within the society (Sahin, 2006). Rogers (1983) listed four necessary elements in the diffusion of innovation that are characteristics of innovation, communication channels, time, and social systems.

Rogers (1983) explained five characteristics of an innovation that may influence a person to adopt or reject an innovation: relative advantage, complexity, compatibility, observability, and trialability. An innovation is considered to have relative advantage if the technology innovation is perceived to be useful and it can enhance the user's well-being, in terms of economic, financial, social, and physical. Compatible innovation emerges if the technology can map the customer's perceived values, by comparing the past and potential needs and wants. If the level of complexity of an innovation is perceived to be low, the amount of physical and mental effort required to use the innovation would be marginal. The trialability of an innovation refers to the opportunities given to the potential adopters to test the innovation within a given time before actual

usage. Observability explains how other members observe an innovation within the social system (see Figure 2.7).

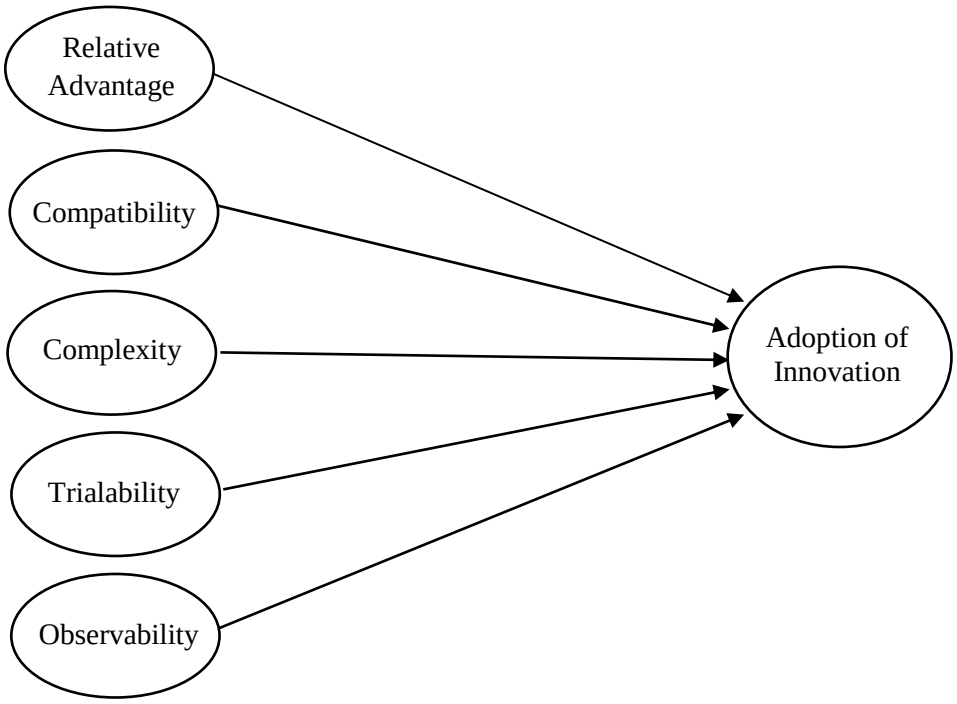



**Figure 2.7: IDT Theoretical Framework**

Source: Rogers (1983)

The second element of innovation diffusion refers to the communication channels: mass media and interpersonal channels that would be used to disseminate information and benefits of an innovation. Mass media such as radios, television, internet, and newspapers can reach a larger audience compared to interpersonal channels.

Time is one of the necessary elements in the innovation diffusion and it consists of three main dimensions. Under the first dimension, the following five main steps of the innovation-decision process will be needed to assist a person to form

an attitude: knowledge, persuasion, decision, implementation, and confirmation (see Figure 2.8). In the first stage, communication channels are used to provide the initial knowledge to the potential adopters of an innovation and its functions. Then, the service provider will persuade the potential adopters to form a positive attitude toward the innovation. After getting sufficient information, the potential adopters will decide whether to adopt or reject the innovation. If the potential users choose to adopt the innovation, they will test the innovation in terms of the technology's usefulness and compatibility with previous and current experiences and needs. Finally, the potential users will confirm their decision whether to continue using the innovation or reject it.

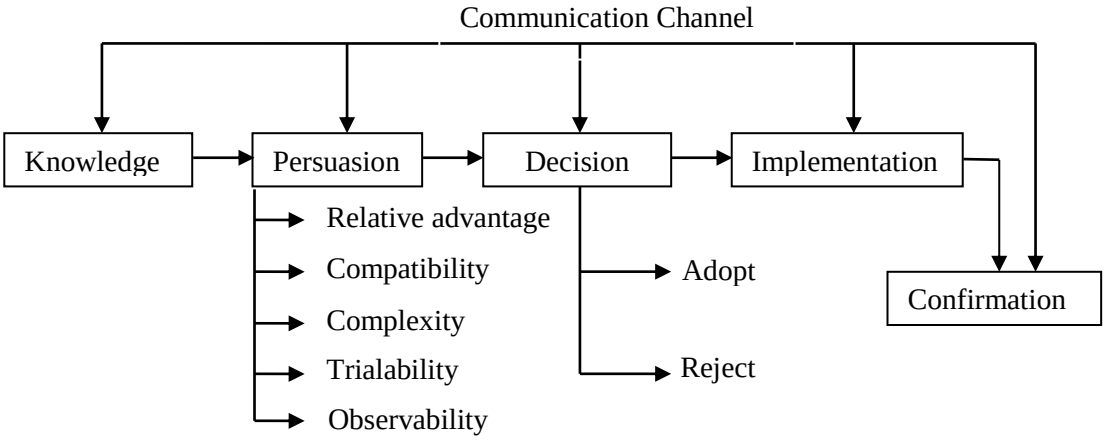



**Figure 2.8: Innovation Diffusion Process Model**

Source: Rogers (1983)

The second dimension shows that some people may adopt innovation earlier than others within the social systems. Rogers (1983) explain this by grouping individual adopters into five categories (see Figure 2.9): (1) Innovators who have greater financial lucidity and high status, and are high-risk taker who will

adopt an innovation as soon as the product or service is introduced. (2) Early adopters, same as innovators, they are highly respected individuals and often are considered as opinion leaders but they depend more on group's norms and values. (3) Comparatively, early majority adopters who tend to collect more information about a technology innovation before adopting the innovation. (4) late majority adopters are those who tend to adopt an innovation once it is already tested, adopted and proved to be with advantages by previous adopters; and (5) laggard adopters who adopt an innovation only when the product or service has been superseded by other innovation.

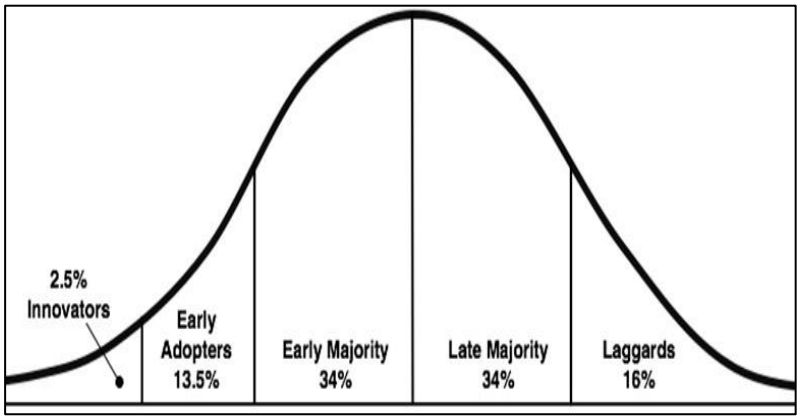



**Figure 2.9: Individual Adopters' Category**
Source: Rogers (1983)

The third dimension reflects the speed of adopting an innovation. This depends on the individual's perception on the advantages that the person may gain from the innovation.

The last element of innovation diffusion is a social system that contains four sub-elements: (1) social structure that could influence how social members live

and interact with each other. Under certain circumstance, a person's act or behaviour may invite other people to replicate his or her act; (2) norms reflects the common behaviour of a society members. A society may adopt an innovation if the technology is compatible with the society norms. (3) Opinion leaders refers to respected people in society with influential power and thus, most society members will follows the leaders' opinion in adopting the technology. (4) Change agents tend to influence diffusion of innovation to client through the use of change agency. In the context of this study, the government is the change agent that will influence the adoption of m-government among the rural farmers through the use of village assembly leaders.

### 2.4.2 Modifications of Original IDT Constructs

Previous researchers pointed out that the existing instruments used to measure characteristics of innovation are not reliable and valid, as they tend to produce inconsistency results in different studies (Downs & Mohr, 1976; Moore & Benbasat, 1991). Unavailability of comprehensive instrument for examining adopter's perception was the reason for inconsistency results (Moore & Benbasat, 1991). Hurt and Hubbard (1987) argued that, measurement of characteristics of innovation identified by Rogers (1983) are too general: in the sense that, different adopters may perceive primary characteristics of innovation differently (Moore & Benbasat, 1991). Furthermore, Rogers' IDT constructs were focusing more on how adopters perceive innovation attributes itself rather than perception on how they can be used in adoption of innovation.

In responding to the criticism, Moore and Benbasat (1991) extended IDT by reconstructing some of Rogers's (1983) original constructs in the following ways. Firstly, perceived characteristics (secondary characteristics) of innovation should be used to evaluate adopters' behaviour while using certain technology instead of primary characteristics (characteristics of innovation). Secondly, image that is subsumed to be part of relative advantage in Rogers's (1983) IDT theory should be regarded as independent variable in adoption of technology innovation. This is because image can enhance an individual's status within the society whereas relative advantage is more relevant to expected advantages that could be generated by using technology over the existing approach.

Thirdly, complexity is interchangeable to PEOU construct in TAM (Agarwal & Prasad, 1997; Davis, 1985). Therefore, Moore and Benbasat (1991) proposed to use ease-of-use construct due to the lack of validated scales for measuring complexity construct. Fourthly, the observability construct in the original IDT is too complex to be measured because tangible measurements that could measure how an innovation is visible and communicable to others are very subjective. Therefore, Moore and Benbasat suggested to split observability construct into two different constructs: visibility and result demonstrability to minimise the generality problem.

Finally, Rogers' innovation characteristics name was proposed to be changed to perceived characteristics of innovation (PCI) and the later contains all the proposed perceived innovation characteristics: relative advantage, ease-of-use,

compatibility, image, result demonstrability, visibility and trialability (see Figure 2.10). After testing the reliability of PCI in rounds and rounds, Moore and Benbasat (1991) concluded that the refined IDT constructs are efficient in measuring the level of technology innovation adoption.

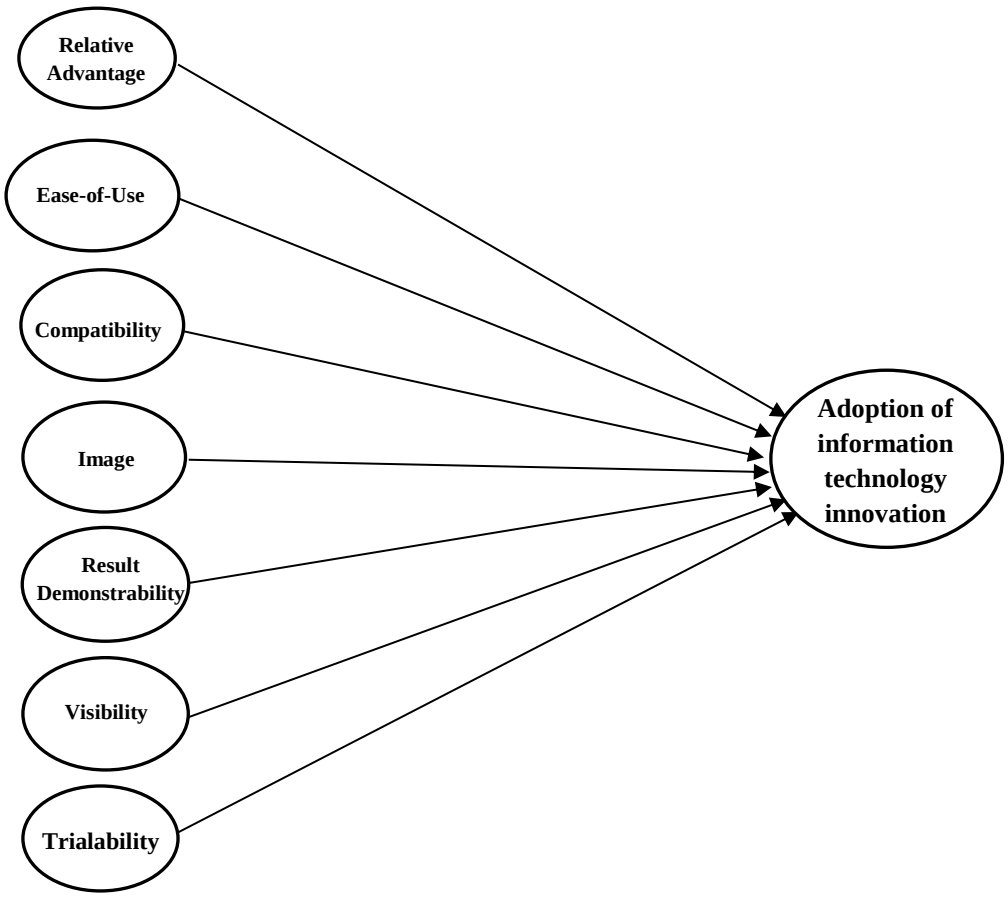



**Figure 2.10: Refined IDT Constructs Relationship**
Source: Moore and Benbasat (1991)

This study adopts the refined IDT constructs because they are secondary attributes of innovation that are more appropriate in making informed decision to adopt information technology than primary characteristics. Secondary attributes measure the perception of adopters while primary attributes refer to

the intrinsic or essential features of a certain innovation (Ong, Poong, & Ng, 2008).

In addition, the refined IDT constructs were purposely developed for information technology contexts whereas the original IDT constructs were too general to be applied on agricultural innovation adoption (Moore & Benbasat, 1991). Furthermore, some of the original IDT constructs were considered to measure more than one contexts (Moore & Benbasat, 1991); hence identifying specific factors which influences adoption of m-government services could be difficult if the original IDT constructs were applied. Also, the nature of the current study's issues that are related to relative advantage, ease-of-use, compatibility and visibility can be addressed more precisely by using specific constructs as defined by Moore and Benbasat (1991) rather using the original IDT constructs.

### 2.4.3 Refined IDT Constructs' Theoretical Relationship

Perceived characteristics of innovation are defined and theorised to have direct and positive effects on information technology adoption behaviour (Moore & Benbasat, 1991). In the next sub-sections, definitions of refined IDT constructs and theorised relationships are presented.

a) Relative advantage is defined as the degree to which technology innovations is perceived to be better than the predecessor (Moore & Benbasat, 1991); for example, accessibility of information at anytime, anywhere and at less cost. If the technology innovation produces more

relative advantages than the current technology, then it is likely to be adopted (Rogers 2003).

b) Ease-of-use shows the extent to which using technology innovation is perceived to require less physical or mental effort (Moore & Benbasat, 1991). Potential adopters would be more likely to use the technology innovation if the system is easy to use (Ong et al., 2008).

c) Compatibility reflects the extent to which technology innovation is perceived to be appropriate to adopters' needs, beliefs, and experiences (Ndubisi & Sinti, 2006). If the technology is perceived to be compatible with certain potential adopters' past and/or current experiences, needs and values, then the likelihood of adopting the technology innovation among the targeted adopters will increase (Al-jabri & Sohail, 2012).

d) Image defines the degree to which an individual perceives that using technology innovation will elevate his/her status in the society (Karahanna, Straub, & Chervany, 1999). Potential adopters would adopt the innovation if they perceive that their social status will improve by using certain technology innovation (Moore & Benbasat, 1991).

e) Result demonstrability defines the extent to which results of using the technology innovation is observable and can be communicated (Karahanna et al., 1999). In other words, if the technology innovation results are perceived to be communicable, the potential adopters may adopt the technology (Ong et al., 2008).

f) Visibility is the degree to which the outcome produced by the technology innovation is visible to adopters (Hsu, Lu, & Hsu, 2007). If the technology innovation is visible in the society then the targeted adopters' likelihood to adopt the technology will increase (Ong et al., 2008).

g) Trialability shows the degree to which the technology innovation may be tested within a given time (Rogers, 2003). If targeted adopters were given the opportunity to try certain technology innovation that was new to them, their likelihood to adopt the innovation in a near future will increase (Sahin, 2006).

## 2.5 Research Models for Relevant Past studies

Different past studies have deployed IDT to establish different determinants that influence the adoption behaviour on various technologies. Most of the analysed models have treated BI as dependent variable instead of actual usage behaviour. This is because most of the analysed previous models were meant to evaluate the initial adoption behaviour of information technology (Karahanna et al., 1999). Initial adoption behaviour is evaluated when the innovation is new and not yet adopted (Karahanna et al., 1999). In this context, rural farmers have not yet adopted m-government services; therefore, to predict their future behavioural intention, this study uses BI instead of actual usage behaviour as the dependent variable.

Most of the analysed previous models either integrated IDT with other theories or added new construct(s). Integrating theories or additional of construct(s) tend to produce more vigorously results. For example, Table 2.3 shows that IDT is mostly integrated with TAM and other theories in examining behavioural intention to adopt e-government services (Abdelghaffar & Magdy, 2012; Carter & Belanger, 2004, 2005; Lean et al., 2009; Shareef et al., 2012). In the context of this study, IDT was extended by two constructs to address the problems presented in the statement of the problem above.

TAM's constructs have been acknowledged to be consistent in producing a high amount of variance in measuring BI during adoption of various technologies (Priyanka & Kumar, 2013; Suki & Ramayah, 2010). However, TAM's constructs are considered to be a subset of PCI (Lee, Hsieh, & Hsu, 2011; Wu & Wang, 2005). Therefore, when IDT theory is used, it should be integrated with other constructs apart from TAM's constructs to make it more vigorous in explaining technology adoption behaviour.

Limited studies have used IDT to study adoption of m-government services in developing countries (Abdelghaffar & Magdy, 2012; Shareef et al., 2012). The studies used students and heterogeneous citizens from urban, suburban and rural areas to examine m-government services. Though, they did not focus on studying true rural citizens. For instance, a study conducted by Liu et al. (2014) included only one IDT construct in studying rural farmers' behaviour intention to adopt m-government services in China. Consequently, this study concluded that there is scant information on the applicability of IDT constructs in

examining rural citizens' behavioural intention to adopt m-government particularly rural farmers in developing countries. This is because rural citizens in developing countries have different characteristics compared to the above examined populations. Therefore, such differences provided the room for the current research to examine how IDT constructs could be applied in m-government context to examine Tanzania rural farmers' behavioural intention to adopt m-government services.

Other refined IDT constructs such as trialability, result demonstrability, and visibility have not been included in most of the previous research conceptual models. The reason for exclusion being, the constructs have been tested in previous studies related to technology adoption and proved not to have any influence on users' behavioural intention (Karahanna et al., 1999; Moore & Benbasat, 1996). This mostly happen when a population being investigated is actual users and it is aware of the technology or it has the experience on any of the relative technology (Karahanna et al., 1999; Moore & Benbasat, 1996). The situation is different in the context of Tanzania rural areas. Previous studies have shown that most of the rural citizens are not aware, and they have limited technology skills (Dewa & Zlotnikova, 2014; Yonazi, 2013). Therefore, the relevance of studying the influence of these three constructs is deemed to be important in the present study.

**Table 2.3: Summary of Relevant Past Studies' Research Models**

| Researchers (Publication year) | Theory used | Construct added | Reason for adding new construct/integrating model |
|---|---|---|---|
| Almuraqab (2017) | IDT, TAM and Trust Model | Nil | Integrated three models to examine m-government adoption |
| Liu et al. (2014) | IDT, TAM | Social Influence<br>Trust | To explore other adoption factors behind technology adoption factors in rural areas |
| Althunibat, Alrawashdeh, and Muhairat (2014) | TAM | Nil | Examine the influence TAM's constructs on adoption of m-government services. |
| Komba and Ngulube (2014) | DeLone-McLean | Nil | Examine the influence DeLone-McLean's constructs on adoption of e-government services. |
| Komba-Mlay (2013) | IDT, TAM and DeLone-McLean | Trust<br>Compatibility<br>Image<br>Social Influence<br>External factors | To examine enhancing factors for the uses of website in e-government services |
| Shareef et al. (2012) | IDT, TAM and TRA | Perceived Reliability<br>Perceived Security<br>Perceived Empathy | M-government technology uses the open network and wireless connection, so there is a need for a reliable and secured transaction.<br>To check willingness of m-government services provider to provide service to the users. |
| Abdelghaffar and Magdy (2012) | TAM, IDT and UTAUT | Trust<br>Internet experience<br>Awareness | Combine different theories and come up with a model that will address all the limitations found on different adoption theories in implementing m-government. |
| Islam and Grönlund (2011) | IDT and TAM | Rural connectivity<br>Access and Response time | To enhance the proposed model with two social factors |
| Rokhman (2011) | IDT | Nil | Checking how IDT variables affect internet users to adopt e-government services. |

*Table 2.3 continue next page*

| Researchers (Publication year) | Theory used | Construct added | Reason for adding new construct/integrating model |
|---|---|---|---|
| Almuraqab (2017) | IDT, TAM and Trust Model | Nil | Integrated three models to examine m-government adoption |
| Lean et al. (2009) | IDT, TAM and Trust | Culture as moderating variable | Check how the combine models influence the adoption of e-government and how culture variable moderate innovation attributes relationship.<br><br>Find the significant antecedents of trust. |
| Singh et al. (2008) | IDT | Knowledge and Technology access Problems | Adding more constructs in IDT to explain e-government adoption specifically. |
| Carter and Bélanger (2005) | IDT, TAM and Trustworthiness | Nil | To make the model stronger by addressing data misuses and privacy issues in implementing e-government. |
| Carter and Bélanger (2004) | IDT, TAM and Trustworthiness | Nil | Analyse how the combined model influences the adoption of e-government services. |
| Carter and Belanger (2003) | IDT | Nil | Checking how the perceived characteristics of innovation can influence the adoption of e-government services. |

Most of the past studies show that trust on government can influence the adoption of e-government and m-government significantly (Carter & Belanger, 2004; Singh, Sarkar, Dissanayake, & Pittachayawan, 2008). When citizens have high trust on the m-government and e-government services about legal, ethical, trustworthy and confidentiality then their likelihood of adopting e-government or m-government services tend to increase (Lean et al., 2009; Meftah, Gharleghi, & Samadi, 2015). This implies that government support is very important because, through government actions and regulations on m-

government services, citizens will increase their level of confidence and trust on government that may result in adopting the m-government services.

Empirical results of previous studies show that relative advantage is positively and significantly influencing the behavioural intention to adopt e-government services (Carter & Belanger, 2003; Lean et al., 2009; Rokhman, 2011; Singh et al., 2008). A similar result was shown on behavioural intention to adopt m-government (Shareef et al., 2012). However, Carter and Belanger (2005) produced contradicting results: relative advantage does not influence adoption of e-government service. Similarly, contradictory results have been observed in examining compatibility, ease-of-use, and image as shown in next paragraph.

Other studies have found compatibility to be positively influencing behavioural intention to adopt e-government services (Carter & Belanger, 2003, 2004, 2005; Lean et al., 2009; Rokhman, 2011) and m-government adoption (Abdelghaffar & Magdy, 2012). Conversely, Shareef et al. (2012) study shows that compatibility does not influence adoption of m-government services. The relationship between ease-of-use and behavioural intention to adopt e-government was proved to be positive and significant by Carter and Belanger (2005). Shareef et al. (2012) produced the same results on adoption of m-government services.

Alternatively, other past studies found that ease-of-use does not influence behavioural intention to adopt e-government (Carter & Belanger, 2003, 2004; Rokhman, 2011). Carter and Belanger (2003), and Lean et al. (2009) asserted

that image is an important factor that has significant influence on the behavioural intention to adopt e-government services. However, Rokhman's (2011) findings are supported by Carter and Belanger's further studies in 2004 and 2005 which revealed that image does not influence the respondent's intention to adopt e-government. Similary, image was not found to be an influential factor in intention to adopt m-government among the farmers in rural China (Liu et al., 2014).

Nevertheless, the non-significant results on relative advantage, ease-of-use, compatibility, and image could be attributed to several factors as follow. (1) If respondents are more familiar with e-government or m-government they do not regard e-government or m-government as innovation anymore (Carter & Belanger, 2005). (2) If targeted respondents have experience on any relative technology, system becomes more compatible to them and easy to use (Carter & Belanger, 2003, 2005; Rokhman, 2011; Shareef et al., 2012). (3) If the intention of using e-government is rather not to acquire social status but to get benefit from using it, then, using e-government may not enhance any social status (Rokhman, 2011).

From the above discussion, it is evidently to conclude that the influence of IDT constructs on intent to adopt e-government or m-government tends to vary based on the skills, knowledge, and experience of respondents being investigated. The respondents in the present study are rural farmers in Tanzania who have quite different characteristics from most of previous studies' respondents. Results produced from most of the previous studies may not be directly applied to the

current study's population due to different characteristics and environment where previous studies were conducted. Therefore, there is a need to examine how the IDT constructs can directly affect Tanzania rural farmers' behavioural intention to adopt m-government services.

Most of past studies have used IDT to examine adoption of e-government technology, but a few have used IDT to study adoption of m-government services (Abdelghaffar & Magdy, 2012; Islam & Grönlund, 2011; Shareef et al., 2012). As shown from the past studies on e-government adoption, IDT is considered to be a useful theory that may assist the government to develop and implement better m-government strategies based on citizens' needs (Carter & Belanger, 2004). Therefore, this study also adapts IDT to extend its applicability on m-government context. This is because IDT has been less used in m-government context; therefore adopting it in this study will provide more insights that are useful to scholars and policy makers.

## 2.6 Relevant Studies on Government Support and Awareness

Apart from considering perceived characteristics of innovation in evaluating citizens' behavioural intention, government support and awareness are critical issues that need to be examined in adoption of m-government services in Tanzania as well. This is supported by recent studies' findings: lack of government support (such as unavailability of regulations, attractive incentive, tax relief and good policies and procedures) can limit the adoption ICT among

the rural people (Dewa & Zlotnikova, 2014; Goh, 1995; Tornatzky & Fleischer, 1990; Yonazi et al., 2010).

Government support refers to the availability of infrastructures, regulations, promotion and encouragements provided by government to enable the adoption and utilisation of information technology (Chong, Ooi, Lin, & Tan, 2010). In the context of e-government adoption, availability of adequate government support tends to increase the likelihood of potential adopters to adopt electronic government services (Al-Shafi, 2009; Al Salmi & Hasnan, 2016). Good examples can be drawn from countries like South Korea, Singapore and Malaysia which are considered to be successfully in usage of e-government services (Bwalya & Mutula, 2014) and their success could be explained by involvement and commitment that have been taken by governments in supporting the implementation of e-government. Similarly, studies in adoption of mobile banking showed that government support could encourage more potential adopters to adopt m-banking technology (Goh, 1995; Rambocas & Arjoon, 2012; Tan & Teo, 2000). This suggests that availability of required technological infrastructures, regulations, policies, promotions and encouragements could encourage potential adopters in Tanzania rural areas to adopt m-government services. Therefore, examining the influence of government support as facilitating condition construct in UTAUT is appropriate for the present study.

Awareness of technology is defined as a scope of knowledge and the recognition that human has over the technology innovation (Meftah et al., 2015). Public

awareness created through various campaigns, seminars, brochures, and pamphlets have to be considered to increase citizens' awareness on technology (Mat, 2011). Public awareness could be carried out to ensure potential adopters are well informed on the availability of certain technology and its benefits, compatibility characteristics, functional behaviour, and other terms and conditions of the innovation. In this way, the potential adopters would be more eager to evaluate the innovation characteristics (Claudy, O'Driscoll, Michelsen, & Mullen, 2010). Furthermore, providing awareness information on different characteristics of the technology information may reduce levels of uncertainty to potential adopters that may result during adoption of the technology (Rogers, 1983). This is supported by various past studies that have proved that awareness has a significant effect on behavioural intention to adopt technology (Alshehri & Drew, 2010; Meftah et al., 2015).

It is interesting to note that on top of generating direct effect on adoption behaviour, awareness could create indirect effect on adoption of technology innovation as well (Mashau, 2016; Mohammadi, 2015). This is due to the fact that, if the potential adopters are not aware on the existence of technology and its advantages, providing awareness through disseminating information related to adavtanges, easy-of-use, compatibility and availability may trigger them to be more informed on different aspects of the technology which could increase their likelihood to adopt technology.

The current situation in Tanzania is that, most of the rural citizens are considered not to be aware of various ICT strategies used to deliver public

services and information (Dewa & Zlotnikova, 2014; Yonazi, 2013). Lack of awareness results in poor adoption of ICT strategies because the potential adopters have no information on availability of the strategies, advantages, and compatiblities. Therefore examining the direct and indirect influence of awareness is very important for the present study.

## 2.7 Research Methodologies for Relevant Past Studies

Quantitative methodology has been a common approach used in e-government or m-government behavioural studies (see Table 2.4). This is because most of the studies are deductive in nature that intend to examine and confirm the pre-determined models' hypotheses and generalise sample results to the targeted population (Creswell, 2013).

In most cases, m-government services are meant to provide betterment to the nation at large (Kushchu & Kuscu, 2003; Maumbe & Owei, 2006). To produce valid and reliable results that can be generalised to the targeted population, quantitative approach is more ideal. Qualitative approach may not be ideal, as this approach relies only on small sample size, collect textual data that may be biased when generalised to the targeted population (Creswell, 2013).

## Table 2.4: Summary of Relevant Past Studies' Research Methodologies

| Researchers (publication year) [study region] | Research type | Sampling technique/ (sample size) | Research tool/ (Respondent) | Methodology limitations |
|---|---|---|---|---|
| Almuraqab (2017) [UAE] | Survey Quantitative | Snow-ball-Social Network Sampling (83) | Structured Questionnaire (University Students) | Sample size used is very small<br>Sample size was selected from high educated citizens |
| Liu et al. (2014) [China] | Survey Quantitative | (409) | Structured Questionnaire (Rural citizens) | Sampling technique is not specified<br>Sample size was selected from one village only |
| Komba and Ngulube (2014) [Tanzania] | Survey Quantitative | Quota Sampling (448) | Structured Questionnaire (Rural citizens) | The use of respondents from urban, peri-urban and rural could result into heterogonous respondents due to different level of understanding |
| Komba-Mlay (2013) [Tanzania] | Mixed Survey Quantitative | Quota and Snow-ball Sampling (448) | Mixed Method Questionnaire (Citizens) Interview (Policy makers) | The use of respondents from urban, peri-urban and rural could result into heterogonous respondents due to different level of understanding.<br>Triangulate policy makers interviews with questionnaire results from citizens could results in ambiguity interpretations |
| Shareef et al. (2012) [India] | Survey Quantitative | Stratified Sampling (351) | Structured Questionnaire (Urban citizens) | The study covers only one country with specific culture traits.<br>Respondents are highly educated which does not reflect the population. |
| Abdelghaffar and Magdy (2012) [Egypt] | Survey Quantitative | Purposive Sampling (100) | Structured Questionnaire (Students) | Sample size covers youth only; it can't be generalised to the intended population. |
| Islam and Grönlund (2011) [Bangladesh] | Mixed Method | Purposive (1680) | Mixed questionnaire Observation Interview (Rural citizens) | Nil |
| Rokhman (2011) [Indonesia] | Survey Quantitative | Purposive Sampling (751) | Web Questionnaire (Internet users) | Nil |
| Lean et al. (2009) [Malaysia] | Survey Quantitative | Convenience Sampling (150) | Self-administered Questionnaire (Employees) | Small sample size and drawn from one region, majority of the respondents were degree holders that do not reflect the real population |
| Singh et al. (2008) [Australia] | Survey Quantitative | Simple Random Sampling (246) | Self-administered Questionnaire (Employees) | Respondents were only well-educated and working people |

*Table 2.4 continue next page*

| Researchers (publication year) [study region] | Research type | Sampling technique/ (sample size) | Research tool/ (Respondent) | Methodology limitations |
|---|---|---|---|---|
| Carter and Bélanger (2005) [USA] | Survey Quantitative | Convenience Sampling (105) | Self-administered Questionnaire (Urban citizens) | Very few agencies were selected and the sample size used was very small. |
| Carter and Bélanger (2004) [USA] | Survey Quantitative | Purposive Sampling (136) | Self-administered Questionnaire (Students) | Respondents were students, so the study cannot be generalised to the populations |
| Carter and Belanger (2003) [USA] | Survey Quantitative | Convenience Sampling (136) | Self-administered Questionnaire (Students) | Respondents were students who may be restricted in some services. |

Most of the previous studies have employed non-probability sampling techniques: convenience, purposive and quota sampling in selecting their respondents (Abdelghaffar & Magdy, 2012; Carter & Belanger, 2005; Rokhman, 2011). However, non-probability sampling techniques are not ideal in studies that intend to generalise sample results to population. This is because they tend to generate unrepresentative sample which may not produce reliable results when generalised to population (Kish, 1995). Evidence provided by Al-jabri and Sohail (2012) on mobile banking adoption studis and Lee et al. (2011) on e-learning adoption study show that their results could not be generalised due to biasness produced by application of convenience sampling method in selecting respondents.

Past researchers have used non-probability sampling because of the absence of sampling frame (Rokhman, 2011); time, cost and manpower constraints (Lean et al., 2009). Though constraints such as time, cost and manpower sometimes are unavoidable (Bryman, 2012), research should be carefully conducted in such

situation; otherwise, the findings could be highly biased and thus cannot reflect the truth.

Limited studies have applied probability sampling approach which are stratified and simple random sampling in examining m-government services (Shareef et al., 2012) and e-government (Singh et al., 2008). Probability sampling is considered to be ideal because it produces representative sample if applied correctly (Teddlie & Yu, 2007). Therefore, to improve the quality of the present study, probability-sampling technique was adopted.

In the data collection process, face-to-face method has been extensively used (Abdelghaffar & Magdy, 2012; Carter & Belanger, 2003, 2005; Lean et al.,2009). The method is considered to collect high quality data from the targeted respondents (Mathers, Fox, & Hunn, 1998). However, it is expensive and time consuming (Mathers, Fox, & Hunn, 2007). On the other hand, Shareef et al. (2012) and Rokhman (2011) have used self-administered questionnaire which are web and mail because such methods can reduce survey cost, easy distribution of questionnaires and easy to reach a larger number of respondents (Millar & Dillman, 2011). However, distribution of questionnaire through web or mail is criticised for being vulnerable as they can be filled by unintended respondents, produce response with large missing values, produces low response rate, and requires the respondents to have access to electronic facilities (Converse, Wolfe, Huang, & Oswald, 2008; Dillman, 1999). A study conducted by Shareef et al. (2012) adopted mail method and produced a very low response

rate of 18%. This also may produce biased results if the opinions of those who did not participate in the survey differs from those who did (Bryman, 2012).

Generally, face-to-face approach was difficult to be applied in the current study because of the nature of targeted respondents. Rural farmers are very busy with their farming and social activities, therefore it was difficult for them to get enough time to complete the questionnaire. Therefore a more feasible method namely Drop-Off/Pick-Up (DOPU) self-administered was adopted (Allred & Ross-Davis, 2011; Trentelman, Irwin, Petersen, Ruiz, & Szalay, 2016). More information on DOPU is provided in chapter three.

Most previous studies that had adopted self-administered questionnaire did not pre-test their data collection instruments (Carter & Belanger, 2004; Rokhman, 2011; Shareef et al., 2012). This resulted in several problems such as unclear and ambiguous words and questions, wrong ordering of the questions (Van Teijlingen & Hundley, 2002). For that reason, some of the questions may not be attended, hence there will be missing values in the responses collected (Bryman, 2012). All of these may result in unreliable data that could produce biased estimates. This suggests that pre-testing of the data collection instrument is very important to avert ambiguity and difficultness.

Sample size used in any of the study should be clearly justified for validity and reliability of the study's findings (Bryman, 2012). If the sample size estimation is not clearly considered it may result in producing sample with inadequate statistical power to estimate the true relationship between the variables (Wolf,

Harrington, Clark, & Miller, 2013). Furthermore, overestimation of sample size can lead to unnecessary cost of conducting the study. Previous studies conducted by Carter and Belanger (2003, 2004, 2005); Rokhman (2011); and Singh et al. (2008) did not provide justifications on their sample size. Abdelghaffar and Magdy (2012) adopted sample size used by previous similar studies where students were the study's respondents. However, Israel (1992) argued that when adopting sample size from past studies on the similar area, the researchers need to justify some criteria such as the distribution and homogeneity of the population. Nonetheless, Abdelghaffar and Magdy (2012) did not provide justification on the above concern when adopted sample size from previous study.

Furthermore, Lean et al. (2009) have used rule-of-thumb concept to justify the sample size. Carefully consideration is required when applying the rule-of-thumb because it is not model-specific thus; there is a possibility to miscalculate the sample size by inflating or deflating (Wolf et al., 2013). To enhance the current study's validity and reliability, a proper method that can generate optimal sample size was considered. More information is provided in the next chapter.

In the relevant literature of e-government and m-government; students, internet users, and employees were the main respondents (Abdelghaffar & Magdy, 2012; Rokhman, 2011; Lean et al., 2009; Carter & Bélanger, 2003, 2004). These targeted populations were representing a small segment of the country's population that could make it difficult to generalise the results to other citizens

with different characteristics. Moreover, a study conducted by Liu et al. (2014) used rural farmers as respondents. However, the selection of respondents was only based in one village. Therefore, generalisation was difficult due to respondents' variation from other villages. In general, most of the previous studies' respondents do not reflect the reality of rural citizens' characteristics. Therefore, this provided a room for using rural citizens as the respondents in this study.

Table 2.4 shows that most of the studies have been conducted in lower-middle income or higher income countries, whereas Tanzania is considered as lower income country (World Bank, 2015). Due to the differences on economic status between low, middle and high income countries, the characteristics of past studies' targeted populations could be different in terms of education, income, and awareness of technology. This is supported by Ahmad and Khalid (2017) who describe that income of any country may have impact on m-government technology adoption. Therefore, past studies' findings may not be ideal to be applied to Tanzania's rural farmers who are considered to be less educated and with low income.

## 2.8 Data Analysis Techniques for Relevant Past studies

In analysing how previous research model variables have influenced the adopters' behavioural intention to adopt e-government or m-government services, different data analysis techniques have been employed to attain the objectives of each study (see Table 2.5). A thorough review show that first-generation multivariate methods are mostly dominating in analysing the

relationship between predictor variables and behavioural intention or usage behaviour in most of the previous studies (Abdelghaffar & Magdy, 2012; Carter & Belanger, 2004, 2005; Lean et al., 2009). However, first-generation multivariate methods are criticised for inability to model individual variables and they do not analyse the varieties of single variables (Tabachnick & Fidell, 2001). Also, first-generation multivariate methods assume that independent variables are measured without error, which is impracticable in behavioural studies (Tabachnick & Fidell, 2007).

Hair, Black, William, Babin, and Anderson (2009) explained that examining multi-level dependence relationships among the variables in which dependent variable turns to be an independent variable in sub-relationship within the same analysis tends to produce better results. Furthermore, Chin (1998) argued that in evaluating relationships between variables in the statistical model, the relationship between latent and observed variables has to be considered because it shows how each observed variable measures the latent variable. All these are difficult to be evaluated when analysing the data by using first-generation multivariate methods.

Studies conducted by Liu et al. (2014) and Shareef et al. (2012) employed Structure modeling equation (SEM). SEM is considered for its powerful techniques of combining the effect all constructs associated with the model during analysis (Awang, 2015). It analyses the interdependent relationships among multiple variables in a single analysis, considers the measurement errors in observed variables. Furthermore, it evaluates the causal relationship between

latent variables and observed variables (Chin, 1998; Hair et al., 2009), and variance produces from SEM analysis tends to be large because it includes both direct and indirect effects (Hair Jr, Matthews, Matthews, & Sarstedt, 2017).

**Table 2.5: Summary of Relevant Past Studies' Data Analysis Techniques**

| Researchers (publication year) | Data Analysis Techniques (Generation) | Purposes of Analysis |
|---|---|---|
| Almuraqab (2017) | Structural Equation Modeling (Second) Partial Least-Squares | Analyse the structural model and test the hypotheses |
| Liu et al. (2014) | Structural Equation Modeling (Second) | Analyse the structural model and test the hypotheses |
| Komba and Ngulube (2014) | Multiple Regression Analysis (First) | To examine different factors that could lead to adoption of e-government services |
| Komba-Mlay (2013) | Multiple Regression Analysis (First) | To examine different factors that could lead to adoption of e-government services |
| Shareef et al. (2012) | Structural Equation Modeling (Second) | Test causal relationships between endogenous variable and exogenous variables in the model |
| Abdelghaffar and Magdy (2012) | Multiple Regression Analysis (First) | To test the hypotheses between dependent variable and set of independent variables |
| Rokhman (2011) | Logistic Regression Analysis (First) | To distinguish between adopters and non-adopters of e-government and determine factors which influences their adoption behavioural |
| Lean et al. (2009) | Multiple Regression analysis (First) | Assess relationship type and strength between trust antecedences as independent variables and trust |
| | Simple Regression analysis (First) | Check the relation between variables by examine various hypotheses |
| | Hierarchical Regression (First) | Test the strength of the relationship between variables that are moderated by a single moderating variable. |
| | Pearson Correlation coefficient (First) | To test the correlation relationship between continuous variables |
| Singh et al. (2008) | Descriptive Statistics Cross tabulation Analysis | To find the most used e-government system and factors which influence its adoption<br>Measure the significant impact of different factors on and dependent variable. |

*Table 2.5 continue next page*

| Researchers (publication year) | Data Analysis Techniques (Generation) | Purposes of Analysis |
|---|---|---|
| Carter and Bélanger (2005) | Multiple Regression Analysis (First) | Assess the significance of demographics on use intentions.<br>Test the relationship hypotheses between the dependent variable and a set of independent variables |
| Carter and Bélanger (2004) | Linear Regression (First)<br>Multiple Regression Analysis (First) | Access the significance of demographic characteristics<br>Determine relationship between dependent variable and set of independent variables |
| Carter and Belanger (2003) | Multiple Regression Analysis (First) | Determine relationship between dependent variable and set of independent variables |

Since this study measures the direct and indirect effect of awareness through IDT constructs on intention to adopt m-government, SEM is considered as an appropriate technique to attain the current research objectives. More information on the uses of SEM are provided in chapter three.

## 2.9 Summary of Literature Review

Since most of previous studies have concentrated in e-government adoption, a specific empirical study that focuses solely on m-government is important. IDT is a suitable theory for this study because the theory can address parts of the present research problems. However, the theory needs to be extended by adding government support and awareness so that other identifies problems can be addressed. In fact, the literature has supported the relationship between IDT constructs and the additional two variables. The current research model is unique, because the framework is more comprehensive compared to past studies' frameworks.

To be able to generalise the sample results to population, probability sampling technique was found to be ideal. This is because the sample elements can be randomly selected to represent the entire population. Furthermore, face-to-face dominated previous studies. However, the nature of the current target respondents was considered to be busy with farming and social activities activity in day times. Thus, the method was not feasible for this study. Instead, DOPU method was considered to be ideal.

First-generation multivariate data analysis methods have been commonly used in past studies. However, the methods are not free from criticism as they may not analyse a model with multiple layers in a single analysis, but also they do not take care of measurement errors in observed variables. In a view of the need to obtain data findings that can be useful for future researchers' references and for policy makers, this study adopted Structural Equation Modeling that is the second-generation multivariate method to analyse the data. The next chapter presents in details the conceptual framework and methodology used in the present study.

# CHAPTER 3

# CONCEPTUAL FRAMEWORK AND METHODOLOGY

## 3.1 Introduction

This chapter presents the current study conceptual framework and hypotheses formulation. The chapter presents, describes, and justifies the methodologies used to investigate determinants of rural farmers' behavioural intention to adopt m-government in Tanzania. The methodologies are carefully refined based on the literature review to ensure that the current study's findings are valid and reliable.

## 3.2 Research Conceptual Model

The main aim of the present study is to develop an m-government adoption model that will be used to increase the adoption of m-government in Tanzania rural areas. The study sought to identify factors that will encourage rural farmers' behavioural intention to adopt m-government technology. To attain the main objective, IDT with refined IDT constructs developed by Moore and Benbasat (1991) was adapted to create a conceptual model of this study.

Rural farmers' behavioural intention to adopt m-government services was used as the dependent variable in the present study. Behavioural intention was investigated because; most of the rural farmers have not yet adopted m-

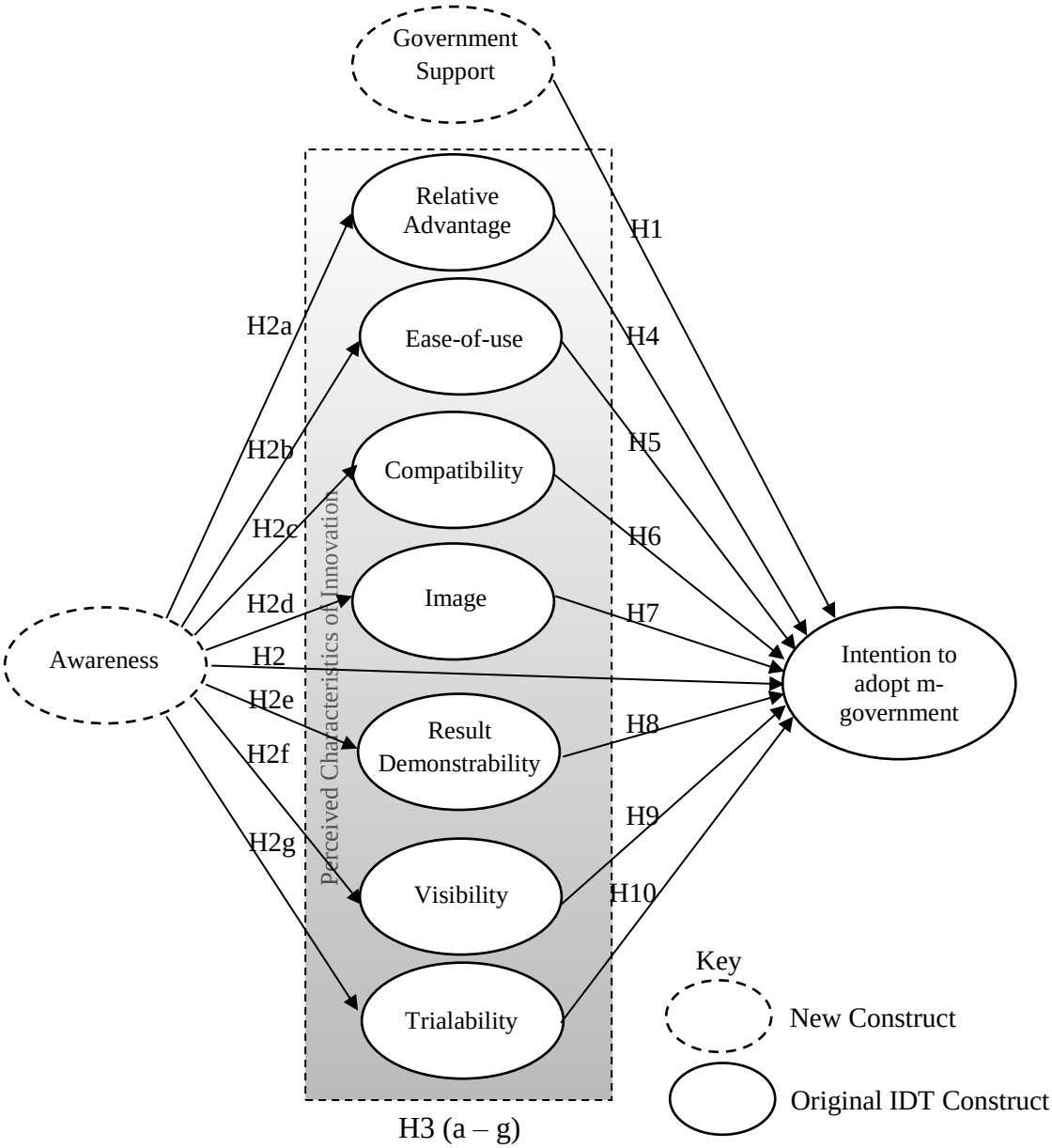
government services. Furthermore, behavioural intention is considered to be a best predictor of the actual usage behaviour (Davis, 1989). Therefore, to predict rural farmers' actual usage behaviour of m-government services, this study used behavioural intention as dependent variable (Karahanna et al., 1999). In this context, behavioural intention is defined as perceived strength of rural farmers' intention to adopt m-government services in accessing agricultural information provided by the government.

The proposed conceptual model consists of the following IDT constructs as predictor variables: relative advantage, ease-of-use, compatibility, image, result demonstrability, visibility, and trialability. Additionally, two predictor variables namely government support and awareness were included to address two major issues that are limited government support and lack of awareness among the rural farmers. The two issues have contributed largely on poor utilization of ICT including m-government services particularly in rural areas (Dewa & Zlotnikova, 2014; Yonazi, 2013). Therefore, there was a need to examine, if availability of adequate government support in terms of infrastructures and availability of policies and legislations could directly influence rural farmers' behavioural intention to adopt m-government services. Similarly, the study examined if awareness of m-government services could directly influence rural farmers' behavioural intention to adopt m-government services.

Apart from serving as predictor variables, IDT constructs also serve as mediating variables. According to Brennan (2014) and Rogers (2003), under certain circumstances, awareness of certain technology may not directly affect

the target users to adopt the technology. For instance, Beynon-Davies (2005) in the United Kingdom found that adoption of e-government was low despite implementation of aggressive awareness campaign that involved different media. The low adoption was attributed to unavailability of specific information such as benefit and how to use the technology during campaign. Therefore, to ensure effectiveness of awareness campaign, specific information that can affect rural farmers' attitude positively to adopt m-government services positively must be provided.

Providing information on the specific characteristics of m-government during the awareness campaign can enhance positive attitude towards the rural farmers' behavioural intention to adopt of m-government services. The features of the m-government that trigger rural farmers' interest could be different among the adopters. Briefly, the same extent of awareness towards m-government adoption could come in the form of different motivations. Knowing the types of motivation that can trigger the studied respondents' behavioural intention is imperative on assisting policy makers to implement appropriate awareness campaign. For these reasons, this study examined the indirect effect of awareness on rural farmers' intention to adopt m-government services through IDT constructs. Figure 3.1 shows the proposed conceptual research model of this study.




**Note**: Hypotheses H3 (a – g) represents indirect relationships between awareness and intention through perceived characteristics of innovation

**Figure 3.1: Current Study's Conceptual Research Model**

### 3.2.1 Development of Current Research's Hypotheses

The present study examines the causal relationship between relative advantage, ease-of-use, compatibility, image, result demonstrability, trialability, visibility, government support, awareness and behavioural intention to adopt m-government technology. Also, the study examines indirect effect of awareness on behaviour intention to adopt m-government through perceived characteristics of innovation. Therefore, next sub-sections present hypotheses that would be empirically tested to accomplish the objectives of this study.

#### 3.2.1.1. Relationship between Government Support and Rural Farmers' Behavioural Intention to Adopt M-government Services

In this context, government support is understood as an extent to which the government creates facilitating environment through various actions and regulations to enable the adoption of m-government in rural areas (Goh, 1995). The government is considered to be the main driver in the success of e-government technology adoption (Al-Shafi, 2009). It may encourage adoption of m-government in rural areas by building required m-government infrastructures, providing distinct policies and procedures required for implementation of m-government services. Such support may facilitate rural farmers to adopt m-government services.

Countries like South Korea, Singapore and Malaysia are considered to be successfully in using e-government services (Bwalya & Mutula, 2014), and their success is because of involvement and commitment that have been taken

by governments in supporting the implementation of e-government. Moreover, the governments also promoted the use of e-services to their citizens. For instance, in Malaysia, the government use broadcasting media to encourage citizens to use MyEG websites, this had led to an increased number of usages (Chong et al., 2010).

Previous studies have shown that government support tends to influence adopters' behaviour intention to adopt e-government (Al-Shafi, 2009; Al Salmi & Hasnan, 2016) and internet banking (Goh 1995; Tan & Teo, 2000; Nasri & Charfeddine, 2012; Rambocas & Arjoon, 2012). Contrary to significant results, Al-Zahrani (2011) asserted that government support did not influence the studied respondents' intention to adopt e-government services. The reason for a non-significant was due to respondents' belief that government is spending less effort to support the spread and use of internet services.

In general, this study assert that if government provides necessary and adequate support as well as encourage rural farmers to use m-government, then the likelihood of rural farmers to adopt m-government services will increases. Based on this fact, this study predicts that:

H1: Government support has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

#### 3.2.1.2. Relationship between Awareness and Rural Farmers' Behavioural Intention to Adopt M-government Services

In this context, awareness is defined as the extent to which rural farmers have enough necessary information about the uses of m-government services in accessing agricultural information provided by the government. As mentioned earlier in the previous sub-topics, it is possible that awareness can create direct and indirect effects on respondents' behavioural intention. The discussion on the awareness effects are segregated into the following sub-topics.

**a) Direct Relationship to Intention**

Various scholars have claimed that creating awareness of an innovation among targeted adopters is considered as the first step in encouraging them to adopt certain technology innovation (AlShishi, 2006; Guiltinand & Donnelly, 1983). If potential adopters have never heard about the innovation technology, there is less likelihood for them to adopt it. Past researchers supported this proposition by showing that, awareness has direct and positive effect on the behaviour intention to adopt the following innovation technologies: (1) e-government (Abdelghaffar & Magdy, 2012; Al-Hujran, 2012; Alshehri & Drew, 2010; Meftah et al., 2015); and (2) internet banking (Mat, 2011; Rambocas & Arjoon, 2012). However, Sohail and Shanmugham (2003) asserted that awareness may not influence the participants' behavioural intention to adopt internet banking if the application of internet technology is not something new to them.

Notwithstanding the online service provided via m-government system, the technology is a relatively new to rural farmers in Tanzania who are generally technology illiterate (Mtega & Ronald, 2013). Providing more information on m-government services through sending SMS, training, publishing posters in rural areas, conducting conferences in rural areas to publicise the uses of m-government in accessing farming information may enable rural farmers to make informed decision and increase their likelihood to adopt m-government. Therefore, this study predicts that:

H2: Awareness has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

**b) Indirect Relationship to Intention through Refined IDT Constructs**

Some scholars have argued that an individual who is aware of certain technology may not necessarily become interested to the innovation if his/her awareness was passively acquired and evaluation of the technology was not activated (Jung, Chan-Olmsted, Park, & Kim, 2012). In other words, developing attitude towards an innovation is considered as an important step in influencing potential adopters to adopt or reject the innovation. Attitude may be formed by how much information has been received by potential adopters and how technology may influence their lifestyle.

Rogers (1983) explained that sufficient information should be given to potential adopters on how specific characteristics of the promoted innovation would benefit users and thereby the potential adopters' likelihood to adopt will increase. Rogers's proposition was supported by several past studies. For

instance, an m-banking study showed that awareness has indirect effect on intention to adopt m-banking systems through PU and PEOE (Mohammadi, 2015). In other words, PU and PEOU could mediate the effect generated by awareness on respondents' behaviour intention to adopt m-banking.

Another study conducted by Noor et al. (2014) also supports the proposition that awareness has significant and positive effects on performance expectancy (relative advantage), effort expectancy (ease of use) and social influences (image) which in turn will motivate the studied respondents' behavioural intention positively. Mashau's (2016) results have further supported the indirect relationship that awareness has indirect influence on behavioural intention through relative advantage and complexity (ease-of-use). However, in Noor et al. (2014) study, awareness and facilitating conditions (compatibility) were not significantly related and therefore facilitating conditions could not mediate the relationship between awareness and behaviour intention.

In this context, adoption of m-government depends on when, how and at what rate the perceived characteristics of m-government information were pervade in rural society. This means by providing more awareness information on various characteristics such as benefits of m-government, availability of m-government, how to use m-government, what are the expected outcome and the need to trial m-government, rural farmers' perception on various aspects on m-government may improve. In other words, perceived characteristics of innovation can mediate the relationship between awareness and behavioural intention to adopt m-government. Thus, this study postulates the following hypotheses:

H2a: Awareness has a positive and direct effect on relative advantage.
H3a: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through relative advantage.

H2b: Awareness has a positive and direct effect on ease-of-use.
H3b: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through ease of use.

H2c: Awareness has a positive and direct effect on compatibility.
H3c: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through compatibility.

H2d: Awareness has a positive and direct effect on image.
H3d: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through image.

H2e: Awareness has a positive and direct effect on result demonstrability.
H3e: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through result demonstrability.

H2f: Awareness has a positive and direct effect on visibility.
H3f: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through visibility.

H2g: Awareness has a positive and direct effect trialability.
H3g: Awareness has a positive and indirect effect on rural farmers' behavioural intention to adopt m-government services through trialability.

#### 3.2.1.3. Relationship between Relative Advantage and Rural Farmers' Behavioural Intention to Adopt M-government Services

In this study, relative advantage shows the extent to which rural farmers perceive that using mobile phone to access farming information provided by government is better than using other available alternatives (Moore & Benbasat, 1991). Previous empirical studies show that relative advantage tends to produce direct and positive effect on respondents' behaviour intention to adopt certain

technologies in the following research areas. (1) m-government services (Almarashdeh & Alsmadi, 2017; Baabdullah, Nasseef, & Alalwan, 2016; Shareef et al., 2012); (2) e-government (Rokhman, 2011; Singh et al., 2008); (3) online shopping (Limthongchai & Speece, 2003); (4) internet banking (Mat, 2011; Rambocas & Arjoon, 2012); (5) mobile banking (Al-jabri & Sohail, 2012; Mohammadi, 2015); and (6) E-learning (Jebeile & Reeve, 2003; Lean et al., 2009; Richardson, 2009).

In contrary, Ahmad and Khalid (2017); Carter and Belanger (2005) and Dastan (2016) found that relative advantage did not influence the adoption of e-government and mobile payment respectively. Possibly, this is because the examined respondents were knowledgeable on the uses of the web and mobile services; therefore, they did not find e-services to be an innovation for them.

In the present study, an m-government service is a relative new technology to rural farmers. Therefore, the current study predicts that relative advantage of m-government such as availability of farming information and advisory services that can be accessible at anytime and anywhere may encourage rural farmers to adopt m-government. Hence, this study predicts that:

H4: Relative advantage has direct and positive effect on the rural farmers' behavioural intention to adopt m-government services.

#### 3.2.1.4. Relationship between Ease-of-use and Rural Farmers' Behavioural Intention to Adopt M-government Services

In this context, ease-of-use is defined as the degree to which m-government service is perceived to require less physical and mental efforts to operate (Davis, 1985). If rural farmers perceive that m-government services are easy to use; their behaviour intention to adopt m-government will tend to increase.

Past empirical studies have shown that, ease-of-use is directly and positively influencing the participants' behavioural intention to adopt the following technologies: (1) m-government services (Almarashdeh & Alsmadi, 2017; Althunibat, Nor, & Sahari, 2011; Baabdullah et al., 2016; Shareef et al., 2012); (2) internet and online banking and Mobile banking (Hanafizadeh, Behboudi, Abedini, Jalilvand, & Tabar, 2014; Mat, 2011).

On the other hand, recent studies have shown that ease-of-use does not statistically influence respondents' behavioural intention to adopt various technologies (Ahmad & Khalid, 2017; Dastan, 2016; Komba-Mlay, 2016). The reason for these non-significant results could be due to the fact that when potential adopters are tech-savvy, complexity of using technology is not considered to be a decisive factor in adoption (Dastan, 2016). Since rural farmers in the present study are not tech-savvy (Misaki, Apiola, & Gaiani, 2016), then having m-government system which requires less physical and mental effort to use is very important. Therefore, this study hypothesises that:

H5: Ease-of-use has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

#### 3.2.1.5. Relationship between Compatibility and Rural Farmers' Intention to Adopt M-government Services

Compatibility in the present study is defined as the degree to which m-government is perceived to be consistent with rural farmers' values, needs and past experience. Past studies indicate that compatibility tends to produce direct and positive impact on participants' behaviour intention to adopt the following technologies: m-government services (Abdelghaffar & Magdy, 2012; Almuraqab, 2017); online banking (Eri, Islam, & Daud, 2011); e-commerce (Limthongchai & Speece, 2003); mobile and internet banking (Mat, 2011; Rambocas & Arjoon, 2012).

However, Shareef et al. (2012) and Wanyoike, Mukulu, and Waititu (2012) contended that, compatibility did not influence intention to adopt m-government and IT respectively. The reason for non-significant result was due respondents' experience on using mobile phone to communicate with government on various issues. Therefore, the researchers did not find compatibility to be an influential factor. In the present study, communication with various government institutions by using mobile technology is a relative new channel to rural farmers, because most of rural citizens are not using their mobile phone to access farming information (Misaki et al., 2016). Therefore, the study proposes that compatibility has a positive impact on behavioural intention to adopt m-government.

H6: Compatibility has direct and positive effect on rural farmers' behaviour intention to adopt m-government services.

#### 3.2.1.6. Relationship between Image and Rural Farmers' Behavioural Intention to Adopt M-government Services

In this study, image reflects the perceived social status that rural farmers may gain upon using m-government services within the rural society (Moore & Benbasat, 1991). Rogers (2003) asserted that social status received from using technology could be the only advantage influencing adopters to accept the technology. This preposition is supported by previous IS empirical studies which have shown that image is significantly influencing adoption of m-government (Liu et al., 2014); e-government (Carter & Belanger, 2003; Lean et al., 2009); and third generation internet technology (Ong et al., 2008). However, other studies have found that image does not influence the adoption of e-government (Carter & Belanger, 2004, 2005; Rokhman, 2011); and e-learning (Jebeile & Reeve, 2003; Richardson, 2009). The reason for non-significant results is as follows. As various related internet technologies were visible or had been used by certain community members, the adoption of the technology thereby was no longer considered as outstanding within their community or enhancing their social status.

Situation in Tanzania rural areas is not similar to the studies cited. Rural farmers who will be using m-government services may benefit in terms of higher social status because the technology is relatively new (Mpogole, Usanga, & Tedre, 2008). Having the ability to access and share latest agricultural information provided by government will make community members to regard m-government users as reliable source of information. Therefore, this study postulates that:

H7: Image has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

#### 3.2.1.7. Relationship between Result Demonstrability and Rural Farmers' Intention to Adopt of M-government Services

Result demonstrability in this context is defined as the extent to which the outcomes produced from using m-government services are tangible and communicable among rural farmers' communities. Earlier IS empirical studies show that result demonstrability is direct and positive influencing adopter's behavioural intention on the following technologies: (1) e-learning (Jebeile & Reeve, 2003; Richardson, 2009); (2) information technology (Agarwal & Prasad, 1997); and (3) online banking (Njuguna, Ritho, Olweny, & Wanderi, 2012; Van Slyke, Comunale, & Belanger, 2002). However, other past researchers found that if technology is not considered to be new, result demonstrability may not be considered to be an influential factor for technology adoption (Akturan & Tezcan, 2010; Karahanna et al., 1999; Moore & Benbasat, 1996).

Since m-government is a relatively new technology in Tanzania rural areas, rural farmers are most likely to have the tendency of evaluating the benefits that could be gained from using m-government before accepting or rejecting the service. Thus, this study hypothesises that:

H8: Result demonstrability has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

#### 3.2.1.8. Relationship between Visibility and Rural Farmers' Behavioural Intention to Adopt M-government Services

In this study, visibility is defined as the degree to which m-government is noticeable within the rural farmers' community. Visibility is considered as an influential factor because it enables potential adopters to evaluate the usefulness of the technology before adoption (Karahanna et al., 1999). The positive and significant relationship between visibility and behavioural intention had been shown in the following research areas: information technology (Agarwal & Prasad, 1997); and e-learning (Jebeile & Reeve, 2003; Richardson, 2009). On the other hand, visibility was not found to be a predictor factor on intention to adopt third generation internet technology (Ong et al., 2008) and internet banking (Njuguna et al., 2012). This is because respondents of the latter research were familiar with internet usage; therefore, they did not find visibility to be an important factor for them to adopt.

In Tanzania, the concept of m-government services is relatively new to rural farmers, as the system is not used in many rural areas due to various technology and non-technological barriers. When rural farmers have seen or observed other local community members using m-government, their interest to acquire knowledge about m-government and its benefits may develop; as a result, this may increase their likelihood to adopt m-government services as well. Therefore, this study predicts that:

H9: Visibility has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

#### 3.2.1.9. Relationship between Trialability and Rural Farmers' Behavioural Intention to Adopt M-government Services

Trialability shows the extent to which rural farmers can test m-government services within a given period so that they familiarise themselves with the system. Several IS empirical researches have shown that trialability tends to influence participant's behavioural intention to adopt the following technology: information technology (Agarwal & Prasad, 1997); mobile marketing (Tanakinjal, Deans, & Gray, 2010); and e-learning (Kee, Omar, & Mohamed, 2012; Richardson, 2009).

However, significant relationship was not found by Al-jabri and Sohail (2012); and Rambocas and Arjoon (2012) in their study of e-banking; and Wanyoike's et al. (2012) study on adoption of e-commerce among small and medium enterprises. The reason for these non-significant results was related to the respondents' ICT knowledge, as they were tech-savvy with high degree of competence in using internet and computers. Thus, they may not have responded to the trialability opportunity. Several past IS studies also acknowledged that when user has some knowledge or experience on the relative technology, opportunity to try the technology may not influence the person's behavioural intention to adopt it (Murphy, 2005; Rogers, 2003).

In Tanzania, rural farmers have very little knowledge or may not have experienced m-government services before. Therefore, giving them an opportunity to try m-government applications may reduce their uncertainties

level and thereby their likelihood to adopt m-government services will tend to increase. This led the present study to postulate that:

H10: Trialability has direct and positive effect on rural farmers' behavioural intention to adopt m-government services.

## 3.3 Measurements of the Current Research's Constructs

The measurement items used in this study were extracted from previous behavioural studies in different information technology contexts as shown in Table 3.1. Using measurement items from different studies tends to reduce bias that could be generated by using one source for all items (Eichhorn, 2014). The present study selected 45 measurement items. The measurement items in each construct were used to design the current study's questionnaire. A more explanation on the questionnaire designed is given in section 3.6.1 of this study.

**Table 3.1: Measurement Items Used in the Current Study**

| Constructs /Code | Measurement Items |
|---|---|
| Government Support (GS) | |
| GS1 | Tanzania government endorses dissemination of farming information to rural area via mobile phone in all government institutions [f h]. |
| GS2 | Tanzania government is active in setting-up relevant facilities such as mobile phone infrastructures so that people can gather farming information via their mobile phone [f h] |
| GS3 | Tanzania government promotes the uses of mobile phone in disseminating farming information in rural areas [f g h]. |
| GS4 | The government regulations and laws related to the use of mobile phone in accessing government's farming information could make me feel comfortable [g k]. |
| GS5 | The government's current efforts is making me feeling comfortable in using the mobile phone to access the government's farming information [f h] |
| Awareness (AW) | |
| AW1 | I am aware of available mobile systems used by the government to distributed farming information to Tanzania rural areas [b] |
| AW2 | I receive enough information about using mobile phone to access farming information provided by government [b m n]. |
| AW3 | I am aware of the benefits that can be generated by using mobile phone in accessing farming information provided by government [m n]. |
| AW4 | I have come across campaigns or advertisements for using mobile phone to access farming information provided by government in rural areas [b]. |
| AW5 | I am aware of the education/training programs on ways to use mobile phone to access farming information provided by government [b] |
| Relative Advantage (RA) | |
| RA1 | Using mobile phone would enable me to access farming information provided by the government more quickly [a b] |
| RA2 | Using mobile phone would require less effort to access farming information provided by the government [c d] |
| RA3 | Using mobile phone would enhances my effectiveness in accessing farming information provided by the government [a c d e]. |
| RA4 | Using mobile phone would enable me to access farming information provided by government anytime, anywhere [a c e] |
| RA5 | I think using mobile phone would be less costly to me when accessing farming information provided by government [b]. |
| Ease-of-Use (EOU) | |
| EOU1 | It would be easy for me to remember how to use mobile phone to access farming information provided by government [a c d e l]. |
| EOU2 | I believe that interacting with government to access farming information over mobile phone would be clear and understandable [a c d e]. |
| EOU3 | I believe it would be easy for me to get mobile farming applications provided by the government to do what I want to do [c] |
| EOU4 | It would be easy for me to learn how to use mobile phone to access farming information provided by government [b c d e]. |
| EOU5 | I believe that using mobile phone to access farming information would be ease to me [a l]. |

*Table 3.1 continue next page*

| Constructs /Code | Measurement Items |
|---|---|
| Compatibility (CMP) | |
| CMP1 | Using mobile phone would fit well with the way I want to access farming information provided by the government [a b c d e]. |
| CMP2 | Using mobile phone to access farming information provided by government would be appropriate to me [c d e] |
| CMP3 | Using mobile phone to access farming information provided by government would fit well into my lifestyle [a b c d]. |
| CMP4 | Using mobile phone to access farming information provided by government would be compatible with how I like to do things [a b c d e]. |
| CMP5 | Using mobile phone to access farming information provided by the government would fulfil my needs [b] |
| Image (IMG) | |
| IMG1 | I think people who use the mobile phone to access farming information provided by government are considered to be trendy [d e]. |
| IMG2 | Accessing government's farming information over mobile phone would enhance my social status [a c d e l]. |
| IMG3 | I think people who are using mobile phone farming information provided by government are perceived as an important person in their society [c d] |
| IMG4 | I think people who use the mobile phone to access farming information provided by government have high profile [d e]. |
| IMG5 | I think people who use mobile phone to access farming information provided by government are more respected in their society [a c d e l] |
| Result Demonstrability (RD) | |
| RD1 | I would have no difficult telling others about the results of using mobile phone to access farming information provided by government [a h l]. |
| RD2 | I believe I could communicate to others the consequence of using mobile phone to access farming information provided by the government [a h l]. |
| RD3 | The results of using mobile phone to access farming information provided by the government are apparent to me [a] |
| RD4 | I would have no difficulty explaining why using mobile phone to access farming information provided by government may or may not be beneficial [a h l]. |
| Visibility (VS) | |
| VS1 | I have seen people in my village using their mobile phone to access farming information provided by government [a h l]. |
| VS2 | In my village, one can easily see other people using mobile phone to access farming information provided by government [a h l] |
| VS3 | I have seen people in other villages using their mobile phone to access the government's farming information [a]. |
| VS4 | It is easy for me to observe how others are using mobile phone in my village to access farming information provided by government [a]. |
| Trialability (TR) | |
| TR1 | Before deciding to use mobile phone to access farming information provided by government, I would want to try it to see what it can do [a f h l] |
| TR2 | I would want to try using mobile phone systems to access farming information provided by government long enough to get familiar how it works and the benefit to be acquired [f j l]. |

*Table 3.1 continue next page*

| Constructs /Code | Measurement Items |
|---|---|
| TR3 | I would use mobile phone to access farming information provided by the government if I would be involved in pilot test [a] |
| Behavioural Intention (BI) | |
| BI1 | In future, I intend to use mobile phone to access farming information provided by government [d p] |
| BI2 | I would use mobile phone to obtain relevant farming information provided by the government that is useful to me [d p] |
| BI3 | I would recommend other people to use the mobile phone to access farming information provided by government [d p] |
| BI4 | I would use the mobile phone to access various information provided by the government [d p] |

| Sources | | |
|---|---|---|
| | [a] Moore and Benbasat (1991) | [k] Ramanathan, Ramanathan, and Ko (2014) |
| | [b] Shareef et al. (2011) | [l] Karahanna, Straub, and Chervany (1999) |
| | [c] Rokhman (2011) | [m] Al-Somali, Gholami, and Clegg (2009) |
| | [d] Carter and Bélanger (2005) | [n] Mat (2011) |
| | [e] Carter and Bélanger (2003) | [p] Nasri and Charfeddine (2012) |
| | [f] Tan and Teo (2000) | |
| | [g] Lin and Ho (2009) | |
| | [h] Rambocas and Arjoon (2012) | |
| | [j] Al-jabri and Sohail (2012) | |

## 3.4 Research Philosophy and Approach

The current study's main objective is to develop m-government adoption model that will be used to increase the acceptance of m-government services in Tanzania rural areas. To attain this objective, data collection were conducted only once within a period of three months to collect sample data which were used to examine the relationships between the variables in the present study. The study adopted cross-sectional design instead of longitudinal design that is mostly focusing on studying the behavioural changes over a long period.

In social science, different research philosophies are used to explain social realities and how research has to be conducted to investigate such reality. The mostly applicable philosophies in social science studies include positivism,

constructivism and post-positivism and they are distinguished based on their assumptions used on conducting the research (Babbie, 2004). Positivism assumes that the truth can only be revealed by observing and measuring facts with theories that uses empirical scientific methods. This paradigm depends on laws and rules of causation to predict the truth (Creswell, 2013). Positivism paradigm start with theory in order to establish the truth (O'Leary, 2004). The observation collected is considered to be quantifiable, and therefore statistically analysed.

Constructivism paradigm criticises the methodologies used to reveal the truth in positivism. Constructivism depicts that the truth can only be constructed by considering participant views on the issue being investigated. This paradigm believes that each individual has his/her own perception which can be used to create the truth and therefore, the truth in this paradigm is considered to be subjective (Martens, 2005). Unlike positivism which begin with theory, constructivism develop a theory through the research process (Creswell, 2013).

Postpositivism modifies positivism assumptions by showing that only theories and scientific methods are not adequate to uncover the truth. Instead, theories with scientific methods and background, knowledge and values of the researchers should be used in combination to uncover the truth. This suggests that postpositivism paradigm depends on mixed methods for prediction and explanation of the reality (Creswell, 2013).

The present study is based on pre-determined conceptual model and hypotheses, questionnaire which employed close-ended questions and generalisation of sample results by using statistical inferences only. This means, this study is a deductive research in nature and therefore, the study follows positivism philosophy. Positivism philosophy permits the researcher to conduct large-scale survey that can uncover the relationship between the variables of interest.

Various research approaches namely qualitative, quantitative and mixed method may be used in collecting and analysing research data (Creswell, 2013). Selection of an appropriate research approach to be used depends on the study's main objective. This study examines factors that could influence rural farmers' behavioural intention to adopt m-government services by using empirical methods. Creswell (2003) explained that, quantitative approach is an appropriate method in understanding the significant predictors of the outcome. Therefore, aligning with main objective of this study, quantitative approach is adopted to collect the required sample data, apply different statistical based methods to analyse sample data and produce results which are to be generalised to the rural farmers population (Onwuegbuzie & Collins, 2007).

## 3.5 Sample Design

### 3.5.1 Survey Location

Location of the present study was Tanzania mainland rural areas only. This is because about 97% of total population lives in mainland and only 3% of them lives in Tanzania Zanzibar (URT, 2013c). In addition, statistics from Revolution

Government of Zanzibar (RGZ) shows that, most of the people in Zanzibar deals with services sector instead of agricultural sector (RGZ, 2010). Therefore, to incorporate respondents from Zanzibar could distort the quality of the research findings.

Only rural areas were considered in Tanzania mainland because 70.9% of Tanzania population lives in remote and rural areas of which 76.8% are considered to be rural farmers (URT, 2013c). Including urban areas could result into heterogeneous respondents, and thus distorting the quality of this study. This is because agricultural information is easily accessible in urban areas due to availability of various sources of information (Temu, Nyange, Mattee, & Kashasha, 2005). In addition, most of urban citizens are non-farmers; therefore incorporating respondents from urban areas could distort the research findings.

Tanzania mainland is divided into zones, regions, districts, divisions, wards and streets or villages. Wards in Tanzania are categorised as rural wards, urban-rural (mixed) wards, and urban wards. Therefore, ward was used in the present study as criteria for selection of required research areas. Research data were collected in villages found in rural wards because compared to urban wards, farmers in rural wards have difficultness in accessing agriculture farming information due to inadequate communication infrastructures (Temu et al., 2005).

### 3.5.2 Target Population

The present study's population constitutes of farmers living in Tanzania rural areas. According to Tanzania basic demographic and social economic profile statistics, rural farmers are about 8,655,022 which makes 76.8% of the rural working age population (URT, 2014). Rural farmers were considered in this study because they are the main producers in Tanzania who contribute largely on growth domestic product, and that they are the one who feed the nation (Amani & Mkumbo, 2012). Therefore, improving the rural farmers' wellbeing has to be given top priority.

Rural farmers have limited access to public services including farming information (URT, 2013a). As a result, they keep on using old farming methods and practise subsistence farming that limits their productions and agribusiness (Salami et al., 2010). Therefore, improving their productivity and accessibility to better market, timely accessibility of required agricultural information would become thereby an important initiative. One of the ways to disseminate agricultural information is through the application of m-government services. In addition, adoption of m-government will serve as a communication platform for rural farmers to interact with government for various issues such legal, health, education and other business services related to their daily operations.

The main characteristics of the targeted respondents were: (1) rural farmers aged between 15 to 64 years old as this is a working age group that is actively involved in Tanzania economic activities (URT, 2013b). (2) Read and write in

either Swahili or English as these are official communication languages in Tanzania. (3) Those who had not yet adopted m-government services because the number of users among rural population is considered to be very marginal. Therefore, the present study intends to examine what could motivate behavioural intention of non-users of m-government services.

### 3.5.3 Sample Size

Determining optimum sample size is very important as it provides the mechanism to reduce cost and minimise time meanwhile producing accurate sample result that can be used in making inference to the population (Lenth, 2001). Furthermore, optimum sample size generates adequate statistical power which can correctly estimate the relationships between the variables of interest (Wolf et al., 2013). Various methods such as imitating sample size from similar studies, using published tables, and applying mathematical formulas are used in determine adequate sample size (Singh & Masuku, 2014).

This study applied mathematical formula to determine the sample size because applying the other two methods could have led to inheriting errors done by previous studies when determine their sample size or could have overestimated or underestimated the sample size (Singh & Masuku, 2014).

When mathematical formula is applied, the researcher should clearly consider if the population of interest is finite or infinite (Israel, 1992). Since the present study population (rural farmers) size was known, then, Yamane's (1967) sample

size formula which is based on finite population was found to be ideal (see equation 1). The formula assumes that the population is homogeneous and it is normally distributed. Furthermore, the formula requires the confidence interval to be 95% but also the sample elements to be drawn randomly (Yamane, 1967).

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where

N = Population size

n = Sample size

e = Acceptable sampling error

To meet the assumptions of the sample size's formulation, the present study was conducted in Tanzania rural areas where the farmers in the target areas have similar (homogeneous) characteristics. In details, selected farmers (respondents) live in rural areas that have limited access to public services and information. Also to increase the homogeneity of respondents, those selected were aged within 15 to 64 years which is a working group in Tanzania (URT, 2012). To reduce the sampling error (e) in the present study, respondents were randomly drawn from selected households.

Selection of confidence interval that could produce a true value of the parameters with relative optimum sample size while considering cost implication factor was of concerned in the present study. Walker and Maddan (2011) explained that either 95% or 99% confidence is acceptable in the social science studies. Although achieving 99% confidence is ideal because it provides

larger confidence interval that may contain a true population value very large sample size may be required to estimate the required parameters. Therefore, 95% confidence was adopted in the present study because it gives the best trade-off between the accuracy of the produced results and the available research budget. Since the rural population meets all Yamane's sample size formula assumptions, therefore, Yamane formula was used to calculate the sample size as shown in equation 2.

According to Tanzania Basic Demographic and Social Economic Profile statistics of 2014, the total number of rural farmers aged between 15 to 64 years is 8,655,022 (URT, 2014). This figure was used as the population size in the present study. Substituting all variables into Yamane's formula presented in equation 1, the optimal sample size required was approximated to be 400 rural farmers as shown in equation 2.

$$n_0 = \frac{8655022}{1 + 8655022 \ *(0.05)^2} = 399.9 \approx 400 \text{ Rural farmers} \quad (2)$$

Where $n_0$ is a number of sample size used in this study

### 3.5.4 Sampling Technique

A representative sample of rural farmers' population was selected from representative areas of Tanzania mainland. To select valid sample, stratified and multistage sampling techniques were employed. Firstly, stratified technique was employed to capture major variation instead of having common identity

respondents in the selected sample of the population (Meng, 2013; Teddlie & Yu, 2007). To ensure selected sample represent all rural farmers' population, the present study used existing geographical zones in Tanzania mainland namely coastal zone, lake zone, central zone, northern zone, and southern-highland zone. Each zone accommodates different number of regions that have similar economic activities, farming seasons and similar geographical environments. These zones were considered as strata in the present study.

Secondly, multistage sampling was applied in each stratum to select units of interest. This is because targeted respondents were scattered in all regions and there was no exhaustive list of all rural farmers in each zone as well as in each region. Thereby, selecting respondents could be very difficult and expensive if multistage sampling technique was not employed (Mathers et al., 2007; Shimizu, 2005). Therefore, multistage cluster sampling was applied to create various stages and select units of interest from region, district, ward, and village levels. The following sub-sections explain how multistage sampling was conducted to select units of interest in each level.

#### 3.5.4.1. Selection of Regions (Level 1)

In each zone (stratum), only regions with more than half of the rural wards were considered to make a region sample frame list. This is because public services including farming information are inaccessible or are very limited in regions with high number of rural wards (Temu et al., 2005). Since all regions in the sample frame list were considered as homogeneous in terms of difficultness in

public services and information accessibility, then simple random method was used to select one region from the list. A proportional stratified sampling technique was used to get the number of respondents (sample size) required in each selected region. This technique maintains proportional sample size for respectively stratum based on its population size (Fottrell & Byass, 2008).

#### 3.5.4.2. Selection of Districts (Level 2)

In each selected region, only districts with more than half of wards categorised as rural ward were considered to make a district sample frame list. Since all districts in the sample frame list were considered as homogeneous in terms of difficultness in public services and information accessibility, then only one district was randomly selected.

#### 3.5.4.3. Selection of Rural Wards (Level 3)

Each selected district may consist of rural ward(s), rural-urban (mixed) ward(s), and urban ward(s). In each selected district, only rural wards were considered to make a ward sample frame list. Furthermore, all rural wards with access to public ICT facilities such as telecentres and internet café were not considered in the sample frame. Since all rural wards in sample frame were considered as homogeneous in terms of accessibility on public services and information then only one ward was randomly selected.

#### 3.5.4.4. Selection of Villages and Households (Level 4)

In each selected ward, all villages were considered to make a village sample frame list. In this case, all villages were considered to have common characteristics because they are in the same ward where accessibility of services and information were considered to be limited, then, only one village was randomly selected.

List of households on the selected village was found from village main office. In a situation where list of households was not found in the village office or found to be too old, listing of households or updating the existing list was done with assistance from village leaders. The list was used as household sample frame list. The households to be visited were randomly selected from the list (the required number of households per village were computed from proportionate sampling as presented in sub section 3.5.4.1).

#### 3.5.4.5. Respondent Selection within Household (Level 5)

Selection of respondent within the household needs to be careful undertaken to avert biases (Gaziano, 2005; Kumar, 2013; Yan, 2009). Different probability methods such as Kish, birthday and age-order have been considered to produce random selection in order to avoid bias estimates (Gaziano, 2005; Kumar, 2013). However, these methods are time consuming but also they may increase nonresponses by not getting cooperation from the selected respondents if they are not properly applied (Gaziano, 2005). The current study selected respondent from eligible household members who were accessible at a time of visit. The

procedure was done by using age-order technique as proposed by Kumar (2013). In this procedure, all eligible household members who were currently available and ready to participate were listed down in ascending order of their age. Random numbers from one to the total number of eligible members listed down were generated and one number was randomly selected. A member corresponding to the selected number was then considered to be the designated respondent to respond to the questionnaire (Gaziano, 2005; Kumar, 2013).

## 3.6 Questionnaire Development and Data Collection Methods

### 3.6.1 Questionnaire Design

Closed-ended questions were used to design the survey instrument used in the current study. Table 3.1 presents the measurement items used in the current study. All measurement items were adapted from previous IS related studies as shown in section 3.3 and modified to suite the present study.

Likert scale was adopted because it is very easy for respondents to answer and easy way to measure respondent's opinion (de Winter & Dodou, 2010). Lehmann and Hulbert (1972) recommended the use of 5 or 7 point Likert scale in behaviour studies because they provide good balance between their benefits and costs. Furthermore, 7-point Likert scale is presumed to be more accurate than 5-points Likert scale in capturing participants' opinion because it produces large variance due to the availability of more options (Dawes, 2008; Finstad, 2010).

However, 7-point Likert is criticised for having more administration cost and may result into large number of missing values due to respondents' fatigue resulting from the presence of too many choices (Lehmann & Hulbert, 972). As most of Tanzania rural citizens are less educated; the use of 7-point Likert scale would be difficult for them to differentiate the available options, but also some options may be skipped due to fatigue and therefore may result in more missing values. Therefore, the present study adopted 5-point Likert-scale which ranges from (1) Strongly Disagree (2) Disagree (3) Neither (4) Agree (5) Strongly Agree.

#### 3.6.1.1. Experts' Questionnaire Review

To improve the quality of the questionnaire, a translational validity was conducted by six (6) experts who are academicians and industrial field experts as proposed by Lynn (1986). A selection of academicians was based on their research experiences on e-government and m-government studies (Sangoseni, Hellman, & Hill, 2013). Industrial experts were selected from Tanzania government institutions based on their experiences and expertise on e-government and m-government projects.

Each expert conducted face validity and content validity by rating each item using 4-point Likert scale (1-not relevant, 2-somewhat relevant, 3-relevant and 4-very relevant). Four-point Likert scale with no mid-point was used because the use of Likert scale with mid-point may result on ambivalent mid-points

which may cause ambiguity in interpretation (Polit & Beck, 2003). Appendix A shows a questionnaire used for face and content validity.

Content validity index (CVI) which is a recommended method in analysing the content validity of measurement item was adopted in the present study (Lynn, 1986; Polit, Beck, & Owen, 2007). CVI shows that an item with content validity index (I-CVI) value less than 0.78 is irrelevant and should be dropped (Lynn, 1986). The I-CVI value is computed by taking number of all experts who completely agree on the relevance of the item (rated item as 3 or 4) divide by number of total experts. Based on this condition, Table 3.2 shows that items 20 and 41 did not attain the required I-CVI threshold; therefore, they were deleted.

## Table 3.2: Item Content Validity Index Results

| | | Experts Rating | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Items** | **Code** | **Exp1** | **Exp2** | **Exp3** | **Exp4** | **Exp5** | **Exp6** | **No. of Agree.** | **I-CVI** |
| **Item 1** | RA1 | 4 | 4 | 4 | 4 | 4 | 3 | 6 | 1.00 |
| **Item 2** | RA2 | 1 | 4 | 4 | 3 | 3 | 4 | 5 | 0.83 |
| **Item 3** | RA3 | 4 | 4 | 4 | 4 | 4 | 3 | 6 | 1.00 |
| **Item 4** | RA4 | 4 | 4 | 4 | 4 | 3 | 3 | 6 | 1.00 |
| **Item 5** | RA5 | 4 | 4 | 4 | 3 | 4 | 4 | 6 | 1.00 |
| **Item 6** | CMP1 | 4 | 3 | 4 | 3 | 3 | 4 | 6 | 1.00 |
| **Item 7** | CMP2 | 3 | 4 | 3 | 4 | 4 | 4 | 6 | 1.00 |
| **Item 8** | CMP3 | 4 | 4 | 3 | 4 | 1 | 3 | 5 | 0.83 |
| **Item 9** | CMP4 | 4 | 3 | 4 | 3 | 3 | 4 | 6 | 1.00 |
| **Item 10** | CMP5 | 4 | 4 | 4 | 4 | 3 | 3 | 6 | 1.00 |
| **Item 11** | IMG1 | 3 | 2 | 3 | 3 | 4 | 3 | 5 | 0.83 |
| **Item 12** | IMG2 | 4 | 2 | 4 | 4 | 4 | 3 | 5 | 0.83 |
| **Item 13** | IMG3 | 3 | 2 | 3 | 4 | 4 | 4 | 5 | 0.83 |
| **Item 14** | IMG4 | 4 | 2 | 4 | 3 | 3 | 4 | 5 | 0.83 |
| **Item 15** | IMG5 | 3 | 2 | 3 | 4 | 3 | 4 | 5 | 0.83 |
| **Item 16** | EU1 | 3 | 2 | 4 | 3 | 4 | 4 | 5 | 0.83 |
| **Item 17** | EU2 | 4 | 1 | 4 | 4 | 4 | 3 | 5 | 0.83 |
| **Item 18** | EU3 | 4 | 2 | 4 | 4 | 4 | 3 | 5 | 0.83 |
| **Item 19** | EU4 | 3 | 2 | 4 | 3 | 3 | 4 | 5 | 0.83 |
| **Item 20** | EU5 | 4 | 2 | 2 | 3 | 4 | 4 | 4 | 0.67** |
| **Item 21** | RD1 | 3 | 2 | 4 | 4 | 4 | 4 | 5 | 0.83 |
| **Item 22** | RD2 | 4 | 3 | 4 | 4 | 4 | 3 | 6 | 1.00 |
| **Item 23** | RD3 | 4 | 3 | 3 | 3 | 2 | 3 | 5 | 0.83 |
| **Item 24** | RD4 | 3 | 2 | 3 | 4 | 4 | 3 | 5 | 0.83 |
| **Item 25** | VS1 | 4 | 2 | 3 | 4 | 4 | 4 | 5 | 0.83 |
| **Item 26** | VS2 | 3 | 2 | 4 | 3 | 3 | 4 | 5 | 0.83 |
| **Item 27** | VS3 | 4 | 2 | 4 | 3 | 4 | 4 | 5 | 0.83 |
| **Item 28** | VS4 | 3 | 2 | 4 | 4 | 3 | 4 | 5 | 0.83 |
| **Item 29** | TR1 | 4 | 4 | 3 | 4 | 4 | 4 | 6 | 1.00 |
| **Item 30** | TR2 | 3 | 4 | 3 | 4 | 4 | 4 | 6 | 1.00 |
| **Item 31** | TR3 | 4 | 4 | 3 | 4 | 2 | 3 | 5 | 0.83 |
| **Item 32** | AW1 | 3 | 2 | 4 | 3 | 4 | 4 | 5 | 0.83 |
| **Item 33** | AW2 | 3 | 2 | 3 | 4 | 3 | 4 | 5 | 0.83 |
| **Item 34** | AW3 | 4 | 3 | 4 | 3 | 4 | 4 | 6 | 1.00 |
| **Item 35** | AW4 | 4 | 2 | 4 | 4 | 4 | 3 | 5 | 0.83 |
| **Item 36** | AW5 | 4 | 2 | 3 | 4 | 4 | 4 | 5 | 0.83 |
| **Item 37** | GS1 | 4 | 2 | 4 | 4 | 4 | 4 | 5 | 0.83 |
| **Item 38** | GS2 | 4 | 3 | 3 | 3 | 4 | 3 | 6 | 1.00 |
| **Item 39** | GS3 | 4 | 2 | 4 | 3 | 4 | 4 | 5 | 0.83 |
| **Item 40** | GS4 | 4 | 2 | 4 | 3 | 4 | 4 | 5 | 0.83 |

*Table 3.2 continue next page*

| | | Experts Rating | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Items** | **Code** | **Exp1** | **Exp2** | **Exp3** | **Exp4** | **Exp5** | **Exp6** | **No. of Agree.** | **I-CVI** |
| **Item 41** | GS5 | 2 | 2 | 3 | 4 | 4 | 4 | 4 | 0.67** |
| **Item 42** | BI1 | 3 | 3 | 4 | 3 | 4 | 3 | 6 | 1.00 |
| **Item 43** | BI2 | 4 | 4 | 3 | 4 | 4 | 4 | 6 | 1.00 |
| **Item 44** | BI3 | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 1.00 |
| **Item 45** | BI4 | 4 | 4 | 4 | 4 | 4 | 4 | 6 | 1.00 |

Where: Exp: Expert; ** item deleted due to low I-CVI (< 0.78)

In addition, experts provided their opinions on face validity that include feasibility, consistency of style and formatting, readability, and clarity of language that were further used to improve the clarity of the questionnaire. After deletion of the two items, 43 items were taken as relevant and used in developing the questionnaire for subsequent stages of this study.

#### 3.6.1.2. Translation of Instrument

Due to the fact that most of the rural farmers in Tanzania are non-English speakers, the validated English questionnaire (see Appendix C) was translated to Swahili to enable clear communication to rural farmers. Two independent linguistic experts from two different departments that deal with communication skills in public academic institutions in Tanzania did the translation from English to Swahili language.

The two translated versions were further cross-checked with assistance of Swahili language expert and finally, a more improved Swahili questionnaire version was generated. To examine the accuracy of the Swahili questionnaire, conversional back-translation method was used by asking another independent

language translator who is unaware of the research context and the original English questionnaire to translate the Swahili version back to English as proposed by Brislin (1970). The two English questionnaires were finally compared and minor changes were made on Swahili questionnaire version to ensure the final Swahili version is equivalent to the original English questionnaire version. Based on these procedures, a final Swahili questionnaire was developed (see Appendix D).

### 3.6.2 Administering the Questionnaires

#### 3.6.2.1. Data Collection Methods

Different methods such as mailed, web and internet, telephone and face-to-face are mostly applied in data collection when survey technique is employed (Converse et al., 2008; Dillman et al., 2009). Among these methods, mailed, web and internet and telephone are considered to be cost-effective, as they reach a large number of respondents and speed up the data collection process (Millar & Dillman, 2011). However, these methods are vulnerable to large non-response rate and responses from unintended respondents (Converse et al., 2008). Furthermore, given the nature of the current respondents and location of the study, mailed, web and internet and telephone methods were not feasible. Applying any of these methods could cause ambiguities in data collection. Therefore this study adopted Drop-Off/Pick-Up (DOPU) method for distributions of questionnaire.

DOPU method is appropriate in data collection particularly in rural areas (Allred & Ross-Davis, 2011). The method enables the researcher to meet with required respondents during hand-delivering of the questionnaire and return later for collection (Trentelman et al., 2016). It also enables the researcher to determine eligibility of getting feedback (Allred & Ross-Davis, 2011). Furthermore, the method returns high response rate, because it allows multiple call-back attempt to the selected household which can improve the response rate (Brehm, Eisenhauer, & Krannich, 2006; Trentelman et al., 2016).

Since this study was conducted in rural areas where rural farmers are very busy during day time, using DOPU method was ideal because it provided flexibility for rural farmers to respond to the questionnaire (Steele et al., 2001). Respondents were given a maximum of two days to respond to the questionnaire. During questionnaire collection, multiple call-backs were conducted to ensure that all questionnaires were collected.

#### 3.6.2.2. Research Facilitators

Two (2) research facilitators were deployed to assist the principal researcher in distribution and collection of questionnaires. The facilitators were university graduates who had survey based research knowledge. They were recommended by research department at the Institute of Finance Management. The facilitators were trained to enhance their research knowledge on the current research area such as importance and advantages of m-government services; ethical issues required during data collection and handling of respondents' inquiry.

Furthermore, both facilitators were first deployed in pre-test and pilot studies as part of training for them to gain more practical understanding and experience before the main survey.

#### 3.6.2.3. Data Collection Period

Data used for pre-testing and pilot were collected from October 2015 to December 2015. Main survey data were collected from March to May 2016, most of the rural farmers were not busy as they were waiting for harvesting season which is mostly at peak on June (Abass et al., 2014). Questionnaires were distributed from 1300 hrs to 1700 hrs. This is because rural farmers may be engaging in farming activities in the early morning up to 1200 hrs. After 1700 hrs, most of rural citizens attend different social gathering and other domestic activities. Therefore, it was difficult to get them in their household out of the specified time.

When the researcher/facilitators visited the household for the first time and did not find any household member or found only unqualified members, then next visit to the household was planned as recommended by Jackson-Smith et al. (2016). As eligible member (s) were found available, an oral explanation on the survey was given and participation eligibility were provided in order to have a list of eligible and ready members to participate. One member was further selected by using age-order procedure to respond to the questionnaire. A self-completion questionnaire (with all instructions) was left to the selected respondent who was unable to complete the questionnaire at a time. Prior

arrangement was made on particular time (within two days) to pickup a completed questionnaire as suggested by Jackson-Smith et al. (2016). When a completed questionnaire was not found at the agreed pickup time, then possible multiple call-back were conducted to collect the questionnaire.

### 3.6.3 Pre-Test and Pilot Study

#### 3.6.3.1. Questionnaire Pre-testing

In making effort to ensure that the questionnaire was clear to rural farmers, a declared pre-test was conducted. A declared pre-testing assists to check the clarity and understanding of questionnaire instructions and questionnaire wording and layout (Ticehurst & Veal, 2000). Pre-testing study was conducted in only one zone. Procedures presented in sub-section 3.5.4 of this chapter were used in selecting rural farmers to be involved in pre-testing the questionnaire. Therefore, Pwani Region, Kibaha District, Viziwaziwa ward, and Sagale village were selected.

A list of 111 households was accessed from Sagale village main office. A pre-test survey was administered by selecting 40 households randomly; one respondent was randomly selected per household to respond to the questionnaire. Respondents were required to fill in the questionnaire and explain their reactions on the questionnaire instructions, items, format, wording and any existing ambiguities.

Only 37 questionnaires were collected and were considered to be adequate for pre-testing since it is more than 30 which is the recommended sample size (Perneger, Courvoisier, Hudelson, & Gayet-Ageron, 2015). Minor ambiguities were identified by respondents in understanding the questionnaire instructions and items. For instance, most of the respondents showed their concern in understanding some technical Swahili words. Therefore, minor corresponding modifications were made to fix the identified issues, and finally an improved questionnaire was generated.

#### 3.6.3.2. Pilot Study

Pilot study was conducted to enhance the validity of the indicators in each factor (construct) by using exploratory factor analysis (EFA) (DeVon et al., 2007). This is because the items used in this study were borrowed from previous studies and customised to fit this study. Therefore, to examine the indicators' validity, EFA procedure was used to establish if the indicators do or do not amount to the corresponding factor (Straub, 1989).

Sampling procedures presented in sub-section 3.5.4 of this chapter were used to select respondents in each selected village. Conducting pilot study using similar procedures to be used in main survey tends to produce realistic results as it uncover political, social and practical problems which may cause the research to fail (Van Teijlingen & Hundley, 2002). Pilot study was administered by using questionnaire with 43 items (see Appendix D). As shown in Table 3.3, 200 questionnaires were distributed to five regions, one region from each zone.

**Table 3.3: Pilot Study Sample Size According to the Selected Regions**

| Region | Farmers Population | District | Ward | Village | Quest. dist. | Prop (%) |
|---|---|---|---|---|---|---|
| Dodoma | 621,747 | Chamwino | Buigiri | Chinangali | 62 | 31 |
| Iringa | 299,829 | Iringa RD | Mseke | Wenda | 30 | 15 |
| Kilimanjaro | 459,095 | Moshi RD | Makuyuni | Lotima | 46 | 23 |
| Pwani | 284,543 | Mkuranga | Kiparang'anda | Kiparang'anda B | 28 | 14 |
| Shinyanga | 345,480 | Shinyanga RD | Lyamidati | Ihugi | 34 | 17 |
| **Total** | **2,010,694** | | | | **200** | **100** |

Where RD: Rural District; Quest. dist.: Questionnaire distributed; Prop: Proportionate

One hundred and eight nine (189) questionnaires which makes 94.5% response rate were collected from respondents. The data were managed and analysed by using IBM SPSS Statistics. Data screening was conducted to check for missing values, the result reveals that 17 responses (8.9%) were having missing values problem. A minimum of 40% to 70% values were not answered in seven case. The plausible reason for these missing values could be due to limited time of respondents. Therefore, all seven cases were discarded (Hair et al., 1998). The remaining 10 cases were having small number of unanswered values in each case which were analysed and found to have non-significant effect ( $\chi^2$ (418) = 408.2, $\rho$ = 0.625), this means the missing values are randomly missing. All missing values were replaced by using expectation maximization algorithm. Therefore, a total of 182 cases were considered to be complete and validy for EFA. This sample size was considered to be adequate as most of the studies suggest a minimum of 100 respondents to produce adequate statistical power when conducting EFA (Comprey & Lee, 2013; Hair et al., 2009).

Maximum Likelihood (ML) extraction with promax method was used in conducting factor analysis. Since the aim of conducting EFA was to check if

each item loads in one factor and does not cross-load between the factors, then using ML was to enable significant statistical testing of loadings and correlation between the factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Promax method which is oblique rotation with Kaizer Normalization were used because, in realistic, independent factors in social science study are expected to have some correlation in between (Hair, Anderson, Tatham, & Black, 1998). Therefore, using rotation method which takes into account the issue of correlation among the factors tends to produce realistic results. The results of the EFA analysis are presented below.

Kaiser-Meyer-Olkin (KMO) Sampling Adequacy and Bartlett's Test were conducted to examine the adequacy and normality of the data for performing factor analysis. Table 3.4 shows that the appropriateness of sample size was 0.75 which is above the recommended threshold of 0.6 and Bartlett's test was found to be statistical significance ($\chi^2$ (820) = 3516, $\rho$ < 0.001). This result suggests that the data are suitable for performing factor analysis (Hair, Anderson, Tatham, & Black, 1995).

**Table 3.4: KMO and Bartlett's Test**

| | | |
|---|---|---|
| KMO Measure of Sampling Adequacy. | | .754 |
| Bartlett's Test of Sphericity | approx. Chi-square | 3516.053 |
| | degree of freedom | 820 |
| | *sig.* | *** |

Where: *** $p$ < 0.001; sig; significance level

Promax rotation technique was used to extract a total of 10 fixed factors based on the research conceptual model of this study (Hooper, 2012). Table 3.5 shows

that the first factor contributed a large percentage of 17.7% and collectively all ten factors produced a total of 54.6% cumulative variance. Since total variance extracted from all ten factors is grater than 50% which is the required threshold, then all factors produced are suitable for this study (Beavers et al., 2013).

**Table 3.5: Total Variance Explained**

| Factor | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 7.774 | 18.96 | 18.960 | 7.261 | 17.71 | 17.710 |
| 2 | 3.691 | 9.002 | 27.962 | 3.156 | 7.698 | 25.408 |
| 3 | 3.072 | 7.493 | 35.455 | 2.649 | 6.462 | 31.870 |
| 4 | 2.287 | 5.577 | 41.033 | 1.970 | 4.804 | 36.673 |
| 5 | 2.166 | 5.283 | 46.316 | 1.597 | 3.896 | 40.570 |
| 6 | 1.926 | 4.697 | 51.012 | 1.561 | 3.807 | 44.376 |
| 7 | 1.839 | 4.486 | 55.498 | 1.460 | 3.561 | 47.937 |
| 8 | 1.545 | 3.768 | 59.266 | 1.130 | 2.757 | 50.693 |
| 9 | 1.249 | 3.046 | 62.313 | 0.837 | 2.042 | 52.735 |
| 10 | 1.224 | 2.986 | 65.299 | 0.747 | 1.823 | 54.558 |

Where 1: Behavioural Intention; 2: Relative Advantage; 3: Ease of Use; 4: Compatibility; 5: Awareness; 6: Government Support; 7: Visibility; 8: Result Demonstrability; 9: Trialability; 10: Image

Since EFA was conducted as a preliminary study for CFA, any item with a minimum loading value of 0.4 is considered to be reliable (Kline, 2014; Lindsay & Chau, 2012). As shown in Table 3.6, all items were loaded on their respective constructs, two items namely RD4 and IMG1 produced loading values below 0.4 and therefore, they were dropped. The internal reliability of the indicators were measured by using Cronbach's alpha. Table 3.6 shows that all factors produced alpha values which are greater than required threshold of 0.7 (Fornell & Larcker, 1981; Nunnally, 1978). This result suggests that the items have high internal consistency and they are measuring what they are suppose to measure.

Based on these findings, only 41 items were considered to be reliable and valid to be used in developing the main survey questionnaire instrument (see Appendix E).

**Table 3.6: Factor Loading and Cronbach's Alpha Values**

| Construct | Item | Loading value | Cronbach's alpha |
|---|---|---|---|
| Behavioural Intention | BI3 | .841 | 0.88 |
| | BI2 | .785 | |
| | BI1 | .755 | |
| | BI4 | .664 | |
| Relative Advantage | RA2 | .739 | 0.79 |
| | RA4 | .716 | |
| | RA3 | .593 | |
| | RA1 | .587 | |
| | RA5 | .514 | |
| Ease-of-Use | EOU3 | .703 | 0.8 |
| | EOU4 | .697 | |
| | EOU2 | .647 | |
| | EOU1 | .548 | |
| Compatibility | CMP3 | .803 | 0.79 |
| | CMP2 | .694 | |
| | CMP4 | .670 | |
| | CMP5 | .631 | |
| | CMP1 | .418 | |
| Awareness | AW2 | .780 | 0.79 |
| | AW1 | .738 | |
| | AW4 | .635 | |
| | AW3 | .618 | |
| | AW5 | .546 | |
| Government Support | GS3 | .832 | 0.83 |
| | GS2 | .691 | |
| | GS4 | .657 | |
| | GS1 | .621 | |
| Visibility | VS3 | .851 | 0.78 |
| | VS2 | .791 | |
| | VS1 | .626 | |
| | VS4 | .443 | |
| Result Demonstrability | RD1 | .850 | 0.77 |
| | RD2 | .847 | |
| | RD3 | .519 | |
| | RD4 | .333** | |
| Trialability | TR2 | .819 | 0.75 |
| | TR1 | .812 | |
| | TR3 | .474 | |

*Table 3.6 continue next page*

| Construct | Item | Loading value | Cronbach's alpha |
|---|---|---|---|
| Image | IMG4 | .658 | 0.76 |
| | IMG2 | .545 | |
| | IMG5 | .447 | |
| | IMG3 | .416 | |
| | IMG1 | .344** | |

Where: ** Item deleted due to low factor loading value (value < 0.4)
Notes**:** Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization

### 3.6.4 Main Survey Data Collection Areas

Table 3.7 presents representative areas where data used in the present study were collected. Proportional sampling technique based on farmers' population in each region was used to compute the required sample size to be selected in each village. In order to have a minimum of 400 responses, 500 questionnaires were distributed based on pilot research experience. Since one respondent was selected per household, the number of questionnaires distributed in each village represented the number of respondents in each respective village.

**Table 3.7: Main Study Areas and Questionnaire Distributed**

| Region | Farmers Population | District | Ward | Village | Quest. dist. | Prop (%) |
|---|---|---|---|---|---|---|
| Dodoma | 621,747 | Chamwino | Buigiri | Buigiri | 154 | 31 |
| Iringa | 299,829 | Iringa RD | Mseke | Ugwachanya | 75 | 15 |
| Kilimanjaro | 459,095 | Moshi RD | Makuyuni | Makuyuni | 114 | 23 |
| Pwani | 284,543 | Mkuranga | Kiparang'anda | Kiparang'anda A | 71 | 14 |
| Shinyanga | 345,480 | Shinyanga RD | Lyamidati | Lyamidati | 86 | 17 |
| **Total** | **2,010,694** | | | | **500** | **100** |

Where: RD: Rural District; Quest. dist.: Questionnaire distributed; Prop: Proportionate

## 3.7 Data Analysis

To empirically test the hypotheses in this study, SEM was adopted. SEM is regarded to be more superior to the first-generation multivariate methods because it takes care of all measurement errors in measurement items which may be source of spurious results (Astrachan et al., 2014; Wang & Wang, 2012). Therefore, the estimated parameters from SEM tend to be error-free; this analysis may be very useful to policy makers. Furthermore, SEM evaluates all multi-level dependence causal relationships simultaneously whereby dependent variable become independent variable to form a sub-relationship within the same analysis (Astrachan et al., 2014; Nachtigall, Kroehne, Funke, & Steyer, 2003). This kind of analysis tends to produce better information on how related independent variables can affect dependent variable because the effects of each variable is evaluated in presence of all other variables which is the case in real working environment.

In Structural Equation Modeling, either Partial Least Square (PLS) or Covariance Based SEM (CB-SEM) statistical method may be used to evaluate the model. CB-SEM is preferable in this study because, the study is confirmatory one instead of exploratory study. As the main interest of this study is to confirm the effects of awareness, government support and IDT constructs on rural farmers' behavioural intention to adopt m-government in Tanzania, CB-SEM is thereby more suitable compared to PLS which is more appropriate for exploratory study (Hair, Hult, Ringle, & Sarstedt, 2014). Furthermore, since the aim was to generalise the sample results to the population of interest, then parametric statistical testing was more appropriate to examine the pre-defined

hypotheses in this study. Therefore, CB-SEM was found to be ideal because it is considered to be strict in parametric testing than PLS (Hair, Hult, Ringle, & Sarstedt, 2013; Hair Jr et al., 2017).

Various software packages such as LISREL, SAS, MPLUS and AMOS are used when data analysis depends on CB-SEM technique. IBM AMOS package was adopted to analyse the interrelationships among the variables in this study because it provides a graphical user interface that permit easy modeling of constructs and its associate observable variables than other software packages which use command-line interface (Byrne, 2013). With AMOS graphical user interface, data analysis is considered to be easy and produces error-free results (Awang, 2015). IBM AMOS version 22 software package was used in analysis because this version was the higher version at the time of conducting data analysis of this study. This version is thought to have more ability to perform computation and generates the results more quickly compared to the previous versions, moreover it accomplishes multiple tasks in a friendly way compared to previous versions (Arbuckle, 2013).

### 3.7.1 Data Assumption Testing

To produce quality results, the data collected were assessed for missing data, outliers, non-normality and multicollinearity. Existence of missing data, outliers, non-normality and multicollinearity can distort the quality of estimated parameters and therefore result into wrong conclusion of the research findings that can mislead policy makers. The next sub-sections discuss how missing

values, outliers, normality and multicollinearity were assessed and handled in this study.

#### 3.7.1.1. Assessment of Missing Values

Scholars assert that once data is collected, assessment for missing data must be careful conducted to avoid issues such as lack of adequate statistical power and unrepresentative of the sample which may produce misleading results (Kline, 2011; Newman, 2014), as well as missing values that may complicate the data analysis process.

The assessment must be conducted to identify if the missing values are: (1) missing completely at random (MCAR), (2) missing at random, or (3) missing not at random (Rubin, 1976). MCAR is regarded to be random which does not result into biased results, whereas the other two are considered to be systematic and may produces biased results when not handled carefully (Kang, 2013).

Various methods such as listwise deletion, pairwise deletion, multiple imputation and maximum likelihood are applied to address the missing value problem (Kline, 2011; Newman, 2014). Thus selection of appropriate method(s) to be used in addressing missing values is important otherwise, using inappropriate method(s) may result into biased results as well as reduction of sample size which may have negative effects on statistical power (Kline 2011).

Deletion method is mostly applicable when missing values are found to be systematic missing that may result into biased findings. Despite its commonly usage, this method is criticised for its ability in reducing the sample size, lower power of hypothesis testing and producing biased results (Baraldi & Enders, 2010).

Maximum likelihood (ML) and multiple imputation are regarded as superior methods because they remedy values with minimally distorting the original values to produce unbiased parameters (Baraldi & Enders, 2010; Karanja, Zaveri, & Ahmed, 2013). Generally, the two methods produce similar estimates, but ML is more preferable since it is easier to implement (Baraldi & Enders, 2010). Furthermore, when ML is applied, expectation maximisation (EM) algorithm is most considered because it assumes the data are multivariate normally distributed (Pigott, 2001). Therefore, assessment of missing data in the present study was conducted using listwise deletion and ML with EM algorithm and the results are reported in chapter four.

#### 3.7.1.2. Assessment of Outliers

Outlier is a data value which is considered to be extreme or an influential data point that tends to deviate from other data points in the data set (Hawkins, 1980). Availability of outliers may generate bias result due inflated or deflated data points (Zimmerman, 1995). In multivariate analysis, squared mahalanobis distance ($D^2$) test which shows the distance of the element from the centroid is mostly used to diagnose the availability of multivariate outliers (Kline, 2005).

A case is considered to be an outlier if the probability of that element to be far from the centroid is less than 0.001 (Tabachnick & Fidell, 2007). Therefore, square mahalanobis distance (D2) test was used to examine the presence of multivariate outliers in this study. The findings of analysis are reported in chapter four.

The identified outliers should be analysed to determine its effects in estimating parameters (Cook, 1977). Cook's distance is a widely used test in determining the effects of available outliers on predictors (Cook, 1977). The outliers are considered to have significant effect on the predictors if Cook's distance and leverage values produced are greater than 1.0 and 0.5 respectively (Stevens, 1992).

Various scholars suggested that if outliers are found to have significant effect they should be deleted, transformed or retained while using robust procedures which prevent its effects particularly when they are genuine elements from the population of interest (Kline, 2005; Ullman, 2006). Conversely, transformation is criticised, because it may produce inflated or deflated estimates and affect interpretation of the results (Kline, 2005).

Other scholars suggest that small number of outliers is always acceptable in large sample size (greater than 200), because the effect of outliers tends to diminish as sample size increases (Hancock & Mueller, 2010; Tabachnick & Fidell, 2001). In case outliers were found to have a severe effects on predictors or they are not part of the population being investigated, deletion method may

be considered (Osborne & Overbay, 2004). In the present study, outliers were analysed and the result is reported in chapter four of this study.

#### 3.7.1.3. Assessment of Normality

Multivariate data analysis requires the data to be normal distributed so as to generalise the sample findings to the population. Uses of non-normality data may distort the research findings. Non-normality tends to exist due to the availability of outliers on the data set. Non-normality may be due to extreme case on one variable (univariate outlier) or it may be due extreme cases on combination of scores of two or more variables (multivariate outlier) (Byrne, 2010).

Univariate normality is always assessed by checking skewness and/or kurtosis of the measurements items. Skewness measures the deviation of mean from the centroid point while kurtosis measures the deviation of variances and covariance from the centroid (Byrne, 2010; DeCarlo, 1997). Kurtosis is mostly considered as main criteria for evaluating univariate normality in a study which uses SEM (Byrne, 2010). This is because SEM focuses on analysing covariance instead of mean analysis (Byrne, 2010). A variable with kurtosis absolute value greater that 3 is regarded as non-normal (Kline, 2005).

West, Finch, and Curran (1995) explained that availability of univariate normality does not guarantee multivariate normality of the data, because in multivariate analysis, variables are not completely independent of each other.

Therefore, multivariate normality must also be evaluated to complete assessment of data normality. The Mardia's test is mostly used to evaluate and confirm the multivariate normality of the data (Mardia, 1970). A rule of thumb suggests that multivariate critical ratio value greater than five shows a sign of multivariate non-normality of the data (Bentler, 2005).

Some scholars suggest that if variables are non-normal distributed, they should be transformed to create new normal distributed variables (Kline, 2005; Ullman, 2006). However, transformed variables are likely to produce biased and meaningless results (Kline, 2005). Therefore, the best alternative recommended is to use robust estimation methods which takes into account slightly non-normality of the data (Ullman, 2006).

Bootstrap maximum likelihood estimation method is the most preferable in estimating parameters when data are found to have slightly non-normality, because it does not impose assumption of normality distribution (Nevitt & Hancock, 2001). Therefore, in this study, univariate and multivariate normality were analysed by using kurtosis and critical ratio respectively. The results are reported in the next chapter.

#### 3.7.1.4. Assessment of Multicollinearity

Since this study uses multivariate techniques in data analysis, assessment of multicollinearity is very important because multivariate analysis assumes predictor variables are uncorrelated (Yoo et al., 2014). Multicollinearity defines

the degree to which the variables in the research model are correlated. Multicollinearity tends to occur when several predictor variables in the model measure the same concept (Yoo et al., 2014). Presence of multicollinearity in the model will lead to produce inaccurate effects (importance, sign, and magnitude) of the predictor variables on the dependent variable.

Multicollinearity is assessed by examining the variance inflation factor (VIF). If VIF value is found to be below 10, then multicollinearity is not considered to have significant effect in the parameter to be estimated (Hair, Black, Babin, & Anderson, 2008). Furthermore, to conclude that multicollinearity does not impose significant effect, the correlation coefficient between the variables is required to be below 0.85 (Awang, 2015). In this study, multicollinearity was assessed and the result is reported in chapter four.

### 3.7.2 Estimation Methods and Model Fit Indices

To test the relationship among the variables in SEM model, variance-covariance input matrix method is mostly employed over correlation method. This is because SEM model deals with a series of causal relationships test which requires variance-covariance input matrix (Hair et al., 1998).

Various estimation algorithms such as asymptotically distribution free, generalised least square and ML are used in estimation of parameters. Among all, ML is widely used in SEM because it is considered to be robust from normality assumption in estimating parameters and standard errors (Byrne,

2013; Hu & Bentler, 1999). Furthermore, ML tends to minimise the statistical differences between sample covariance and implied covariance in the population (Kline, 2015). Therefore, covariance input matrix with ML estimation methods were used in the present study.

The decision to accept or reject a specified model is based on various numbers of model fit indices which show how well a specified model fit the data by considering the acceptable indices threshold values (Bentler, 1990; Kline, 2005). Selection of which fit indices to be reported is an endless debate among the researchers due to large number of indices available in the model fit literatures (Gefen, Straub, & Rigdon, 2011; Jackson, Gillaspy Jr, & Purc-Stephenson, 2009). It has been noted that most of researchers tend to report only indices which have attained the required threshold levels (Hooper, Coughlan, & Mullen, 2008). However, such kind of reporting is vulnerable to miss-reporting as it tends to hide other important and usefully information that is required in evaluating the model fit (McDonald & Ho, 2002). Since model fit has different categories namely absolute fit, incremental fit and parsimonious fit (Awang, 2015), SEM scholars are suggesting to report at least one index from each category (Awang, 2015; Hair, Black, Babin, & Anderson, 2010; Hooper et al., 2008).

Model fit literatures show that chi-square ($\chi^2$), its associate degree of freedom (*df*) and p-value must be reported in absolute fit (Gefen et al., 2011; Iacobucci, 2010; Kline, 2005). The reason is $\chi^2$ and *df* are the prerequisite indices for evaluation of absolute fit. A non-significant $\chi^2$ ($p > 0.05$) indicates adequate

model fit (Hooper et al., 2008). However, assessment of absolute model fit may not completely depend solely on $\chi^2$ as it tends to be smaller when the sample size is large (de Carvalho & Chima, 2014). Furthermore, *p value* tends to be significant (means poor model fit) when the sample size is large (Iacobucci, 2010). Therefore, normed chi-square ($\chi^2/df$) and root mean square approximation (RMSEA) also must be reported in absolute fit (Boomsma, 2000; Kline, 2015)

Furthermore, comparative fit index (CFI) and Tucker-Lewis index (TLI) are the most recommended in assessing incremental fit whereas $\chi^2/df$ is also recommended to assess parsimonious fit (Boomsma, 2000; Hu & Bentler, 1999; Kline, 2005). Additionally, standardised root mean square residual (SRMR) should be reported because it is used to examine the global fit of the model which is the part of the absolute fit (Boomsma, 2000). These indices are the mostly recommended because they are representing different categories of model fit but also they are insensitive to sample size and model misspecification (Hooper et al., 2008).

Based on the aforementioned arguments, the current study model fit was assessed by using $\chi^2$, RMSEA, CFI, TLI, SRMR and $\chi^2$/df. The acceptable threshold levels for the selected indices tend to vary in different model fit literatures. Nevertheless, there is rule-of-thumb on minimum acceptable thresholds that are presented in Table 3.8. The results of analyses for all model fit used in this study are presented in chapter four.

**Table 3.8: Selected Fit Indices and Acceptable Thresholds**

| Category | Definition | Name of index | Acceptance threshold |
|---|---|---|---|
| Absolute fit | Determine how well the model fits the data | Chi-square ($\chi^2$) | $p > 0.05$ |
| | | RMSEA | $< 0.08$ |
| | | SRMR | $< 0.08$ |
| Incremental fit | Compare the chi-square value with baseline model to identify correlation among the variables | CFI | $> 0.9$ |
| | | TLI | $> 0.9$ |
| Parsimonious fit | Analyses the dependence between the estimation process and sample data | Normed Chi-square ($\chi^2/df$) | $< 3.0$ |

Sources: Awang (2015); Bentler (1990); Kline (2005)

### 3.7.3 Validating the Measurement Model

Measurement model shows the relationship between measurement items and respective constructs. Measurement model was examined to test if measurement items measures the underlying constructs (Niran, Abd, & Hook, 2016). Furthermore, measurement model assessment was conducted to examine the correlation among the constructs in the model (Kaplan, 2008).

At this stage, confirmatory factor analysis (CFA) procedure was used to validate the measurement model. To conclude that the measurement model is valid and reliable, the measurement model must meet all specified conditions for unidimensionality, validity, and reliability (Awang, 2015; Bagozzi & Yi, 1998). The conditions are discussed in the following sub-sections below.

#### 3.7.3.1. Unidimensionality

Unidimensionality is examined to assess if each item measures only one construct in the specified model. This is a prior condition to be examined since other conditions are highly depending on its results (Awang, 2015). To achieve unidimensionality, only measurement items with loading value of 0.5 or higher are considered as appropriate measurement items for a specific construct (Awang, 2015).

#### 3.7.3.2. Validity

Validity is assessed to check the ability of the measurement items (observed variables) to measure the underlying constructs. In assessing measurement model validity; convergent, construct and discriminant validity must be assessed (Awang, 2015).

Convergent validity measures the proportional of variance shared by measurement items in measuring a particular construct. Convergent validity is attained based on two conditions, (1) all measurement items should be statistical significant (Awang, 2015) and (2) the average variance extracted (AVE) value of the construct should be 0.5 or higher (Fornell & Larcker, 1981; Hair Jr et al., 2017).

Construct validity is assessed to measure the fitness indices produced in measurement model analysis. It involves assessing absolute fit, incremental fit

and parsimonious fit indices (Awang, 2015). To attain construct validity, all fit indices as specified in Table 3.8 must attain the adequate threshold levels.

Furthermore, discriminant validity is assessed to check if model constructs measure different contexts in the model (Fornell & Larcker, 1981). Discriminant validity is achieved by checking two conditions: (1) correlation between the constructs should not exceed 0.85 (Awang, 2015). (2) AVE values should be greater than square of the correlation values (Fornell & Larcker, 1981).

#### 3.7.3.3. Reliability

Reliability is assessed to check how reliable is the measurement model in measuring the underlying constructs (Awang, 2015). To examine construct reliability two criteria must be checked. Firstly, an internal consistency of the latent constructs should be evaluated. Internal consistency of the scale is mostly examined by using Cronbach's alpha (Tavakol & Dennick, 2011). However, Cronbach's alpha is criticised due to its inability to produce a true reliability coefficient because it assumes that all indicators have equivalent loadings which is impractical (Peterson & Kim, 2013). On the other hand, composite reliability (CR) is considered to be more accurate because it uses loadings acquired from nomological network (Hair, Black, Babin, Anderson, & Tatham, 2006; Peterson & Kim, 2013). Therefore, this study adopted CR in examining construct reliability. Construct with CR value of 0.6 or higher is considered to achieve the internal reliability (Hair et al. 2008). Secondly, each construct is

required to have a minimum of 0.5 AVE value to be considered as a reliable construct (Awang, 2015).

To summarise, this study evaluated measurement model by assessing all conditions associated with unidimensionality, reliability and validity. The findings of all evaluation are presented in chapter four.

### 3.7.4 Analysing Structural Model

Structural model is used to show the inter-relationship between the exogenous constructs and endogenous constructs (Awang, 2015). To examine the relationship between exogenous and endogenous variables, all model fit indices specified in Table 3.8 must attain the required threshold levels (Hooper et al., 2008).

To examine the indirect (mediation) effect, various methods such as Causal step strategy (Joint Significant Test), Sobel test and Biased-Corrected Confidence Interval are employed to assess the statistical significance of the indirect path. Causal step strategy proposed by Baron and Kenny (1986) requires the total effect between independent and dependent variables to be significant for mediation to exist. However, this necessary condition has been criticised in several studies. Researchers claimed that statistical significance of total effect is not necessary condition for indirect effect to exist (MacKinnon, 2008; Preacher & Hayes, 2008; Rucker, Preacher, Tormala, & Petty, 2011). This could be due to differential statistical power used to examine direct effect, indirect

effect and total effect (Rucker et al., 2011). Therefore, applying causal step strategy may not reveal the effect of intervened variables if the total effect is non-significant.

Sobel test assumes the sample data are normally distributed; the test relies on the product of the path coefficients which forms an indirect path (i.e. path between independent variable to mediator then path from mediator to dependent variable) to get the indirect effect (MacKinnon, 2008). However, the product of the two paths is considered to be positive skewed and therefore violating normal distribution assumption (Preacher & Hayes, 2008). The method is regarded as suitable only when indirect effect sampling is normally distributed. However, when applied to multiple mediators model it may overestimate the parameters produced from indirect effects (Preacher & Hayes, 2008).

Biased corrected confidence interval (BC-CI) tis the best method hat has the power of not imposing distributional assumption during data analysis and can handle Type I error (Preacher & Hayes, 2008). BC-CI is considered to be superior in testing and confirming the indirect effect of mediating variables in complex model (Awang, 2015). When BC-CI is applied, the mediation tends to exist if the 95% of BC-CI of the indirect effect does not include zero (Paulsen, Callan, Ayoko, & Saunders, 2013). Furthermore, when the direct effect is also found to be significant it denotes partial mediation otherwise it is considered to be full mediation (Awang, 2015). Therefore, this study adopted BC-CI method to examine the indirect effects of all mediation variables as proposed by

Preacher and Hayes (2008). The results of structural model analysis are presented in chapter four.

## 3.8 Handling of Common Method Variance

Common method variance (CMV) is considered as the source of inflation or attenuation on parameter estimates in social science when self-reported method is used in data collection (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Williams & Brown, 1994). Substantial CMV effect tends to distort the quality of the findings and therefore the study may end up with wrong conclusion. CMV mostly happens due to item social desirability, item context effect, consistent style in answering the questionnaire items and ambiguity of the questionnaire statements (Podsakoff et al., 2003).

To reduce the likelihood of CMV to impair the current study's findings, the following proactive control measures were considered during designing of the questionnaire. (1) Questionnaire was translated to Swahili language and pre-tested to increase more understanding of the questionnaire instructions and measurement items (MacKenzie & Podsakoff, 2012; Podsakoff et al., 2003). (2) Construct names were not included in the questionnaire to avert the possibility of respondents to guess the relationship between the items and constructs. This reduces the effect of consistency in answering and social desirability (MacKenzie & Podsakoff, 2012). (3) Respondents were informed through the introductory letter that there is no right or wrong answer. Furthermore, respondents were required to respond to all items honestly depending on their

level of understanding. In addition, respondents were informed that their responses will be regarded as confidential and used only for academic objectives in the present study. This reduces the effect which may occur due to anonymity and confidentiality fear (MacKenzie & Podsakoff, 2012; Podsakoff et al., 2003).

Furthermore, to assess if CMV has not led to substantial effect in the present study, two statistical testing techniques namely Harman's single factor and common latent factor (CLF) were employed in CFA procedure. The two methods were employed because, there is no general agreement on which method is best in assessing the effects of CMV (Conway & Lance, 2010; Eichhorn, 2014), therefore, using two techniques provided more proof on the effect level of CMV on this study.

Harman's single factor method requires all constructs indicators to be loaded in only one construct to create a single-factor model. CMV is considered to be substantial in Harman's single factor if a single-factor model produces adequate model fit (Mossholder, Bennett, Kemery, & Wesolowski, 1998; Podsakoff & Organ, 1986). Furthermore, when CLF method is applied, CMV tends to produce significant effects if the delta value between standardised regression weight without CLF and with CLF exceed 0.2 (Shu & Quynh, 2015). The statistical results for CMV effects analysis for the present study are reported in chapter four.

## 3.9 Ethical Considerations

This section describes the ethical practices observed during the data collection in the present study. The permission to conduct a research in the United Republic of Tanzania was provided by UTAR (see Appendix F). Furthermore, the Institute of Finance Management who is the sponsor of this study provided an introductory letter to request all authorities in Tanzania involved in this study to grant permission for data collection which was to be used only for academic purposes (see Appendix G).

Permission to conducting a survey in respective wards was obtained from the respective District Executive Director (see Appendix H). The permission was handled to Ward Executive Officer who communicated with Village Executive Officers for the selected villages to allow researchers to conduct the study. A familiarization meeting was conducted with available village leaders. Furthermore, village leaders were requested to provide all necessary information and assistance to facilitate collection of the data in their respective village.

Since it was the researcher's responsibility to encourage respondents to participate in the present study, no respondent was forced to participate in the survey. All respondents were clearly informed verbally and through cover letters on the intent of the study and they were assured about confidentiality of their information. Clear information was further provided to each respondent that their participation on the study was voluntary and that anyone who was not

ready to participate would not be regarded to have committed an offence. Lastly, all respondents agreed to participate in the study were required to sign an informed consent (see Appendix B) to indicate that they have understood the aim of the study, instructions and are willing to participate.

### 3.10 Summary of Research Methodology

This study used quantitative research approach to attain its main objectives. The selection of respondents was based on stratified and multistage cluster techniques, whereby simple random sampling was applied to select the units of interest in each stage. The study's questionnaire was designed based on measurement items adapted from past IS studies related with technology adoption. The questionnaire was checked and validated by experts. The questionnaire was further translated to Swahili language, pre-tested and piloted to have a valid and reliable survey instrument. Age-order technique was used to select one member within household to respond to the questionnaire. DOPU method was employed in distribution and collection of questionnaire during pre-testing, piloting and main survey.

Five hundred paper-based questionnaires were dispersed during main survey with assistance of two facilitators to five villages in different regions, one region from each zone. A total of 427 responses were collected from rural farmers and used for the data analyses. Structure equation modeling using AMOS software package was used in assessing the measurement and structural model. All results and their discussions are reported in chapter four.

# CHAPTER 4

# RESULTS AND DISCUSSION

## 4.1 Introduction

This chapter presents survey data analysis and findings. It shows the characteristics of respondents who were involved in the present study and data screening by checking missing values, outliers, normality, and multicollinearity. Furthermore, the chapter presents contingency table analysis, assessment of measurement model by analysing unidimensionality, construct reliability, validity, and assessment of common method variance. Finally, the chapter presents structural model and discusses the results of the hypotheses testing.

## 4.2 Demographic Characteristics of the Sample

A total of 427 (85.4% responses rate) out of 500 questionnaires were collected from five villages. The data collected were managed by using SPSS for prior data analyses. Table 4.1 presents demographic characteristics of the respondents who constitute the sample of the present study which in turn provides an overview of the targeted population. In general, male accounts to 53.4% of the total sample respondents. However, Tanzania statistics show that female constitute a large portion of rural citizens in Tanzania (URT, 2013b). Therefore, there is slightly difference in this sample. This could be explained by the fact that, woman are more engaged in domestic activities compared to men (Osorio

et al., 2014; Siyao, 2012), therefore, most of them were absent or occupied with domestic activities during the survey time.

**Table 4.1: Demographic Profile of the Sample**

| Demographic | 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

Youth age group (15 – 35 years) contributes large percentage (50.4%) of the total sample respondents. The sample age distribution in this study is similar to Tanzania working age population distribution in rural areas (URT, 2013b). Furthermore, most of the respondents (56.0%) were educated up to primary level, which is also according to Tanzania Household Statistics (URT, 2013b). Therefore, sample's characteristics of this study represent Tanzania rural population.

The large percentage of mobile phone owners (78%) is indeed supporting the need to disseminate agricultural information through m-government in rural areas. This finding supported Siyao (2012) and Sife et al. (2010) recommendations on using mobile phone to disseminate agricultural information. Also 97% of the respondents were found to be fluent in Swahili language, however it has been shown that English language is mostly used to disseminate agricultural information to Tanzania rural citizens (Siyao, 2012). This suggests that the main language to be used in disseminating information should be Swahili. Further information on association between groups of respondents and variables are provided in contingency table analysis presented in section 4.4.2 of this chapter.

## 4.3 Data Screening

To produce error-free parameters, the data collected was assessed for missing data, availability of outliers, non-normality, and multicollinearity based on criteria presented in sub-section 3.7.1 on chapter three. The next sub-sections present the results of each data screening assessment.

### 4.3.1 Assessment Missing Data

Out of the 427 collected questionnaires, 52 cases were having missing data problem. More specifically, 20 cases were having serious problems related to: (1) 50% or higher of the surveyed variables' items and demographic information were not answered and (2) availability of suspicious response patterns. While

32 cases were having a total of 0.25% (41/16,687) missing values as shown in Table 4.2.

**Table 4.2: Measurement Items with Missing Values**

| Item | valid response | missing values | % of missing |
|---|---|---|---|
| RA1 | 404 | 3 | 0.7 |
| RA2 | 406 | 1 | 0.2 |
| RA4 | 405 | 2 | 0.5 |
| CMP4 | 404 | 3 | 0.7 |
| CMP5 | 405 | 2 | 0.5 |
| IMG3 | 405 | 2 | 0.5 |
| IMG4 | 404 | 3 | 0.7 |
| EOU2 | 405 | 2 | 0.5 |
| EOU3 | 405 | 2 | 0.5 |
| RD1 | 406 | 1 | 0.2 |
| TR1 | 404 | 3 | 0.7 |
| TR3 | 401 | 6 | 1.5 |
| AW5 | 404 | 3 | 0.7 |
| GS2 | 401 | 6 | 1.5 |
| BI3 | 405 | 2 | 0.5 |
| **Total** | | **41** | **0.25** |

Notes: Sample size (N) = 407; Total values=16,687;

One of the main reasons that had caused for uncompleted questionnaires could be respondents' limited time. Perhaps respondents were too engaged in farming, domestic and social activities, and thereby no ample time to complete the questionnaire. In addition, there are respondents who showed sign of losing interest on answering the questionnaire. Therefore, all 20 cases were discarded for subsequent analyses. The data set were reduced to 407 with 32 cases contains small number of missing values.

Forty one (41) missing values from 32 cases as shown in Table 4.2 were assessed and no any evidence for patterns that indicates relationship between

the missing values was found. The plausible reason for these missing values could be that the respondents skipped the items unintentionally.

Later, Little's MCAR test was carried out to assess the significance effect of all available missing values in the present study. The results indicated that the effect of missing values was non-significant ($\chi^2$ (297) = 326, $\rho$ = 0.113), indicating that the values were randomly missing. Therefore, all missing values were replaced by using EM algorithm. Finally, a complete data set of 407 cases without missing data values was generated and used in subsequent statistical analyses.

### 4.3.2 Assessment of Outliers

Squared mahalanobis distance ($D^2$) test was used to diagnose the availability of multivariate outliers in the present study. As shown in Table 4.3, there were five outlier cases in the data set which are based on conditions presented in chapter three of this study. This is only 1.2% (5/407) which implies very small amount of outliers. Manual review of the $D^2$ test result was conducted (see Mahalanobis d-square column in Table 4.3); the results revealed no any case which had produced slightly higher value separated from other $D^2$ values of the cases considered to be outliers. A possible reason for these outliers could be due to strongly belief or disbelief of some respondents on the questionnaire statements that made them to have extremely different opinion from other respondents.

**Table 4.3: Mahalanobis Distance Analysis Results**

| Observation number | Mahalanobis d-squared | p1 | p2 |
|---|---|---|---|
| 373 | 82.470 | 0.000 | 0.052 |
| 388 | 80.754 | 0.000 | 0.003 |
| 400 | 79.520 | 0.000 | 0.000 |
| 252 | 78.297 | 0.000 | 0.000 |
| 81 | 77.778 | 0.000 | 0.000 |

Where: p1: probability of an observation to exceed the square mahalanobis distance
p2: probability of the large square distance to exceed the mahalanobis distance

An investigation was further conducted to assess the effect of identified outliers on the predictors of behavioural intention in the present study. Cook's distance analysis results presented in Table 4.4 shows that Cooks distance and leverage maximum values are below the acceptance thresholds of 1.0 and 0.5 respectively. This suggests that the effect of existing outliers is non-significant; therefore, they did not pose any threat to the parameters estimated in the present study.

**Table 4.4: Cook's Distance and Leverage Test Results**

| | N | Minimum | Maximum | Mean |
|---|---|---|---|---|
| Cook's Distance | 407 | .000 | .111 | .003 |
| Centered Leverage Value | 407 | .002 | .144 | .022 |

Notes: N: Sample size

Taking into consideration that all identified outliers are real cases from rural farmers' population that have non-significant effect on the predictors of behavioural intention, then all identified outliers were retained for subsequent analyses. Furthermore, sample size used in the present study is greater than 200, therefore the effect of small amount of outliers in the present study is negligible.

### 4.3.3 Assessment of Normality

In the present study, univariate and multivariate normality were examined to assess the data normality. Table 4.5 shows that all measurement items' kurtosis absolute values are below 3 which is a recommended threshold as explained in chapter three sub-section 3.7.1.3. Therefore, this finding reveals that there is no univariate non-normality problem. Analysis was further conducted to assess presence of multivariate normality of the data. As shown in Table 4.5, multivariate critical ration (CR) value is 16.2, which is greater than recommended threshold score of five. This indicates that multivariate non-normality among the measurement items exist and this may cause problems in estimating parameters of present study.

To redress the identified multivariate non-normality problem, a review was further conducted and it was observed that multivariate non-normality in the present study was due to availability of multivariate outliers. Nevertheless, the effects of available outliers were found to be non-significant as shown in section 4.3.2 of the present study.

Furthermore, according to Hair et al. (2006), Tabachnick and Fidell (2007) and Waternaux (1976) – if large sample size (greater than 200) is used, slight variance of non-normality data will not generate substantial impact in the estimation of parameters. This is because when the sample size becomes large, the impacts of departure from centroid tend to diminish (Hair, Black, Anderson, et al., 2006; Tabachnick & Fidell, 2007; Waternaux, 1976). As the sample size

in the present study is 407 which is greater than 200, the problem of marginal non-normality data may not pose any significant effect. Therefore, all non-normality items were retained and considered to be valid cases for subsequent statistical analyses.

Nonetheless, producing parameters that are more accurate was of concern in this study. Therefore, this study adopted bootstrap maximum likelihood (ML) estimation method in order to produce parameters that are more accurate. The method is thought to be more robust and superior to normal ML since it does not enforce normality assumption during parameters estimation and it has high power to control Type I error which may lead to deceptive findings (Preacher & Hayes, 2008).

**Table 4.5: Assessment of Normality**

| Construct | variable | min | max | skew | c.r. | kurtosis | c.r. |
|---|---|---|---|---|---|---|---|
| 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 |
| Behavioural Intention | BI1 | 1 | 5 | -0.683 | -5.627 | 0.708 | 2.916 |
| | 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 Support | GS1 | 1 | 5 | -1.208 | -9.946 | 1.089 | 4.483 |
| | 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 Advantage | RA1 | 1 | 5 | -1.125 | -9.265 | 0.559 | 2.303 |
| | 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 |
| Result Demonstrability | RD1 | 1 | 5 | -0.756 | -6.228 | 0.431 | 1.774 |
| | 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** |

Notes: Sample size (N) = 407.
Where c.r: critical ratio.

## 4.4 Descriptive Statistics Analysis

### 4.4.1 Means, Standard Deviation and Correlation

Table 4.6 presents correlation values among all variables used in the present study. The result shows that the highest correlation value is 0.394. This is below recommended threshold of 0.8 (Hair et al., 1998). Furthermore, collinearity test was conducted to examine the level of multicollinearity. As shown in Table 4.7, all tolerance values are higher than the required threshold of 0.4 and VIF values are below the recommended threshold of 10 (Hair et al., 2008). These results substantiate that multicollinearity is not a problem in estimating parameters in the present study. This means the variables examined in this study are measuring different context, hence parameter estimated shows the true effect of each predictor variable on the behavioural intention.

**Table 4.6: Means, Standard Deviation and Correlation Results**

| | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 3.80 | .857 | 1 | | | | | | | | | |
| **2** | 3.66 | .859 | .018 | 1 | | | | | | | | |
| **3** | 3.94 | .704 | .149** | -.008 | 1 | | | | | | | |
| **4** | 3.62 | .926 | .089 | .194** | .264** | 1 | | | | | | |
| **5** | 3.77 | .766 | .071 | -.039 | .054 | .063 | 1 | | | | | |
| **6** | 3.41 | .950 | -.038 | .325** | .107* | .367** | -.053 | 1 | | | | |
| **7** | 4.18 | .714 | .103* | .058 | .116* | .252** | .167** | .195** | 1 | | | |
| **8** | 3.62 | .977 | .217** | .141** | .331** | .278** | .015 | .261** | .079 | 1 | | |
| **9** | 3.96 | .892 | .058 | -.120** | .035 | -.118* | .108* | -.090 | -.038 | -.067 | 1 | |
| **10** | 4.15 | .644 | .267** | .260** | .206** | .394** | .128** | .313** | .166** | .301** | .056 | 1 |

Where: M: Mean; SD: Standard Deviation; 1: Relative Advantage; 2: Compatibility; 3: Image; 4: Ease-of-Use; 5: Result Demonstrability; 6: Visibility; 7: Trialability; 8: Awareness; 9: Government Support; 10: Behavioural Intention; * $p < 0.05$; ** $p < 0.01$.

**Table 4.7: Multicollinearity Statistics Analysis**

| Independent variables | collinearity statistics | |
|---|---|---|
| | Tolerance | VIF |
| Relative Advantage | 0.920 | 1.087 |
| Compatibility | 0.873 | 1.146 |
| Image | 0.839 | 1.191 |
| Ease-of-Use | 0.757 | 1.322 |
| Result Demonstrability | 0.947 | 1.056 |
| Visibility | 0.749 | 1.334 |
| Trialability | 0.888 | 1.126 |
| Awareness | 0.786 | 1.273 |
| Government support | 0.953 | 1.049 |

Notes: Dependent variable: Behavioural intention; VIF: Variance Inflation Factor

### 4.4.2 Contingency Table Analysis

To understand the relationship between groups of respondents and the latent variables used in this study, a cross tabulation analysis was conducted. The information provided by the analysis can help policy makers to formulate strategies for m-government adoption based on groups of respondents. Cross tabulation analysis requires all variables to have categorical data (data with mutually exclusive groups). Therefore, all latent variables in this study were converted into categorical variables by using mean score. The mean scores of each variable were computed by averaging the original scores of its relative items which ranges from 1 to 5. In order to have mutually exclusive group, classification was done to re-categorise the mean scores into three mutually exclusive groups 1 – 2.4 (Disagree), 2.5 – 3.4 (Neutral) and 3.5 – 5 (Agree) (Appolus, Niemand, & Karodia, 2016; Hameen-Anttila, Halonen, Siponen, Holappa, & Ahonen, 2011; Price & Chamberlayne, 2004)

To ensure that the association test between the examined variables produce correct results, a correlation test was used when all variables were ordinal whereas chi-square test was used when one or both variables were nominal (White & Korotayev, 2004). Four associations between the variables were found to be statistical significant and their results are reported on the next sub-sections. These results could assist policy makers do understand how different groups of respondents are affected by different variables. In addition, all non-significant associations are reported in Appendixes J and K to assist policy makers understand the variables which are non-significant associated.

#### 4.4.2.1. Respondents' Opinion on Intention to Adopt M-government based on their Income

Table 4.8 shows that regardless of respondents' income, large percentage (87.2%) of respondents agreed that they will adopt m-government services. The analysis also shows that respondents with lower income are more likely to adopt m-government services compared to higher income respondents. This is probably, m-government channel is the best alternative method for them to access agricultural information at lower cost (Sife et al., 2010). The finding is in line with an observation of the International Telecommunication Union (2011) which pointed out that m-government technology is more suitable in developing countries as a large percentage of citizens are living in rural areas and are considered to be poor.

In Tanzania, physical government offices that deals with agricultural issues are located very far from rural areas (Siyao, 2012) and moreover, very few

telecentres or internet cafes are available in rural areas (Mtega & Malekani, 2009). Therefore, it may be too costly for rural farmers especially the poor to travel to the government agency offices to access agricultural information (Almarashdeh & Alsmadi, 2017; Samuel, Shah, & Hadingham, 2005). For that reason, for majority of rural citizens who are considered as low-income earners, accessing farming information through m-government is an ideal solution.

**Table 4.8: Relationship between Behavioural Intention and Income**

| Income (TShs) | | Behavioural Intention | | | Total |
|---|---|---|---|---|---|
| | | Disagree | Neutral | Agree | |
| Below 200,000 | Count | 1 | 8 | 98 | 107 |
| | % within income | 0.9% | 7.5% | 91.6% | 100.0% |
| 200,000 – 300,000 | Count | 4 | 10 | 132 | 146 |
| | % within income | 2.7% | 6.8% | 90.4% | 100.0% |
| 300,001 – 400,000 | Count | 0 | 8 | 59 | 67 |
| | % within income | 0.0% | 11.9% | 88.1% | 100.0% |
| Above 400,000 | Count | 1 | 20 | 66 | 87 |
| | % within income | 1.1% | 23.0% | 75.9% | 100.0% |
| Total | Count | 6 | 46 | 355 | 407 |
| | % within income | 1.5% | 11.3% | 87.2% | 100.0% |
| Symmetric Measure | | | | | |
| Kendall's tau-c | | | | | -0.083 |
| Approx. Sig | | | | | 0.004 |

#### 4.4.2.2. Respondents' Opinion on M-government Benefits based on their Income

About 67% of the respondents, regardless of their income status, agreed that m-government services are relatively more beneficial channels to access agricultural information provided by government (see Table 4.9). Similarly Sife et al. (2010) findings show that rural citizens agreed that using mobile phone is

more advantageous as it timely eases access to product markets and prices information. Furthermore, using mobile phone can enable rural farmers to bypass middleman who are thought to manoeuvre the farmers and reduce their profits.

Relatively, rural farmers with higher income appear to appreciate the advantages of using m-government in accessing farming information than the lower-income earners. The plausible reason could be due to low awareness of m-government benefits among the low-income earnings farmers. Higher income earners are more exposed to m-government benefits that are disseminated through various media such as radios, television, internet, and magazine which are within their affordable power. Similar information can be inaccessible to lower income earners as most of them cannot afford to purchase the broadcasting and printed media. Moreover, the receptive of information through certain media is poor due to level of illiteracy in rural areas (Mtega, 2012).

**Table 4.9: Relationship between Relative Advantage and Income**

| Income (TShs) | | Relative Advantage | | | Total |
|---|---|---|---|---|---|
| | | Disagree | Neutral | Agree | |
| Below 200,000 | Count | 7 | 30 | 70 | 107 |
| | % within income | 6.5% | 28.0% | 65.4% | 100.0% |
| 200,000 – 300,000 | Count | 12 | 49 | 85 | 146 |
| | % within income | 8.2% | 33.6% | 58.2% | 100.0% |
| 300,001 – 400,000 | Count | 6 | 9 | 52 | 67 |
| | % within income | 9.0% | 13.4% | 77.6% | 100.0% |
| Above 400,000 | Count | 3 | 18 | 66 | 87 |
| | % within income | 3.4% | 20.7% | 75.9% | 100.0% |
| Total | Count | 28 | 106 | 273 | 407 |
| | % within income | 6.9% | 26.0% | 67.1% | 100.0% |
| Symmetric Measure Kendall's tau-c | | | | | 0.084 |
| Approx. Sig | | | | | 0.026 |

#### 4.4.2.3. Respondents' Opinion on Intention to Adopt M-government based on their Education Level

Comparatively, rural farmers with lower education level are more eager to adopt m-government services than higher educated rural farmers (see Table 4.10). This can be explained by the reason that a person who interacts with officers at the physical government offices, or communicates through telecentres, internet and web services and other information system needs to have a certain level of communication knowledge and skills (Komba-Mlay, 2013; Mbangala & Samzugi, 2014). Such level of knowledge may not be possessed by lower educated people particularly those who live in rural areas. To elaborate, most of Tanzania government websites use English as their medium language of communication (Kaaya, 2004). This study found that majority of rural farmers are Swahili speakers. Therefore, the use of English language in media could be

barrier for accessing government information for rural farmers who are less fluent in English.

**Table 4.10: Relationship between Behavioural Intention and Education Level**

| Education | | Behavioural Intention | | | Total |
|---|---|---|---|---|---|
| | | Disagree | Neutral | Agree | |
| No formal education | Count | 0 | 3 | 16 | 19 |
| | % within education | 0.0% | 15.8% | 84.2% | 100.0% |
| Primary | Count | 2 | 20 | 213 | 235 |
| | % within education | 0.9% | 8.5% | 90.6% | 100.0% |
| Secondary | Count | 3 | 19 | 122 | 144 |
| | % within education | 2.1% | 13.2% | 84.7% | 100.0% |
| Diploma | Count | 1 | 2 | 4 | 7 |
| | % within education | 14.3% | 28.6% | 57.1% | 100.0% |
| Bachelor | Count | 0 | 2 | 0 | 2 |
| | % within education | 0.0% | 100.0% | 0.0% | 100.0% |
| Total | Count | 6 | 46 | 355 | 407 |
| | % within education | 1.5% | 11.3% | 87.2% | 100.0% |
| Symmetric Measure | | | | | |
| Kendall's tau-c | | | | | -0.060 |
| Approx. Sig | | | | | 0.034 |

#### 4.4.2.4. Respondents' Opinion on Intention to Adopt M-government based on their Age

Table 4.11 shows that 87.2% of the total respondents agreed that they will adopt m-government services regardless of age differences. Comparatively, the findings indicate that younger respondents are more positively responsive to m-government compared to older respondents. Similarly, previous findings have shown that younger population is more interested to adopt e-government as compared to older population in Tanzania (Komba-Mlay, 2013). This could be attributed to the fact that young people are considered to be more digitally

connected than the older ones (Correa, 2015; Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). In other words, since young people are mostly connected to technology, there is high chance for them to be aware of m-governments and its relative advantages.

Furthermore, most of the older people perceive that the uses of mobile technology could be very difficult (Renaud & Van Biljon, 2008). Mainly, this is caused by their poor experimentation experience of mobile technology. Also cognitive changes due to aging is considered to influence less adoption behaviour of technology as they require more time to learn and understand ICT technology (Conci, Pianesi, & Zancanaro, 2009). As a result, they tend to avoid the technology.

**Table 4.11: Relationship between Behavioural Intention and Age**

| Age | | Behavioural Intention | | | Total |
|---|---|---|---|---|---|
| | | Disagree | Neutral | Agree | |
| 15-35 | Count | 1 | 17 | 179 | 197 |
| | % within Age | 0.5% | 8.6% | 90.9% | 100.0% |
| 36-59 | Count | 4 | 20 | 162 | 186 |
| | % within Age | 2.2% | 10.8% | 87.1% | 100.0% |
| 60-64 | Count | 1 | 9 | 14 | 24 |
| | % within Age | 4.2% | 37.5% | 58.3% | 100.0% |
| Total | Count | 6 | 46 | 355 | 407 |
| | % within Age | 1.5% | 11.3% | 87.2% | 100.0% |
| Symmetric Measure | | | | | |
| Kendall's tau-c | | | | | -0.077 |
| Approx. Sig. | | | | | 0.006 |

## 4.5 Measurement and Structural Model Assessment

### 4.5.1 Measurement Model Analysis

Measurement model assessment was conducted through CFA procedure. CFA measures the extent to which the observed variables represent the constructs. Figure 4.1 shows a pooled CFA model developed from 10 latent constructs with 41 measurement items. Unidimensionality, validity and reliability of the present study's measurement model are discussed in the next sub-sections.

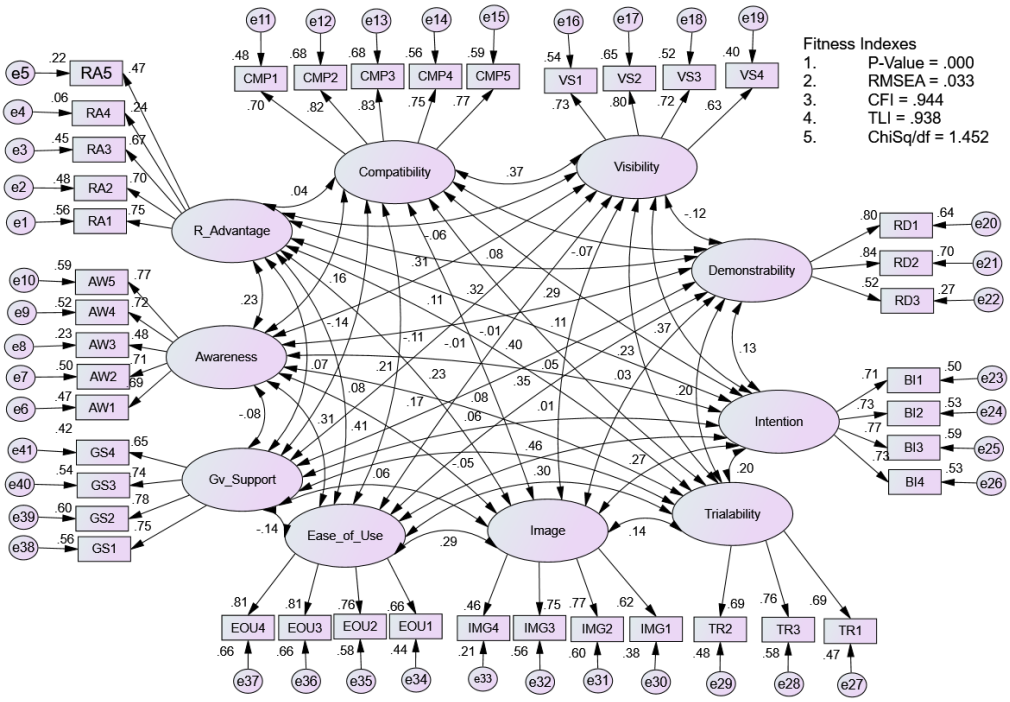



**Figure 4.1: Initial Measurement Model (Model 1)**

#### 4.5.1.1. Unidimensionality Assessment

To assess model validity and reliability, the unidimensionality condition which requires all measurement items to have a minimum loading value of 0.5 was

prior assessed (Awang, 2015). Figure 4.1 shows that four measurement items: (1) m-government services provides quick access to information (RA5), (2) m-government enhances effectiveness (RA4), (3) I am aware of m-government education/training (AW3), and (4) people who use m-government have high profile (IMG4); have factor loading values below 0.5. This means the initial measurement model did not achieve the unidimensionality condition; therefore, model modification was carried out to attain the required unidimensionality.

Awang (2015) and Hair, Black, Anderson, and Tatham (2006) suggested that in order to attain unidimensionality, all items with factor loading below 0.5 should be deleted because they do not measure their respective constructs. Therefore, four measurement items mentioned above (RA5, RA4, AW3, and IMG4) were deleted in iterations one after another.

Total items deleted account for 9.7% (4/41), which is below the recommended threshold of 20% (Awang, 2015). This shows that the dataset is reliable for assessment of measurement model (Hair, Black, Babin, Anderson, & Tatham, 2006). After modifications done on the initial measurement model, Figure 4.2 shows a more enhanced measurement model in which all measurement items have adequate loading values which are higher than 0.5. Therefore, it is evident to conclude that each item in the modified measurement model measures its respective construct.

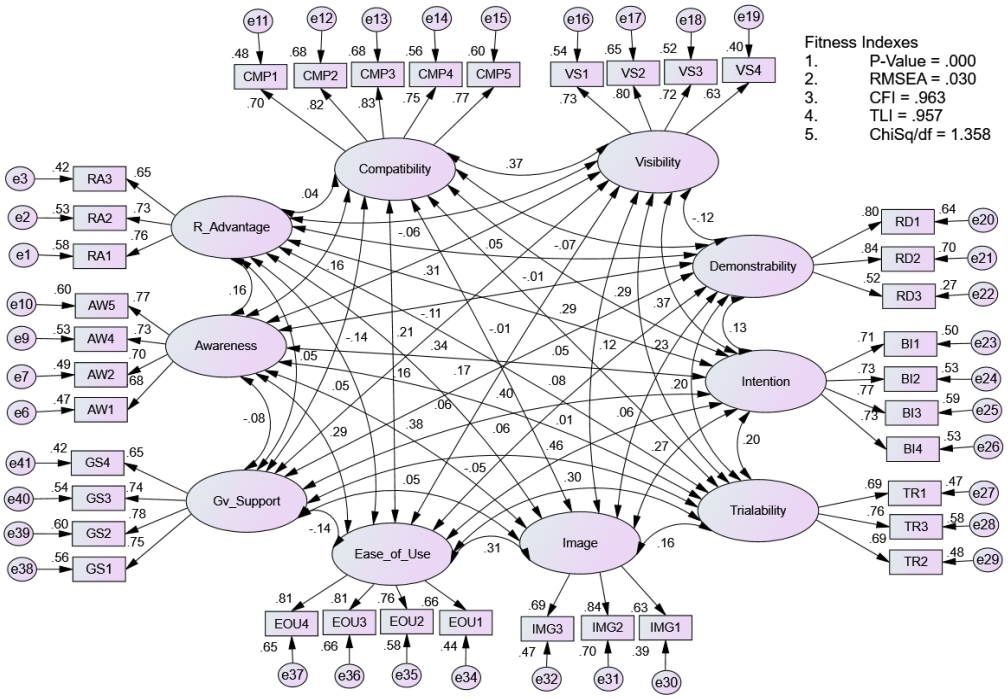



**Figure 4.2: Modified Measurement Model (Model 2)**

### 4.5.1.2. Validity Assessment

Model validity was examined by assessing construct, convergent, and discriminant validity. Assessment of construct validity was conducted by examining absolute, incremental and parsimonious fit indices (the examination process details is presented in chapter three). Table 4.12 shows that all fit indices that represent three categories of model fit in model 2 met the required thresholds. Therefore, the measurement model has demonstrated adequate construct validity. This can further strengthen the evidence that the measurement items in this study measured the intended constructs significantly, as shown in Figure 4.2.

**Table 4.12: Current Study's Model Fit Indices**

| **Model** | $\chi^2$(*df*) | ***p*-value** | **RMSEA** | **CFI** | **TLI** | **SRMR** | $\chi^2$/*df* |
|---|---|---|---|---|---|---|---|
| Required level | | *p >0.05* | < 0.08 | > 0.90 | > 0.90 | < 0.08 | < 3 |
| Model 2 | 793.3 (584) | *** | 0.03 | 0.96 | 0.95 | 0.043 | 1.358 |

Notes: Sample size (N) = 407; *** p < 0.001

Convergent validity was assessed based on two conditions presented in chapter three of this study. The result indicates that convergent validity was achieved in all constructs since all measurement items were found to be statistically significant (see Appendix L). In addition, Table 4.13 shows that all AVE values produced are above 0.5, which is the required AVE threshold (the details are discussed in chapter three).

Since the square root of AVE (the diagonal bold values in Table 4.14) is greater than any values on its respective row and column, then discriminant validity was achieved as well. In addition, as shown in Appendix M, the highest value of correlation between the latent variables is 0.458. This is below the recommended threshold of 0.85 (Awang, 2015). Furthermore, this result also confirms to the initial test in section 4.4.1 that multicollinearity is not a problem in the present study due to low correlation values which are below the recommended cut-off point of 0.9 (Radosevic & Yoruk, 2013). Therefore, this result concludes that all constructs in the modified measurement model (Model 2) measured different concepts.

#### 4.5.1.3. Reliability Assessment

Construct reliability was examined by checking two conditions which are internal reliability and AVE values for all constructs as discussed in chapter three. Table 4.13 shows that the modified measurement model (model 2) is reliable because all CR and AVE values are above 0.6 and 0.5 respectively, the minimum required threshold. Therefore, construct validity was attained in the present study. This result denotes that the measurement items were consistency in measuring the intended constructs.

**Table 4.13: The CFA Results for the Adjusted Measurement Model**

| Constructs | Item | Factor loading | CR | AVE |
|---|---|---|---|---|
| Behavioural Intention | BI1 | 0.71 | 0.824 | 0.540 |
| | 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 |
| | 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 | | |
| Result Demonstrability | RD1 | 0.80 | 0.769 | 0.536 |
| | RD2 | 0.84 | | |
| | RD3 | 0.52 | | |

Where: CR: Composite Reliability; AVE: Average Variance Extracted

**Table 4.14: Discriminative Validity Index Summary**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **0.735** | | | | | | | | | |
| **2** | 0.335 | **0.723** | | | | | | | | |
| **3** | 0.268 | 0.383 | **0.722** | | | | | | | |
| **4** | 0.060 | -0.078 | 0.054 | **0.729** | | | | | | |
| **5** | 0.202 | 0.061 | 0.160 | -0.053 | **0.715** | | | | | |
| **6** | 0.458 | 0.294 | 0.309 | -0.135 | 0.301 | **0.764** | | | | |
| **7** | 0.285 | 0.161 | 0.160 | 0.049 | 0.084 | 0.046 | **0.713** | | | |
| **8** | 0.374 | 0.311 | 0.120 | -0.110 | 0.230 | 0.403 | -0.063 | **0.726** | | |
| **9** | 0.294 | 0.164 | -0.011 | -0.138 | 0.051 | 0.212 | 0.039 | 0.372 | **0.774** | |
| **10** | 0.126 | -0.008 | 0.056 | 0.165 | 0.199 | 0.015 | 0.054 | -0.121 | -0.074 | **0.732** |

Where 1: Behavioural Intention; 2: Awareness; 3: Image; 4: Government Support; 5: Trialability; 6: Ease-of-Use; 7: Relative Advantage; 8: Visibility; 9: Compatibility; 10: Result Demonstrability.

#### 4.5.1.4. Assessment of Common Method Bias

CMV was tested to examine if it may pose any substantial threat on the present study's findings. Harman's single factor method was employed by loading all 41 indicators to only one construct to create a single-factor model in CFA. The results show that the model was recursive ($\chi^2$ (819) = 5453.4, $p < 0.001$). Nevertheless, a single-factor model did not produced adequate fit indices (RMSEA = 0.118, CFI = 0.223, TLI = 0.222, $\chi^2/df$ = 6.659 and SRMR = 0.1442) (see Appendix N). Therefore, CMV had no significant impact in estimating parameter of the present study.

CMV effects analysis was further conducted by using CLF technique to confirm the results of the previous test. Appendix P shows that the difference between the standardised regression weight before and after introducing CLF does not exceed the threshold value of 0.2 in all 41 indicators. This further supports the absent of CMV's significant impact in this study. Based on the remedy

procedures taken to lessen the effect of CMV during questionnaire design and the results of these two statistical tests, it is evident to conclude that CMV did not produce substantial impact in present study.

The assessment of measurement model shows that the modified measurement model (model 2) fit the data set and all constructs indicators are reliable and valid. Therefore, the following statistical analysis: modeling of inter-relationship with structural model analysis was subsequently carried out. The analysis of structural model involves the assessment of model fit indices; coefficient of determination ($R^2$) as well as hypotheses testing and discussion of the results are presented in the next sub-sections.

### 4.5.2 Structural Model Analysis

After completing the validation of measurement model in section 4.5.1 which has demonstrated to be valid and reliable, this sub-section presents the analysis of the structural model and confirmation of the hypotheses. The m-government adoption structural model was developed by using ten (10) latent variables and thirty seven (37) measurement items as shown in Figure 4.3.

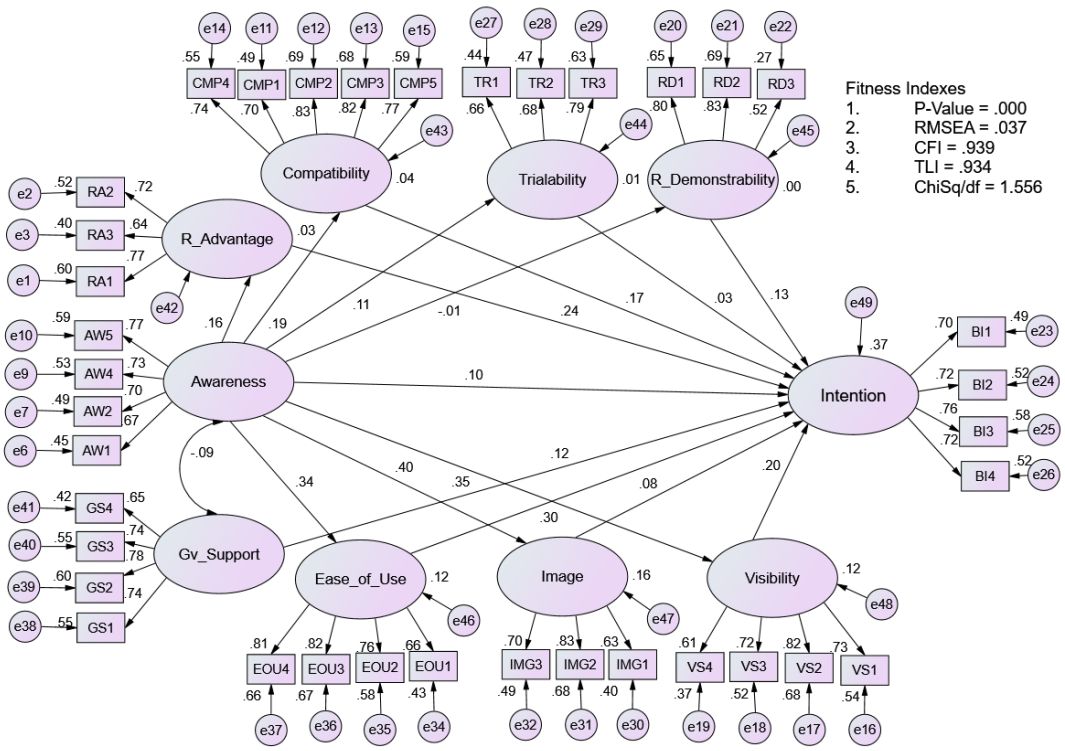



**Figure 4.3: M-government Structural Model**

The m-government structural model was found to be recursive ($\chi^2$ (612) = 952.2, $p$ < 0.001). Furthermore, Figure 4.3 shows that the structural model produced adequate model fit because all required fit indices met the required threshold that have been discussed in details in chapter three. In addition, SMRS was found to be 0.07 which is under the required threshold. Since unidimensionality and all model fit conditions were met in all categories, no model modification was conducted. From Figure 4.3, all predictors could explain 37% (depicted by $R^2$ score) of the total variance of the rural farmers' behavioural intention to adopt m-government services in Tanzania.

To answer the current study's research questions, analyses were further carried out to evaluate the direct relationship between independent and dependent

variables as well as examining the indirect effect of awareness on dependent variable through multiple mediators which are perceived characteristics of innovation.

#### 4.5.2.1. Testing of Direct Effect Relationships

The direct relationship on the structural model results were analysed by considering all direct paths between endogenous and exogenous variables within the m-government adoption model, estimates of parameters and its corresponding significance level (*p-value*).

As shown in Figure 4.3 and Table 4.15, government support, relative advantage, ease-of-use, compatibility, result demonstrability and visibility were found to have direct and positive significant influences on rural farmers' behavioural intention to adopt m-government services. Conversely, it was interesting to note that image, trialability, and awareness have no direct statistical significance effect on rural farmers' behavioural intention to adopt m-government. This is difference from the initial expectations as specified in research conceptual model of the present study.

**Table 4.15: Direct Hypotheses Testing Results**

| Hypotheses | Structural path | | | Path Coefficient | | S.E | C.R |
|---|---|---|---|---|---|---|---|
| | | | | Standardised | Unstandardised | | |
| H1 | GS | → | BI | 0.121* | 0.068 | 0.030 | 2.288 |
| H2 | AW | → | BI | 0.100 | 0.061 | 0.043 | 1.409 |
| H2a | AW | → | RA | 0.162** | 0.171 | 0.067 | 2.569 |
| H2b | AW | → | EOU | 0.342*** | 0.289 | 0.054 | 5.398 |
| H2c | AW | → | CMP | 0.194*** | 0.162 | 0.049 | 3.280 |
| H2d | AW | → | IMG | 0.398*** | 0.274 | 0.047 | 5.775 |
| H2e | AW | → | RD | -0.012 | -0.010 | 0.049 | -0.198 |
| H2f | AW | → | VS | 0.345*** | 0.362 | 0.066 | 5.462 |
| H2g | AW | → | TR | 0.107 | 0.075 | 0.044 | 1.706 |
| H4 | RA | → | BI | 0.241*** | 0.140 | 0.033 | 4.170 |
| H5 | EOU | → | BI | 0.305*** | 0.220 | 0.044 | 5.058 |
| H6 | CMP | → | BI | 0.173*** | 0.126 | 0.039 | 3.274 |
| H7 | IMG | → | BI | 0.078 | 0.069 | 0.053 | 1.299 |
| H8 | RD | → | BI | 0.126* | 0.094 | 0.040 | 2.377 |
| H9 | VS | → | BI | 0.198*** | 0.115 | 0.034 | 3.411 |
| H10 | TR | → | BI | 0.029 | 0.025 | 0.047 | 0.534 |

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

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

SEM results shown in Table 4.15 presents the answers for two research questions ( question one and three) on the direct effect of: (1) awareness and government support on rural farmers' behavioural intention to adopt m-government services. (2) The direct effect of PCI on rural farmers' behavioural intention to adopt m-government services. According to the results presented in Table 4.15, meaningful discussions on the direct effect between the variables are presented on the next sub-sections. The discussion is arranged based on the research questions and from significant hypotheses to non-significant hypotheses.

### a) Direct Relationship between Government Support and Rural Farmers' Behavioural Intention to Adopt M-government Services

Findings of this study supported hypothesis H1 which shows significant positive relationship between the government support and rural farmers' behavioural intention to adopt m-government (see Table 4.15). In other words, most of the rural farmers will adopt m-government services after realising that there is presence of adequate support from the government. This result substantiates with past empirical IS findings which have shown that government support has significant influence on adopters' behavioural intention to adopt e-government services (Al-Shafi, 2009; Al Salmi & Hasnan, 2016) and internet banking technology (Rambocas & Arjoon, 2012; Tan & Teo, 2000).

Contradicting finding was presented in Al-Zahrani's (2011) study: government support could not produce significant effect on respondents' behavioural intention to adopt e-government services. Al-Zahran (2011) argued that non-significant result was caused by participants' belief that government has not provided enough effort to widen the coverage areas of internet. Therefore, credits were given to private institutions for expansion and improvements of internet infrastructures.

The situation is different in this study. Tanzania government has recently invested in developing National ICT backbone which has reduced the cost of communication by improving connectivity in urban and rural areas (Sedoyeka & Sicilima, 2016). Furthermore, the government universal communication services access fund (UCSAF) is encouraging both public and private sectors to

widen the coverage of communication services to both rural and under-served urban areas. Therefore, these efforts could be the reasons for rural farmers to believe that continue government support can assist them to adopt m-government services.

**b) Direct Relationship between Relative Advantage and Rural Farmers' Behavioural Intention to Adopt M-government Services**

The standardised estimates coefficient in Table 4.15 depicts the statistical significant relationship between relative advantage and behavioural intention to adopt m-government. Thus, hypothesis H4 is supported. This result is consistent with IDT theoretical expectation (Rogers, 1995), and past empirical IS studies on e-government and m-government adoption (Almarashdeh & Alsmadi, 2017; Baabdullah et al., 2016; Carter & Belanger, 2004; Shareef et al., 2012).

In viewing the level of effect created by examined variables, it was noted that relative advantage variable is the second strongest determinant of rural farmers' behavioural intention ($\beta = 0.241$), after the effect of ease-of-use. This shows that rural farmers in Tanzania can adopt m-government services if they perceive that mobile government application can enable them to access agricultural information such as trading markets, agricultural products price or production materials more easily compared to other dissemination channels at anytime and anywhere. The reason for such perception is that since most of rural citizens are poor (Aikaeli, 2010), they want to make sure that any additional cost incurred due to the uses of m-government services will produce positive return in addressing challenges of accessing required farming information.

### c) Direct Relationship between Ease-of-use and Rural Farmers' Behavioural Intention to Adopt M-government Services

Table 4.15 shows that ease-of-use is significantly affecting rural farmers' behavioural intention to adopt m-government services; therefore, the result supported hypothesis H5. This means that m-government applications should be very easy to use so that rural farmers can use effortless in navigating and accessing the required agricultural information. The finding is apparently consistent to previous empirical IS studies which have shown that ease-of-use has significant effect on the technology adoption (Almarashdeh & Alsmadi, 2017; Baabdullah et al., 2016; Liu et al., 2014; Osman, 2013; Shareef et al., 2012).

Moreover, the result also indicates that ease-of-use is a strongest predictor of rural farmers' behavioural intention to adopt m-government ($\beta = 0.305$). This is consistent with the results found from mobile financial services study that involved rural people who were considered to be low educated (Dass & Pal, 2011). Similarly, Agarwal and Prasad (1999) reported that respondents with lower level of education were more influenced by PEOU than PU. Thus, the past and the current findings confirm that low educated rural farmers are more attracted to technologies that require less physical and mental effort in operating.

In different past studies, perceived usefulness (similar to relative advantage) has been shown to be a strongest predictor of technology adoption than perceived ease-of-use (Aloudat, Michael, Chen, & Al-debei, 2014; Carter & Belanger,

2003; Chitungo & Munongo, 2013; Mun et al., 2006). However, that is not the case in the present study. Probably, it is the reason that rural farmers in Tanzania are unaware on the benefits that can be derived from using m-government services and they are less technology savvy. In other words, farmers are more concerned with having m-government system which is less complex and easy to use rather than admiring m-government system that could be useful to them but too complicated in operation. Similarly, Chang, Li, Hung, and Hwang (2005) in their study showed that e-government system users with no or less experience are more influenced by ease of use than usefulness of the system.

**d) Direct Relationship between Compatibility and Rural Farmers' Behavioural Intention to Adopt M-government Services**

In Table 4.15, hypothesis H6 was supported because the relationship between compatibility and rural framers' behavioural intention to adopt m-government was found to be statistically significant. This means, if the rural farmers find that m-government service is compatible to their values, farming working style, and can fulfil their needs, they are more likely to adopt the services.

This result is apparently in line with theoretical expectation which theorised that compatible innovation technology is mostly likely to be adopted compared to incompatible innovation (Rogers, 1983). Moreover, the result corroborates with previous empirical IS findings which have shown that compatibility is a vital determinant of behavioural intention to adopt of m-government (Abdelghaffar & Magdy, 2012; Al-Busaidi, 2012; Almuraqab, 2017).

The following are the plausible explanations that could support this result. Since rural farmers are very busy with farming activities such as preparing their farms, and looking for markets, they may not have enough time to source appropriate agricultural information by using other alternative channels. Further, compared to e-government, rural farmers may find that extracting agricultural information from e-government systems is not feasible because of poor experience and knowledge of using computers and internet. They may also find that using other alternative channels can be expensive to them (Sedoyeka, 2012).

**e) Direct Relationship between Result Demonstrability and Rural Farmers' Behavioural Intention to Adopt M-government Services**

Table 4.15 shows that the direct relationship between result demonstrability and rural farmers' behavioural intention to adopt m-government services is statistically significant; hence, hypothesis H8 is supported. This result supported IDT's proposition: communicating positive outcome of the technology innovation tends to influence potential adopters' decision to accept the innovation (Moore & Benbasat, 1991).

This result is consistent with other previous empirical IS studies which have shown that result demonstrability has significant effect on adoption of technology (Moore & Benbasat, 1991; Rogers, 2003; Yaacob & bin Yusoff, 2014). Despite the fact that, Tanzania rural citizens are used to various mobile phone applications which could be similar to m-government applications in terms of operations (France, 2013), understanding the capability of m-government services to accomplish their search of useful agricultural

information is more important to them. Since most of the rural farmers are considered to be poor, they are cost sensitive to any new technology (Hassan & Semkwiji, 2011). Therefore, they would like to know the consequences and outcomes of using m-government services before adopting. Being aware of consequence and outcome prior to adoption could save their monies for other household needs in case they do not find m-government to be usefully. Nevertheless, being aware on positive outcome could lead them to adopt m-government services.

### f) Direct Relationship between Visibility and Rural Farmers' Behavioural Intention to Adopt M-government Services

The estimated path between visibility and rural farmers' behavioural intention to adopt m-government services was found to be positive and statistical significant (see Table 4.15), and thereby supported hypothesis H9. This result support IDT's related proposition on the influence of visibility on information technology adoption (Moore & Benbasat, 1991). The result is further consistent with previous empirical IS studies (Jebeile & Reeve, 2003; Richardson, 2009). Similarly, Wamoto (2015) asserted that e-government users' likelihood tends to increases when there is high degree of e-government services visibility. This is due to the fact that high visibility assures citizens that the government is using e-government technology to deliver public services and information.

According to Dewa and Zlotnikova's (2014) findings, most of e-government initiatives are less publicised in Tanzania. As a result, the visibility of various e-government services is very low among citizens. This suggests that in order

to increase m-government adoption rate, the level of m-government visibility in rural areas should as well be increased. There could be a possibility that rural farmers need to understand the usefulness of m-government service in accessing agricultural information before adoption. Also, rural farmers need to have high confidence that the government is using m-government technology to disseminate agricultural information before adopting (Wamoto, 2015).

### g) Direct Relationship between Awareness and Rural Farmers' Behavioural Intention to Adopt M-government Services

The direct analysis result on Table 4.15 shows that hypothesis H5 is rejected: awareness has no direct statistical significant effect on rural farmers' behavioural intention to adopt m-government services. Investigation was further conducted by analysing the descriptive statistics of this variable. The mean score of the awareness construct produced in Table 4.6 is 3.62 out of 5 point-Likert scale. This sample result shows that majority of respondents were in an indecisive situation or they were not sure that the government use mobile services to provide agricultural information.

The result is inconsistency with previous empirical IS findings which had shown that awareness is one of the direct determinants in encouraging the targeted population to adopt m-government (Abdelghaffar & Magdy, 2012; Shareef et al., 2012). Nevertheless, this results is also consistent with other previous empirical IS studies which have shown that awareness does not have direct influence on technology adoption (Al-Fahim, 2012; Khatimah & Halim, 2016; Sanni, Ngah, Harun, Abdullah, & Waheed, 2013).

Various scholars have shown that awareness may not be considered as an influential factor to adopt technology innovation particularly when it is passively acquired or adopters are unaware of its benefits (Brennan, 2014; Rogers, 2003). In the current study, Tanzania government has done little in providing awareness information on e-government initiative including m-government in rural areas (Yonazi et al., 2010). As a result, most of rural farmers are unaware of the service, or they can be aware of it but they have not yet developed an attitude toward m-government services due to uninformed of key information (Jung et al., 2012). Based on this fact, being aware only on existence of m-government services is not an influential factor for them to adopt the technology because so much valuable information about m-government services is not disseminated. In summary, if potential adopters are actively provided with valuable information on various aspects about the innovation of technology, their likelihood to adopt technology may increase (Rogers, 2003).

### h) Direct Relationship between Image and Rural Farmers' Intention to Adopt M-government Services

Hypothesis H7 is rejected because the path between image and rural farmers' behavioural intention to adopt m-government was found to be non-significant (see Table 4.15). The result is deviated from refined IDT's related proposition: image was theorised to have a significant direct and positive influence on technology innovation adoption (Moore & Benbasat, 1991). This result is consistent with past studies which have shown that image does not significantly influence the adoption of e-government technology (Komba-Mlay, 2016; Liu et al., 2014; Rokhman, 2011).

The plausible reason for this result could be due to the cultural values of the Tanzania rural citizens. Cultural values is an important aspect that can influence community in decision making (Bagchi, Hart, & Peterson, 2004). Tanzania societies are considered to practise collectivism culture (Katzenstein & Chrispin, 2005). Being a member of a collectivism community, an individual would have fewer tendencies to present him/herself as unique or different from other members because by so doing he/she may lessen the cohesive bond among society members. Therefore, the rural farmers in Tanzania are not eager to project themselves as superior than others when using m-government service and thus they do not find image to be an influential factor for adoption.

**i) Direct Relationship between Trialability and Rural Farmers' Intention to Adopt M-government Services**

In the IDT theory, trialability is considered to be an influential factor especially for those who are illiterate in technology. This is because trialability can reduce potential adopters' fear on whether the technology innovation can meet their requirements (Rogers, 2003).

In the present study hypothesis H10 is rejected as the relationship between trialability and rural farmers' behavioural intention to adopt m-government was found to be non-significant (see Table 4.15). In other words, rural farmers would not adopt m-government services even if they are given enough trial time of m-government services before actual usage. This result is in line with previous IS empirical studies that have not supported the theory's proposition: if potential adopters have a high degree of skills or knowledge of the investigated

technology, trialability may not be able to serve as an influential factor for adoption of technology investigated (Karahanna et al., 1999; Rambocas & Arjoon, 2012).

Despite that rural farmers in Tanzania are not highly educated, they are quite knowledgeable and skilful in using various mobile services. To elaborate, mobile phone has been one of the communication tools widely used by Tanzania rural citizens for communication and money transfer purposes (Economides & Przemyslaw, 2014). As mobile services are increasingly in Tanzania's rural areas, mobile operators are competing among themselves by providing more mobile services so that they can obtain larger market share (Mazer & Rowan, 2016). As a result, rural farmers are becoming more skilful in using mobile services. In addition, the farmers may feel that getting an opportunity to try the m-government services is not necessary because mobile operators provide daily continuous assistance to their customers. These could be the plausible reasons as to why rural farmers are not considering trialability as an influential factor for them to adopt m-government.

#### 4.5.2.2. Indirect Effect of Awareness on Behavioural Intention

To address the present study's second research question, indirect effect relationships were examined by testing the mediation role of each PCI in relationship of awareness and rural farmers' behavioural intention to adopt m-government services. Bootstrapping procedure was conducted based on 1000 re-sampling from the original sample at 95% confidence interval. Bootstrap

samples of 1000 is considered to be adequate to produce stable confidence interval values (Cheung & Lau, 2008). The indirect effect of each mediating variable was evaluated by considering biased corrected confidence interval as specified in chapter three of this study. The results of the analysis are presented in Tables 4.16 and 4.17.

**Table 4.16: Indirect Effects of Awareness on Behavioural Intention**

| HP | IV | | Mediator | | DV | LB-BC | UB-BC | TTS-BC | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| H3a | AW | → | Relative Advantage | → | BI | 0.009 | 0.083 | 0.014* | Mediate |
| H3b | AW | → | Ease-of-Use | → | BI | 0.053 | 0.186 | 0.001** | Mediate |
| H3c | AW | → | Compatibility | → | BI | 0.008 | 0.072 | 0.007** | Mediate |
| H3d | AW | → | Image | → | BI | -0.018 | 0.094 | 0.201 | No Mediation |
| H3e | AW | → | Result Demonstrability | → | BI | -0.021 | 0.014 | 0.705 | No Mediation |
| H3f | AW | → | Visibility | → | BI | 0.028 | 0.141 | 0.002** | Mediate |
| H3g | AW | → | Trialability | → | BI | -0.004 | 0.029 | 0.408 | No Mediation |

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

**Table 4.17: Type of Mediation Imposed by all Mediator Variables**

| Mediator | Direct effect on intention | | Indirect effect through mediator | | Type of Mediation |
|---|---|---|---|---|---|
| | Effect | *p-value* | Effect | *p-value* | |
| Relative Advantage | 0.110 | $0.209^{Ns}$ | 0.038 | $0.014^{Sg}$ | Full mediation |
| Ease-of-Use | 0.102 | $0.279^{Ns}$ | 0.101 | $0.001^{Sg}$ | Full mediation |
| Compatibility | 0.107 | $0.220^{Ns}$ | 0.031 | $0.007^{Sg}$ | Full mediation |
| Visibility | 0.108 | $0.237^{Ns}$ | 0.065 | $0.002^{Sg}$ | Full mediation |

Where: Sg: Significant; Ns: Not Significant.

As shown in Table 4.16, relative advantage, ease-of-use, compatibility and visibility were found to mediate the relationship between awareness and behavioural intention. However, awareness has not produced significant indirect effect on behavioural intention when image, result demonstrability and

trialability are used to mediate the relationship. Furthermore, Table 4.17 shows that all four mediators are fully mediating the effect of awareness on rural farmers' behavioural intention to adopt m-government services. These results suggest that awareness may only produce significant impact on rural farmers' behavioural intention if it is provided through explaining the significant mediators.

In summary, awareness is an important factor in influencing rural farmers' perception on the m-government's relative advantage, ease-of-use, compatibility and visibility. This will in turn increase their likelihood to adopt m-government services. The next sub-sections explain the mediating role of each mediator in relationship between awareness and behavioural intention to adopt m-government services. The discussion is arranged based on the significant to non-significant relationship.

**a) The Indirect Effect of Awareness on Rural Farmers' Behavioural Intention to Adopt M-government through Relative Advantage**

Table 4.17 shows that one of the mediators playing an indirect role is relative advantage ($\beta = 0.038$); hence hypothesis H3a was supported. Also, the two paths which make the indirect relationship were also significant. The result shows that awareness has positive effect on rural farmers' perception regarding relative advantage of m-government services (see Hypothesis H2a). Likewise, relative advantage was found to be a predictor of rural farmers' behavioural intention to adopt m-government services in the present study (see hypothesis H4). This suggests that providing information on benefits of m-government could

positively affect rural farmers' perception which in turn can increase the likelihood of rural farmers to adopt m-government services.

This result is in line with previous IS empirical studies which show that the provision of awareness information that is related to the benefits of certain technology can enhance the recipient's understanding of the benefit of technology innovation (Noor et al., 2014; Premkumar & Roberts, 1999). In addition, Kleintop, Blau, and Currall (1994) have shown that providing more training related to usefulness of IT systems, can make employees appreciate the benefits of the technology better and eventually be encouraged to adopt the technology.

**b) The Indirect Effect of Awareness on Rural Farmers' Behavioural Intention to Adopt M-government through Ease-of-use**

Table 4.17 shows that ease-of-use mediates the relationship between awareness and perception of rural farmers' behavioural intention; thus, hypothesis H3b was supported. In addition, ease-of-use was found to play the highest indirect role ($\beta = 0.101$). Generally, the result shows that providing awareness information on how m-government service is easy to use will strongly enhance rural farmers' perception on less mental and physical effort required to use the m-government services. This may possibly influence rural farmers' behavioural intention to adopt m-government services.

This result supports Noor et al.'s (2014) findings: when target population become aware of the technology innovation, they may perceive that the ICT

system would require less physical and mental effort to operate. Carter and Belanger (2005) asserted that when citizens are less technological savvy, state government should provide more education through community centres to allow those who are unfamiliar with technology become apt to use the technology. Similarly, Kleintop, Blau, and Currall (1994) explained that by providing more information on ease-of-use on the targeted technology, potential adopters will believe that the level of effort required to use the technology is minimal. Likewise in the current study, this result suggests that providing awareness information on the process expectancy can enhance rural farmers' perception on the level of effort required to use m-government services.

### c) The Indirect Effect of Awareness on Rural Farmers' Behavioural Intention to Adopt M-government through Compatibility

The third mediator that plays an indirect role among the dimensions of the perceived characteristics of innovation is compatibility ($\beta = 0.031$) (see Table 4.17). This result supported hypothesis H3c. As shown in Table 4.15, the hypothesised relationship between awareness and rural farmers' perception on compatibility (hypothesis H2c) was also found to be significant ($p < 0.001$). Moreover, compatibility was found to have significant influence on rural farmers' behavioural intention to adopt m-government in rural areas (Hypothesis H6).

This finding supports Rogers (1995) and Noor et al. (2014) arguments which assert that more information is required to enable potential adopters to become more knowledgeable on how certain technology innovation could be compatible

to potential adopters' needs. Similarly, Venkatesh (1999) pointed out that providing training enables formulation of adopters' perception on compatibility of the technology on the efficacy expectancy. In this context, providing awareness information on how the m-government can assist rural farmers to access agricultural information at anytime, and anywhere will enable rural farmers understand the useful of m-government services in their daily working activity. Through this awareness, rural farmers' perceptions on compatibility of m-government will be strengthened. This will increase the likelihood of adopting m-government services.

**d) The Indirect Effect of Awareness on Rural Farmers' Intention to Adopt M-government through Visibility**

Visibility was found to play an indirect role between awareness and rural farmers' behavioural intention (see Table 4.17), and thereby it supported hypothesis H3f. Moreover, awareness has a significant role on influencing adopters' perception regarding visibility of m-government; the result supported hypothesis H2f. Similarly, visibility was found to have a significant effect on rural farmers' behavioural intention to adopt m-government services (see hypothesis H9).

This finding corroborates previous results which have shown that the provision of more information on innovation could enhance the adopters' perception of on the visibility of studied technology (Kim, Freling, & Eastman, 2013; Pham & Johar, 2001; Xia & Lee, 2000). The plausible argument for this finding is that visibility is considered to be one of the elements of efficacy expectancy

(Bandura, 1982; Xia & Lee, 2000). Therefore, providing more information on visibility of m-government services will enhance rural farmers' perception, as they will be more aware of m-government services in providing access to desired agricultural information.

**e) The Indirect Effect of Awareness on Rural Farmers' Behavioural Intention to Adopt M-government through Image**

It is clearly shown on Table 4.16 that image do not mediate the relationship between awareness and rural farmers' behavioural intention to adopt m-government; hence, hypothesis H3d is not supported. The role of awareness on increasing adopter's perception on image was found to be significant. Therefore it supported hypothesis H2d. However, the direct effect generated by image on rural farmers' behavioural intention was found to be non-significant (hypothesis H7). In other words, rural farmers do not regard image as important factor to influence their intention to adopt m-government.

This finding supports Noor et al. (2014) study: awareness is necessary to enhance the perception of workers on the importance of social influence factors on the adoption of tax application software. However Noor et al. (2014) also did not find significant relationship between social influence and behavioural intention. A plausible reason for this result could be due to the wide availability of mobile services that look similar to m-government application system. Also, rural farmers are aware on negative impact of image factor on their collectivism society due to their experiences on the uses mobile phone. Therefore, providing awareness on how m-government may enhance their social status can improve

rural farmers' perception, but will not trigger rural farmers' decision towards adopting m-government services

**f) The Indirect Effect of Awareness on Rural Farmers' Behavioural Intention to Adopt M-government through Result Demonstrability**

Figure 4.5 shows that the impact of awareness on the result demonstrability is non-significant (hypothesis H2e), but result demonstrability is an influential factor for increasing the likelihood of rural farmers to adopt m-government (hypothesis H8). Generally, result demonstrability was not found to mediate the relationship between awareness and behavioural intention; hence the result did not support hypothesis H3e. Surprisingly, this result is inconsistency to psychological model which shows that having knowledge of actual results tend to increase works motivation (Hackman & Oldham, 1976).

The plausible reason for this result is that rural farmers are more informed on mobile technology due to availability of mobile phone services in rural areas. Therefore, they do not think that providing awareness information only on this aspect will increases their motivation to adopt m-government services. Instead, they are more eager to see real outcome of using m-government services provided by change agents.

**g) The Indirect Effect of Awareness on Rural Farmers' Behavioural Intention to Adopt M-government through Trialability**

Figure 4.5 shows that the indirect relationship between awareness and rural farmers' behavioural intention to adopt m-government was not statistically

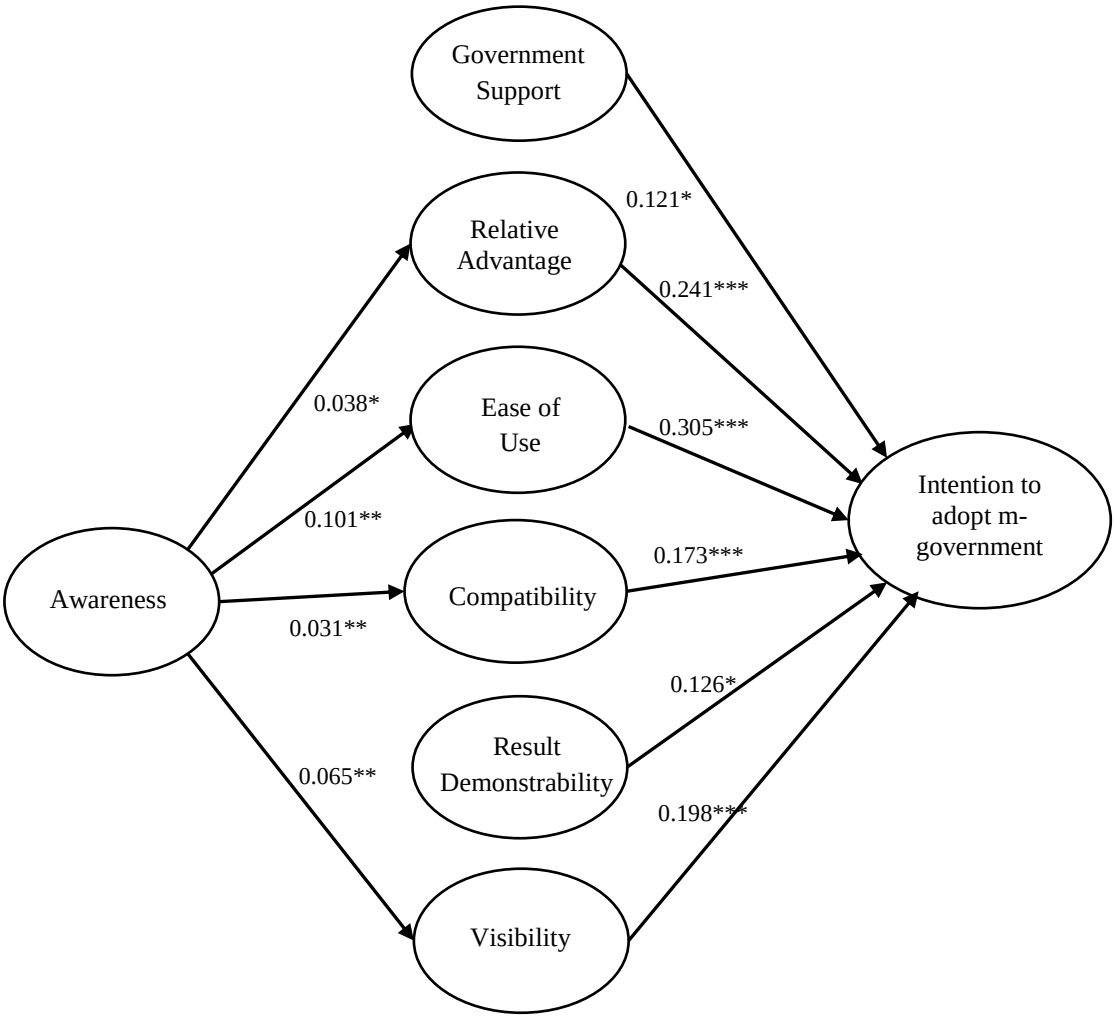
mediated by trialability. Therefore, the result did not support hypothesis H3g. Furthermore, all sub-relationships between (1) awareness and trialability (hypothesis H2g); and (2) trialability and intention to adopt m-government (hypothesis H10) were non-significant as well.

This is unexpected outcome as several studies have shown that by providing more awareness information on the need of trying the technology as well as letting potential adopters try the technology innovation before its actual usage tend to increase the potential adopters' intention to perform certain behaviour (Kleintop et al., 1994; Noor et al., 2014). The possible reason for this non-significant finding may be due to the wide knowledge of participants on uses of mobile phone applications that look similar to m-government applications. Therefore, rural farmers do not find that the provision of more awareness information on trialability will encourage them to try and use the m-government applications.

## 4.6 Developed M-government Adoption Model

Based on the findings presented in previous sections, only significant factors were found to be influential aspects for rural farmers' behavioural intention to adopt m-government services. Therefore, Figure 4.4 shows a developed M-government Model that can be used to facilitate the adoption of m-government services in Tanzania rural areas. This figure depicts the achievement of the main aim of this study.

The developed Model shows that providing adequate government support can directly influence rural farmers' behaviour to adopt m-government services. Also the Model shows that relative advantage, ease-of-use, compatibility, results demonstrability and visibility have direct influence on rural farmers' behavioural intention. Lastly, the Model shows that awareness has indirect influence to behavioural intention through relative advantage, ease-of-use, compatibility and visibility.




Paths are Significant at: * **$p < 0.001$; ** $p < 0.01$; * $p < 0.05$

**Figure 4.4: Developed M-government Adoption Model**

## 4.7 Summary of Results

The summary of hypotheses testing is provided in Table 4.18. Generally, the analysis has shown that government support, relative advantage, ease-of-use, compatibility, result demonstrability and visibility have significant direct and positive effects on rural farmers' behavioural intention to adopt m-government services. Contrary to that, awareness, image and trialability were not found to have significant direct effects on rural farmers' behavioural intention to adopt m-government services. These results have provided answers to research questions one and three of this study.

In addition, four variables namely; relative advantage, ease-of-use, compatibility, and visibility were found to mediate the relationships between awareness and rural farmers' behavioural intention to adopt m-government services. This implies that awareness towards the existence of m-government will drive rural farmers in believing that the m-government must have had obvious (because visible) and practical applications (because advantageous) deemed to be useful (because ease of use) and fulfilling their agricultural daily needs (because it's compatible) in order to adopt it. Contrary to the above four mediating variables; image, trialability, and result demonstrability were not found to be significant factors in explain how awareness can exert its influence on rural farmers' behavioural intention to adopt m-government. These results have provided answers for research question two of this study.

**Table 4.18: Summary of Hypotheses Testing Results**

| Hypothesis | | Remarks |
|---|---|---|
| H1 | Government support has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Supported |
| H2 | Awareness has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Not Supported |
| H4 | Relative Advantage has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Supported |
| H5 | Ease of Use has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Supported |
| H6 | Compatibility has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Supported |
| H7 | Image has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Not Supported |
| H8 | Result demonstrability has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Supported |
| H9 | Visibility has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Supported |
| H10 | Trialability has direct and positive effect on rural farmers' behavioural intention to adopt m-government services | Not Supported |
| H3a | Awareness has indirect and positive effect on rural farmers' behavioural intention through relative advantage | Supported |
| H3b | Awareness has indirect and positive effect on rural farmers' behavioural intention through ease of use | Supported |
| H3c | Awareness has indirect and positive effect on rural farmers' behavioural intention through compatibility | Supported |
| H3d | Awareness has indirect and positive effect on rural farmers' behavioural intention through image | Not Supported |
| H3e | Awareness has indirect and positive effect on rural farmers' behavioural intention through result demonstrability | Not Supported |
| H3f | Awareness has indirect and positive effect on rural farmers' behavioural intention through visibility | Supported |
| H3g | Awareness has indirect and positive effect on rural farmers' behavioural intention through trialability | Not Supported |

# CHAPTER 5

# CONCLUSION AND IMPLICATIONS

## 5.1 Introduction

Previous chapter presented the results that are based on the data collected from rural farmers in Tanzania. Furthermore, comprehensive discussions on the significant and non-significant relationships were also provided in chapter four. This chapter presents information on accomplishment of research objectives, implications of the findings to scholars and policy makers. Limitations and suggestions for the future researches in the field of m-government are also explained.

## 5.2 Accomplishment of Research Objectives

The main aim of the present study was to develop an m-government adoption model that will be used to increase the adoption of m-government services in Tanzania rural areas. To accomplish the main objective, three specific objectives were established.

Firstly, to evaluate the direct effect of government support and awareness on rural farmers' behavioural intention to adopt m-government. Two hypotheses H1 and H2 which are related to government support and awareness respectively were developed and examined. The results indicated that government support

can directly increase the rate of m-government adoption among the rural farmers in Tanzania. On the other hand, awareness was not found to have significant direct influence of rural farmers' behavioural intention to adopt m-government services.

Secondly, to evaluate the indirect effect of awareness on rural farmers' behavioural intention to adopt m-government through IDT constructs. Seven mediation hypotheses: H3a, H3b, H3c, H3d, H3e, H3f, and H3g were formulated and tested. Among these, four hypotheses: H3a, H3b, H3c, and H3f related to relative advantage, ease-of-use, compatibility, and visibility respectively were found to be significant. This is to say that providing awareness information related to relative advantage, ease-of-use, compatibility, and visibility can trigger adopters' perceptions on the respective characteristics of the technology and eventually influence them to adopt of m-government services. On the other hand; image, result demonstrability, and trialability did not emerge as the mediators variables.

The last specific objective was to evaluate the direct effects of IDT constructs on rural farmers' behavioural intention to adopt m-government. In this objective, seven hypotheses: H4, H5, H6, H7, H8, H9, and H10 were hypothesised to have direct and positive effect. The results show that relative advantage, ease-of-use, compatibility, result demonstrability, and visibility can directly influence the adoption of m-government service. However, image and trialability were found to have non-significant effects on rural farmers' behavioural intention to adopt m-government services.

In regard to the above explanations, it is evident to conclude that all research specific objectives were successful assessed and that the main objective of the study which was to develop a research Model for adoption of m-government services in Tanzania was also achieved. The achievement attained on the objectives provides insight information that may assist scholars and policy makers to understand the factors for the adoption of m-government services in Tanzania rural areas.

## 5.3 Implications

### 5.3.1 Implications for Academia

Communication style between governments and their citizens is changing rapidly from e-government to m-government particularly in developing countries (Kushchu & Kuscu, 2003). Additional research is required to provide further knowledge on the application of m-government services in remote and rural areas. Literature scanned revealed that there are limited empirical studies which specifically focus on adoption of m-government services in rural areas (Liu et al., 2014). Kushchu and Kuscu (2003) proposed the need for more specific research in m-government area to widen the knowledge in this emerging technology. Therefore, this study broadens the existing limited knowledge by providing empirical evidence on factors that can motivate rural farmers to adopt m-government services in Tanzania rural areas.

The study extends Innovation Diffusion Theory (IDT) by adding two variables: government support and awareness to develop m-government research model.

The empirical results of this study provide evidence that the extended IDT model can be used to increase the adoption of m-government services in developing countries particularly in Tanzania rural areas. This study expands the existing body of knowledge as it has developed a Model that integrate IDT with government support and awareness, a less common model in the IS literature particular in m-government adoption areas.

The study employed DOPU method for data collection. The method provided flexibility to respondents on responding to the questionnaire; as a result, it increased response rate. This method is less frequently used in previous IS behavioural studies; therefore using DOPU in the current study extends the knowledge of researchers on data collection methods particularly in rural areas where respondents are more engaged in farming activities. Furthermore, the study employed SEM to analyse the inter-relationships between the variables. Since most of the previous studies analyses were based on first-generation multivariate analysis, applying SEM in the current study extends researchers' knowledge on the applicability of SEM technique particularly when the research model have multiple layers of inter-relationship between the variables.

In addition, this study provides empirical evidence on the important role played by awareness as the prerequisite element that can increase adopters' understanding on various characteristics on m-government services which in turn influences behavioural intention to adopt m-government services. Therefore, the current study has extended the body of knowledge as studies that empirically examine the indirect effect of awareness on behavioural intention

through perceived characteristics of innovation are less common in m-government services context.

### 5.3.2 Implications for Policy Makers

The eGA in Tanzania considers m-government as the best strategy that could enable Tanzania government to reach large number of citizens and provide them with required public services and information. However, evidences from a number of studies show that m-government is less acceptable and adopted in Tanzania society (Kyem, 2016; Yonazi, 2013). Therefore, this study makes a number of contributions to policy and decision makers on how they can achieve the said objective (see Table 5.1 for summarised practical implications).

The study has developed m-government adoption Model that could assist policy and decision makers in Tanzania to understand how to increase the adoption of m-government in Tanzania rural areas. Specifically, the empirical results in this study provides more understanding to policy makers on the importance of government support, awareness, relative advantage, ease-of-use, compatibility, result demonstrability and visibility as keystone on increasing the likelihood of rural farmers to adopt m-government services.

This study found that rural farmers are mostly likely to adopt m-government services when they perceive that government provides adequate support for them to adopt the services. Therefore, policy makers need to provide all necessary support that can improve rural farmers' perception on the adoption

m-government services. This can be done by improving infrastructure for m-government utilizations; laying down back-end information systems that will be used to handle m-government transactions and provides feedback quickly. Also, the government through UCSAF need to emphasis on the extension of mobile network infrastructures to enable more rural citizens access mobile services. Furthermore, policy makers need to establish and publish distinct policies, procedures and regulations for m-government utilisation (Kushchu & Kuscu, 2003). Availability of clear regulations and laws will make rural farmers become more confident on the security and legitimate of the m-government operations. This will increase the likelihood of rural farmers to adopt m-government because they will be regarding m-government as reliable and legitimate channel of accessing agricultural information. Furthermore, policy makers have to invest more time on promoting the uses of m-government services among rural farmers. eGA has to ensure that farming information provided by public institutions is accessible via mobile phone as well. Moreover, m-government services transactions have to be charged at minimum cost to enable rural farmers to afford the services.

This study found that awareness is more important on improving rural farmers' belief on various aspects of m-government such as usefulness, easy to use, compatibility, and visibility that can influence rural farmers' behavioural intention to adopt m-government services. Therefore, policy makers have to carry out more awareness campaigns through training, posters, leaflets, brochures and SMS notifications to rural farmers. Awareness campaigns need to focus on promoting usefulness, how the system is easy to use, compatibility,

and visibility of m-government services. Because providing awareness towards the existence of m-government will lead them into believing that m-government is beneficial, easy to use, compatible, and visible. By promoting these key aspects via different campaign methods, the Tanzania government will be able to strengthen the awareness of m-government services among rural farmers and eventually, they will be encouraged to adopt m-government services. Additionally, encouraging opinion leaders and change agents who are considered to be more influential in rural society to create awareness among rural farmers can be useful as well.

Moreover, policy makers need to concentrate on delivering information on the advantages of using m-government services as compared to other government–citizens' communication channels. The emphasis should be directed on explaining the benefits that are useful to rural farmers such as quick and real-time access to agricultural information such as meteorological, market, and price provided by government as well as ability to access potential buyers directly without middleman at anytime and anywhere.

This study has shown that relative advantage is important factor in influencing rural farmers' behavioural intention to adopt m-government services. Therefore, policy makers and system designers have to concentrate on understanding the rural farmers' needs so that they can provide a more effective and efficient m-government services that meet rural farmers' needs as compared to existing methods of accessing farming information. To materialise this, specific emphasis should be given on developing the ubiquity and mobility m-

government services. The government has to ensure that back-end information systems that are communicating with rural farmers through mobile systems are available 24 hours – 7 days to allow continuous accessibility of agricultural information at anytime and anywhere.

In addition, the government has to deploy powerful back-end information systems that can handle huge number of transactions at a time to quickly save large number of mobile users. This is because delay in processing electronic transaction has been reported to slow down the adoption of m-government services (Munyoka & Manzira, 2014). Content designers have to focus on providing up-to-date and usefully agricultural contents through m-government applications. Agricultural information provided through mobile phone should be customised depending on particular area and rural farmers' needs instead of providing general information that cannot be very useful (Mittal & Mehar, 2012). The reason is that rural farmers from different areas have different needs due to diverse factors such as cropping system, harvest season, soil type, and local weather.

This study has also shown that rural farmers can be directly influenced by m-government service that is easy to use. Therefore, system designers and content designers should devote more time and resources to make sure that m-government system is easy to use. System designers may include rural farmers in designing process of m-government services (user-centered design). Through this, rural farmers can share their views and needs on the systems to be

developed. Giacomin (2014) has shown that including users in the designing process tends to produce system which is easy to use.

The m-government system needs to provide clear and understandable instructions that can allow rural farmers to navigate and access the intended agricultural contents which are deemed important motive for establishing m-government services. This argument is supported by several findings which have shown that clear and ease navigation systems tend to increase system usability (Cyr, Head, & Ivanov, 2009; Ngadiman, Pambudi, Wardani, & Sabandi, 2014). Since most of the rural farmers are Swahili speakers, policy makers have to make sure that mobile and m-government services use Swahili language in order to enable ease communication to rural farmers. Furthermore, developed m-government services have to contain "Help/User's Guide" section that can provide helpful information on how to use the application in accessing the required information. Finally, policy makers have to ensure that agricultural information is more accessible through USSD than mobile internet because most of the citizens use basic mobile phones.

Another factor that is directly influencing rural farmers' behavioural intention to adopt m-government services is compatibility. Thus, policy makers and system designers need to understand rural farmers' needs and produce compatible m-government services to their life style and needs. To achieve compatibility, agricultural information provided through m-government services needs to be customised according to the geographical areas and rural farmers' needs. Furthermore, compatibility can be achieved by having common

look and feel in all mobile government services. This will allow rural citizens to use their experiences from other m-government application to access the required information. Additionally, compatibility can be achieved by ensuring interoperability in application development and information presentation and access. System designers, developers, and content developers should ensure that the back-end information systems and its relative contents are in interoperable format that can be accessible via mobile phone.

Moreover, result demonstrability has direct and positive effect on the rural farmers' behavioural intention to adopt m-government services. Therefore, policy makers need to put more emphasis on sharing and communicating the consequences and outcomes of using m-government services in accessing agriculture information. Opinion leaders such as village leaders, middle, and high successfully farmers and any other influential persons in rural areas can be contacted to try out m-government services and then serves as change agent in communicating the outcome of using m-government services. Positive testimonies from change agents and other people who use m-government service to access agricultural information provided by the government can be provided in various rural farmers' meeting to promote the uses of m-government services.

Visibility has also demonstrated a significant direct effect on rural farmers' behavioural intention. Thus, to increase the visibility of the existence of m-government services, policy makers have to keep on encouraging village leaders, successfully farmers, and any other influential persons to use m-

government services and act as m-government change agent to other rural farmers. In addition, the government has to provide training to young age group and let them act as m-government change agents who would increase the visibility of m-government. Liébana-Cabanillas, Sánchez-Fernández, and Muñoz-Leiva's (2014) study has shown that young people have higher tendency to accept new technology more quickly. On top of that, marketing strategies to create awareness of the services need to be enhanced to cover more rural and isolated areas.

**Table 5.1**: **Summary of Implication for Practices**

| S/N | Major findings | Policy implication |
|---|---|---|
| **1** | Government support has direct and positive influence on rural farmers' behavioural intention to adopt m-government services | Improves infrastructure for m-government operation.<br><br>Establish and enforce policies, procedures and regulations for m-government utilisation |
| **2** | Awareness has indirect influence on rural farmers' behavioural intention to adopt m-government through ease-of-use, relative advantage, visibility and compatibility | Awareness campaigns should focus more on promoting usefulness, ease of use, compatibility and visibility of m-government services<br><br>Enhance more awareness campaigns through training, posters, leaflets, brochures and SMS notification<br><br>Extend awareness marketing strategies on m-government services to reach more rural areas |
| **3** | Relative advantage has direct and positive influence on rural farmers' behavioural intention to adopt m-government | Provide more effective and efficiency m-government services that meet rural farmers' needs. This will add more value as compared to existing alternative of accessing farming information<br><br>Ensure that back-end systems that are communicating with mobile systems are available 24 hours – 7 days<br><br>Providing up to date, usefully and customised agricultural contents through the m-government applications |
| **4** | Ease-of-use has direct and positive influence on rural farmers' behavioural intention to adopt m-government. | System designers, and content designers should devote more time and resources to make sure that m-government services are easy to use.<br><br>Provide clear and understandable instructions that can allow rural farmers to navigate and access the intended agricultural contents |
| **5** | Compatibility has direct and positive effect on rural farmers' behavioural intention to adopt m-government | Produce compatible m-government to the rural farmers' life style, needs, how they search and access various farming information.<br><br>Producing m-government with common look and feels in order to allows the uses of past experiences<br><br>Ensure back-end systems and its contents are in interoperable format that can be accessible by mobile phones |

*Table 5.1 continue next page*

| S/N | Major findings | Policy implication |
|---|---|---|
| **6** | Result demonstrability has direct and positive effect on rural farmers' behavioural intention to adopt m-government. | Opinion leaders such as village leaders, middle and high successfully farmers and any other influential persons in rural areas should be contacted to try out m-government services and then let them serve as change agent in communicating the outcome of using m-government services. |
| **7** | Visibility has positive and direct effect on rural farmers' behavioural intention to adopt m-government services | Increase the visibility of the existence of m-government services.<br><br>Encouraging village leaders, successfully farmers, and any other influential persons to use m-government services and act as m-government change agent to other rural farmers.<br><br>Provides education to young age group and let them act as an m-government change agent |

## 5.4 Research Limitations

Despite the fact that this study has provided useful theoretical and practical contributions, the study had the following limitations that should be carefully taken into account when applying these results into practice. Firstly, the present study used DOPU technique to collect data from rural citizens in the village. With DOPU technique there is likelihood for others to fill up the questionnaire on behalf of the intended targeted respondent.

Secondly, this study examined behavioural intention instead of actual usage behaviour due to limited acceptance of m-government services in Tanzania rural areas. The findings of this study should be used with caution because behavioural intention may not necessary influence actual usage behaviour (Ajzen, 1985). This is because behaviour intention may change due to various circumstantial factors (Ajzen, 1985).

Thirdly, the developed M-government Adoption Model has explained only 37% of the total variance, despite the fact that this study has added two variables which are government support and awareness to address the major issues of low awareness and lack of government support. This result suggests that there is a need for more predictor variables to be included in the Model in order to produce very high explanatory power of behavioural intention.

## 5.5 Opportunities for Future Studies

This study has considered only small part of m-government services adoption in Tanzania. M-government is still a relative new concept in Tanzania. Therefore, future studies can be conducted to widen the body of knowledge in the m-government area. The study highlights few areas to be considered:

Longitudinal study is of important in future studies because as this was a cross-sectional one, conducting a longitudinal study can provide more understanding on the behavioural intention of respondents to adopt m-government since their behaviour will be evaluated at different points over a long period.

This study concentrated only on studying the behavioural intention of non-adopters of m-government services in rural areas. More studies can further be conducted to examine actual usage and continuance usage behaviour of m-government services consumers in rural areas when an optimum number of rural farmers have adopted m-government. Such studies will provide more useful

information to enable policy makers improve the provision of m-government services and make it more sustainable.

This study extended IDT with only two variables namely government support and awareness to address the major issues identified in chapter one. Future studies can extend the Model by adding other variables such as trust and perceived barriers in order to understand its effects on the adoption of m-government services. Such studies can produce useful information to policy makers on other factors that can influence rural farmers' behavioural intention to adopt mobile government services.

The current conceptual model was only used to study the accessibility of agricultural information in rural areas provided by the government. Future studies can extend the proposed model in other fields such as health, education, and democracy affairs in rural areas. The studies can provide new information on factors that may influence rural farmers to use mobile in accessing public health services, education services, and democracy affairs in rural areas.

This study looked on the factors that may influence service consumers (rural farmers) to adopt m-government services. Future studies may be directed in the aspect of service providers (public organisations) to provide more useful information that will enable more government organisations to introduce back-end systems that will be compatible with mobile technologies.

The cross tabulation analysis has shown that some of the demographic variables have significant association with latent variables used in the current study's model. Therefore, future studies can be conducted further to examine how demographic variables such as education, income, gender, and age moderates the relationship between the predictor variables and rural farmers' behavioural intention to adopt m-government services as shown in the current study's model.

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# APPENDICES

## Appendix A: Questionnaire Sent to Expert for Content Validity


**UNIVERSITI TUNKU ABDUL RAHMAN**

**TITTLE: THE IMPACTS OF GOVERNMENT SUPPORT AND AWARENESS ON INTENTION TO ADOPT M-GOVERNMENT SERVICES IN TANZANIA**

Dear Prof / Dr /Mr / Ms,

I am currently doing the aforementioned research as my PhD thesis undertaking. The main aim of this study is to examine the role played by perceived characteristics of innovation, government support, and awareness on rural farmers' behavioural intention to adopt m-government services in Tanzania.

I have prepared an instrument with measurement items adapted from previous studies to measure constructs of interest. The current stage is to ***face validate*** and ***content validate*** the measurement items in order to establish whether they are matching their respective construct operational definition. I would be grateful if you could spend some time to read through the questionnaire, assess and provides feedback on face validity and specifically rate the measurement items in order to assess their content validity.

Thank you in advance for your time and expertise.

You're sincerely,

Mandari Herman
PhD Candidate

**QUESTIONNAIRE**

Please indicate how relevant the measurement item is to the respective construct. You can mark or circle your rating from 1 to 4; the scale used indicates:

**[1] - Not Relevant [2] - Somehow Relevant [3] - Quite Relevant**

**[4] - High Relevant.**

**RELATIVE ADVANTAGE**

| **Operational definition** | **Measurement items** | **Scale** | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Relative advantage shows the extent to which rural farmers perceive that using mobile phone to access farming information provided by government could be better than using available alternatives. | 1. I think using mobile phone would be less costly when accessing farming information provided by the government | ☐ | ☐ | ☐ | ☐ |
| | 2. Using mobile phone would require less effort to access farming information provided by the government | ☐ | ☐ | ☐ | ☐ |
| | 3. Using mobile phone would enable me to access farming information provided by government anytime, anywhere | ☐ | ☐ | ☐ | ☐ |
| | 4. Using mobile phone would enhances my effectiveness in accessing farming information provided by the government | ☐ | ☐ | ☐ | ☐ |
| | 5. Using mobile phone would enable me to access farming information provided by the government more quickly | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**COMPATIBILITY**

| **Operational definition** | **Measurement items** | **Scale** | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Compatibility is defined as the degree to which using mobile phone in accessing farming information provided by | 1. Using mobile phone would fit well with the way I want to access farming information provided by the government | ☐ | ☐ | ☐ | ☐ |
| | 2. Using mobile phone to interact with government for accessing farming information would appropriate to me | ☐ | ☐ | ☐ | ☐ |
| | 3. Using mobile phone to access farming information provided by government would fit well into my lifestyle | ☐ | ☐ | ☐ | ☐ |

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| government is perceived to be consistent with rural farmers' values, needs and past experience | 4. Using mobile phone to access farming information provided by government would be compatible with how I like to do things | ☐ | ☐ | ☐ | ☐ |
| | 5. Using mobile phone to access farming information provided by the government would fulfil my needs | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**IMAGE**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Image reflects the perceived social status that rural farmers may gain upon using mobile phone to access farming information provided by government. | 1. I think people who use mobile phone to access farming information provided by government are considered to be trendy | ☐ | ☐ | ☐ | ☐ |
| | 2. Accessing government's farming information over mobile phone would enhance my social status | ☐ | ☐ | ☐ | ☐ |
| | 3. I think people who are using mobile phone to access farming information provided by government are perceived as an important person in their society | ☐ | ☐ | ☐ | ☐ |
| | 4. I think people who use the mobile phone to access farming information provided by government have a high profile | ☐ | ☐ | ☐ | ☐ |
| | 5. I think people who use mobile phone to access farming information provided by government are more respected in their society | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**EASE-OF-USE**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Ease-of-use is defined as the degree to which using | 1. It would be easy for me to remember how to use mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| mobile phone to access farming information provided by government is perceived to be free from the physical and mental effort | 2. I believe that interacting with government to access farming information over mobile phone would be clear and understandable | ☐ | ☐ | ☐ | ☐ |
| | 3. I believe that it would be easy for me to get mobile phone application provided by government to do what I want to do | ☐ | ☐ | ☐ | ☐ |
| | 4. It would be easy for me to learn how to use mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |
| | 5. I believe that using mobile phone to access farming information would be ease to me | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**RESULT DEMONSTRABILITY**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Result demonstrability shows the extent to which the outcomes produced by using mobile phone to access farming information provided by government are tangible and communicable among the rural farmers | 1. I would have no difficult telling others about the results of using mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |
| | 2. I believe I could communicate to others the consequence of using mobile phone to access farming information provided by the government | ☐ | ☐ | ☐ | ☐ |
| | 3. The results of using mobile phone to access farming information provided by the government are apparent to me | ☐ | ☐ | ☐ | ☐ |
| | 4. I would have no difficult explaining why using mobile phone to access farming information provided by government may or may not be beneficial | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**VISIBILITY**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Visibility is defined as the degree to which using mobile phone to access farming information provided by the government is noticeable within the rural farmers society | 1. I have seen people in my village using their mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |
| | 2. In my village, one can easily see other people using their mobile phone to access the government's farming information | ☐ | ☐ | ☐ | ☐ |
| | 3. I have seen people in other villages using their mobile phone to access the government's farming information | ☐ | ☐ | ☐ | ☐ |
| | 4. It is easy for me to observe how other people use mobile's phone systems in gathering the government's farming information | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**TRIALABILITY**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Trialability shows the extent to which using mobile phone to access farming information provided by government can be tested by the rural farmers within a given time. | 1. Before deciding on whether or not to use mobile phone to access farming information provided by government, I would want to be able to use it on a trial basis to see what it can do | ☐ | ☐ | ☐ | ☐ |
| | 2. I would want to try using mobile phone systems to access farming information provided by government long enough to get familiar how it works and the benefit to be acquired | ☐ | ☐ | ☐ | ☐ |
| | 3. I would use mobile phone to access farming information provided by the government if I would be being involved in pilot test | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**AWARENESS**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Awareness defined a scope of knowledge and the recognition that rural farmers have over the use of mobile phone in accessing farming information provided by the government. | 1. I am aware of available mobile systems used by government to distributed farming information to Tanzania rural areas | ☐ | ☐ | ☐ | ☐ |
| | 2. I receive enough information about using mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |
| | 3. I am aware of the education/training programs on ways to use mobile phone to access farming information provided by government. | ☐ | ☐ | ☐ | ☐ |
| | 4. I have come across campaigns or advertisements for using mobile phone to access farming information provided by government in rural areas | ☐ | ☐ | ☐ | ☐ |
| | 5. I am aware of the benefit that can be generated by using mobile phone in farming information provided by government. | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**GOVERNMENT SUPPORT**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Government support is considered as extent to which government provides all necessary support which could enable rural farmers to use mobile phone in accessing farming information provided by government | 1. Tanzania government endorses the dissemination of farming information to rural area via mobile phone in all government institutions | ☐ | ☐ | ☐ | ☐ |
| | 2. Tanzania government is active in setting-up relevant facilities such as ICT infrastructures so that people can gather farming information via their mobile phone | ☐ | ☐ | ☐ | ☐ |
| | 3. Tanzania government promotes the uses of mobile phone to disseminate farming information provided by the government in rural areas | ☐ | ☐ | ☐ | ☐ |
| | 4. The government requlations and laws related to the use of mobile phone in accessing government's farming | ☐ | ☐ | ☐ | ☐ |

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| | information could make me feel comfortable. | | | | |
| | 5. The government's current efforts is making me feeling comfortable in using the mobile phone to access the government's farming information | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

**BEHAVIOURAL INTENTION**

| Operational definition | Measurement items | Scale | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Behavioural Intention is defined as perceived strength of rural farmers intention to adopt mobile phone to access farming information provided by government | 1. In future, I intend to use mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |
| | 2. I would use mobile phone to obtain relevant farming information provided by the government that is useful to me | ☐ | ☐ | ☐ | ☐ |
| | 3. I would recommend other people to use the mobile phone to access farming information provided by government | ☐ | ☐ | ☐ | ☐ |
| | 4. I would use the mobile phone to access various information provided by government. | ☐ | ☐ | ☐ | ☐ |
| **Additional comments (if any):** | | | | | |

## Appendix B: Introduction letter and Informed Consent

**UNIVERSITI TUNKU ABDUL RAHMAN**

Dear Sir / Madam,

I am conducting a study titled **"The Impacts of Government Support and Awareness on Rural Farmers' Intention to Adopt M-Government in Tanzania."** The study seeks to examine the factors which may influence the adoption of mobile in accessing farming information provided by government in Tanzania rural areas.

The study involves only Tanzania rural farmers like you, who are most likely or least likely to use mobile phone to access farming information provided by the government. I would like to obtain your opinion and really appreciate if you could respond to the whole questionnaire. Please read carefully all the instructions and answer every questions sincerely. There is no right or wrong answer.

Your participation in this study is voluntary. If you choose not to participate or withdraw from participating you can do so at any time without any penalty. The findings of this study will assist Tanzania policy makers in the uptake and planning for the use of mobile in accessing farming information provided by government in rural areas.

I would like to assure you that your response would be treated as private and confidential and would only be used for academic purposes in this study.

Thank you very much for responding to my questionnaire despite your hectic schedules. If you have any question regarding this study, please call the number below

You're sincerely,

Mandari Herman
PhD Candidate
Mobile: +255 688 [redacted] 030

# Informed Consent Agreement

**I understand that:**

1. I may decline or withdraw at any time without consequences.
2. My personal anonymity will be upheld and guaranteed.
3. The research data will be used only for academic purposes
4. The researcher has thoroughly explained the research objectives and all of my questions and concerns have been addressed.
5. Data will be stored in a confidential and locked area; all forms used for data collection will be shredded after closing this study.

By signing this form, I acknowledge that, I understand the objective of the study. Furthermore, my signature on this form also indicates that, I am 15 years old or older and below 65 years. Also, I give my permission to voluntarily serve as a participant in this study.

**Signature of the participant: …… Date……**

## Appendix C: Main Questionnaire- English Version

### PART A

### RESPONDENT'S BACKGROUND

Instructions: Please mark an (√) for your answer in the boxes provided.

**1 Gender**

- Male ☐
- Female ☐

**2 Age**

- 15 – 35 ☐
- 36 – 59 ☐
- 60 – 64 ☐

**3 Fluent in which language?**

- Swahili ☐
- English ☐

**4 Do you own mobile phone?**

- Yes ☐
- No ☐

**5 Roughly, your gross yearly income (Tshs)?**

- Below 200,000 ☐
- 200,000 - 300,000 ☐
- 300,001 - 400,000 ☐
- Above 400,000 ☐

**6 What is your education level?**

- No formal education ☐
- Primary ☐
- Secondary ☐
- Diploma ☐
- Bachelor ☐
- Postgraduate ☐

**PART B**

**Instruction:**

Please indicate how strongly you agree or disagree with the statements below. You can mark your sincere response anywhere from 1 to 5. The score means**:** **[1] – Strongly Disagree [2] – Disagree [3] – Neither [4] – Agree [5] – Strongly Agree**.

| No | Statements | Strongly Disagree | Disagree | Neither | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 1 | By using the mobile phone, I may be able to access the government's farming information with lesser financial cost | 1 | 2 | 3 | 4 | 5 |
| 2 | By using the mobile phone, I may be able to access the government's farming information with less effort | 1 | 2 | 3 | 4 | 5 |
| 3 | By using the mobile phone, I may be able to access the government's farming information anytime, anywhere | 1 | 2 | 3 | 4 | 5 |
| 4 | By using the mobile phone, I may be able to access the government's farming information effectively | 1 | 2 | 3 | 4 | 5 |
| 5 | By using the mobile phone, I may be able to access the government's farming information more quickly | 1 | 2 | 3 | 4 | 5 |
| 6 | Using mobile phone would fit well with the way I like to gather government's farming information | 1 | 2 | 3 | 4 | 5 |
| 7 | Using mobile phone to access government's farming information would be appropriate to me | 1 | 2 | 3 | 4 | 5 |
| 8 | Using mobile phone to gather government's farming information would fit my lifestyle well | 1 | 2 | 3 | 4 | 5 |
| 9 | Using mobile phone to access government's farming information would be compatible with how I like to do things | 1 | 2 | 3 | 4 | 5 |
| 10 | Using mobile phone to access the government's farming information would fulfil my needs | 1 | 2 | 3 | 4 | 5 |
| 11 | I think people who are using mobile phone to access the government's farming information are considered to be trendy in our society | 1 | 2 | 3 | 4 | 5 |
| 12 | I think using mobile phone to access government's farming information would enhance my personal social status in our society | 1 | 2 | 3 | 4 | 5 |

| No | Statements | Strongly Disagree | Disagree | Neither | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 13 | I think people who use mobile phone to access government's farming information are perceived as an important person in our society | 1 | 2 | 3 | 4 | 5 |
| 14 | I think people who use the mobile phone to access government's farming information have high profile in our society | 1 | 2 | 3 | 4 | 5 |
| 15 | I think people who use mobile phone to access farming government's farming information will be more respected in our society | 1 | 2 | 3 | 4 | 5 |
| 16 | It would be easy for me to remember how to use the mobile phone to access the government's farming information | 1 | 2 | 3 | 4 | 5 |
| 17 | I believe that interacting with government to access farming information over mobile phone would be clear and understandable | 1 | 2 | 3 | 4 | 5 |
| 18 | I believe it would be easy for me to get mobile farming applications provided by the government to do what I want to do | 1 | 2 | 3 | 4 | 5 |
| 19 | It would be easy for me to learn how to use mobile phone to access governments' farming information | 1 | 2 | 3 | 4 | 5 |
| 20 | I would have no difficult telling others about the results of using mobile phone to access governments' farming information | 1 | 2 | 3 | 4 | 5 |
| 21 | I believe I could communicate to others the consequence of using mobile phone to access governments' farming information | 1 | 2 | 3 | 4 | 5 |
| 22 | The results of using mobile phone to access farming information provided by government are apparent to me | 1 | 2 | 3 | 4 | 5 |
| 23 | It would be easy to me to explain how and why the use of mobile phone to access government's farming information may or may not be beneficial | 1 | 2 | 3 | 4 | 5 |
| 24 | I have seen people in my village using their mobile phone to access the government's farming information | 1 | 2 | 3 | 4 | 5 |
| 25 | In my village, one can easily see other people using their mobile phone to access the government's farming information | 1 | 2 | 3 | 4 | 5 |
| 26 | I have seen people in other villages using their mobile phone to access the government's farming information | 1 | 2 | 3 | 4 | 5 |
| 27 | It is easy for me to observe how other people use the mobile's system in gathering the government's farming information | 1 | 2 | 3 | 4 | 5 |

| No | Statements | Strongly Disagree | Disagree | Neither | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 28 | Before deciding to use mobile phone to access farming information provided by government, I would want to be able to use it on a trial basis to see what it can | 1 | 2 | 3 | 4 | 5 |
| 29 | I would want to try using mobile phone systems to access farming information provided by government long enough to get familiar how it works and the benefit to be acquired | 1 | 2 | 3 | 4 | 5 |
| 30 | I would use mobile phone to access farming information provided by the government if I would be involved in pilot test | 1 | 2 | 3 | 4 | 5 |
| 31 | I am aware that the government is distributing farming information via various mobile application such as M-kilimo, Magriculture and mFarming | 1 | 2 | 3 | 4 | 5 |
| 32 | Sufficient information about using mobile phone to access government's farming information have been provided to me | 1 | 2 | 3 | 4 | 5 |
| 33 | I am aware of the education / training provided to farmers on ways to access government services and farming information via mobile phone. | 1 | 2 | 3 | 4 | 5 |
| 34 | I have seen/ heard of the campaigns or advertisements that were used to promote the use of mobile phone to access government's farming information in rural areas | 1 | 2 | 3 | 4 | 5 |
| 35 | I am aware of the benefits that can be generated by using the mobile phone in accessing the government's farming information. | 1 | 2 | 3 | 4 | 5 |
| 36 | The government endorses the dissemination of relevant information to rural area via mobile phone in all government institutions | 1 | 2 | 3 | 4 | 5 |
| 37 | The government is active in setting-up relevant facilities such as mobile phone infrastructures so that people can gather farming information via their mobile phone | 1 | 2 | 3 | 4 | 5 |
| 38 | The government promotes the uses of mobile phone to disseminate farming information in rural areas | 1 | 2 | 3 | 4 | 5 |
| 39 | The government regulations and laws related to the use of mobile phone in accessing government's farming information could make me feel comfortable. | 1 | 2 | 3 | 4 | 5 |
| 40 | In future, I intend to use mobile phone to access the government's farming information | 1 | 2 | 3 | 4 | 5 |

| No | Statements | Strongly Disagree | Disagree | Neither | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 41 | I would use mobile phone to obtain relevant government's farming information that is useful to me | 1 | 2 | 3 | 4 | 5 |
| 42 | I would recommend other people to use the mobile phone to access the government's farming information | 1 | 2 | 3 | 4 | 5 |
| 43 | I would use the mobile phone to access various information provided by the government | 1 | 2 | 3 | 4 | 5 |

**Thank you so much for your time and assistance**

## Appendix D: Main Questionnaire- Swahili Version


**CHUO KIKUU CHA TUNKU ABDUL RAHMAN**

Ndugu Mkulima,

Ninafanya utafiti juu ya **Matokeo ya Ushiriki wa Serikali na Uelewa wa Wananchi juu ya Kusudio la Wakulima wa vijijini kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali.** Utafiti huu unalenga kuchambua sababu mbalimbali ambazo zinaweza kusaidia wakulima wa vijijini kutumia simu za mkunoni kupata taarifa za kilimo zinazotolewa na serikali nchini Tanzania.

Utafiti huu unawahusu wakulima tu wanaoishi vijijini. Ukiwa mmoja wa wakulima ambao kwa kiasi kikubwa au kidogo wanaweza kutumia simu za mkononi kupata taarifa zinazotolewa na Serikali kuhusu kilimo, ningependa kupata maoni yako wewe binafsi kwa maswali yote kupitia dodoso hili. Tafadhali unaombwa kusoma kwa makini maelekezo yote na kujibu maswali yote kwa uaminifu mkubwa. Katika dodoso hili hakuna jibu lililo sahihi ama lisilo sahihi. Jibu lolote utakalotoa litakubalika.

Una maamuzi ya kushiriki au kutokushiriki katika utafiti huu, kutokushiki kwako hakukufanyi wewe tutenda kosa lolote. Taarifa zitakazopatikana zitawasaidia watunga sera wa Tanzania kupata uelewa na kupanga mipango kwa ajili ya kutoa huduma za kilimo za Serikali kwa njia ya simu za mkononi katika maeneo ya vijijini.Napenda kukuhakikishia kwamba taarifa utakazotoa zitakuwa siri na zitatumika kwa matumizi ya utafiti huu tu.

Nakushukuru sana kwa kutoa muda wako kushiriki katika kujibu maswali yaliyomo katika dodoso hili. Kama utakuwa na swali tafadhali wasiliana na namba hiyo hapo chini

Wako,

Mandari Herman
Mwanafunzi wa Shahada ya Uzamivu
Simu: +255 688 [redacted] 030

## Mkataba wa Ridhaa

**Mimi naelewa kwamba:**

1. Ninaweza kujitoa kushiriki katika utafiti huu muda wowote pasipo na madhara yoyote.
2. Nimehakikishiwa taarifa zangu zitatunzwa kwa siri.
3. Taarifa za utafiti huu zitatumika kwa madhumuni ya kielimu tu.
4. Nimeelezwa madhumuni ya utafiti huu na pale nilipokuwa na swali nimeeleweshwa vizuri.
5. Madodoso yoote yaliyotumika kwenye huu utafiti yatachanwachanwa baada ya huu utafiti kuisha.

Kwa kusaini form hii, ninakubali kuwa ninaelewa malengo ya utafiti huu. Zaidi ya hapo, sahihi yangu pia katika karatasi hii inaonyesha kuwa nina umri wa kuanzia miaka 15 na chini ya miaka 65. Lakini pia nimekubali mimi mwenyewe kwa hiari yangu kuwa mhojiwa kwenye utafiti huu.

**Sahihi ya Mhojiwa: …… Tarehe……**

**SEHEMU A**

**TAARIFA BINAFSI ZA MSHIRIKI**

Maelekezo: Tafadhali weka alama ya vema (√) kwa jibu sahihi kwenye kisanduku.

**1 Jinsia**

Mme ☐

Mke ☐

**2 Umri**

15 – 35 ☐

36 – 59 ☐

60 – 64 ☐

**3 Unaongea lugha ipi kwa ufasaha?**

Kiswahili ☐

Kingereza ☐

**4 Unamiliki/ulishamiliki simu ya mkononi?**

Ndiyo ☐

Hapana ☐

**5 Makisio ya Kipato chako kwa mwaka (Shillingi)**

Chini ya 200,000 ☐

200,000 - 300,000 ☐

300,001 - 400,000 ☐

Zaidi ya 400,000 ☐

**6 Kiwango chako cha Elimu**

Sijasoma ☐

Darasa la Saba ☐

Sekondari ☐

Stashahada ☐

Shahada ☐

Uzamili ☐

**SEHEMU B: MAELEKEZO**

Tafadhali onesha ni kwa kiasi gani unakubaliana ama kutokubaliana na kauli hizi katika jedwali. Weka alama ya (√) katika namba yoyote kuanzia 1 mpaka 5 kulingana na kiasi cha kukubalina ama kutokubaliana kwako. Namba zilizopo kati ya 1 na 5 zina maana ifuatayo:-

[1] - Sikubaliani Kabisa [2] - Sikubaliani [3] – Sijui [4] – Nakubaliana [5] - Nakubaliana Kabisa

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 1 | Kwa kutumia simu ya mkononi naweza kupata taarifa za kilimo zinazotolewa na Serikali kwa gharama ndogo. | 1 | 2 | 3 | 4 | 5 |
| 2 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali kwa wepesi. | 1 | 2 | 3 | 4 | 5 |
| 3 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali wakati wowote na mahali popote. | 1 | 2 | 3 | 4 | 5 |
| 4 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali kwa ufanisi. | 1 | 2 | 3 | 4 | 5 |
| 5 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali kwa muda mfupi. | 1 | 2 | 3 | 4 | 5 |
| 6 | Utumiaji wa simu ya mkononi utanisaidia kwa namna nitakavyopenda kupata taarifa mbalimbali za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 7 | Utumiaji wa simu ya mkononi kwa kuwasiliana na mamlaka za Serikali za kilimo utanifaa sana. | 1 | 2 | 3 | 4 | 5 |
| 8 | Utumiaji wa simu ya mkononi katika kukusanya taarifa za kilimo zinazotolewa na Serikali utaendana vyema na mtindo wangu wa maisha. | 1 | 2 | 3 | 4 | 5 |
| 9 | Utumiaji wa simu ya mkononi kuwasiliana na mamlaka za Serikali kupata taarifa za kilimo hakutaendana na namna ninavyopenda kufanya mambo yangu. | 1 | 2 | 3 | 4 | 5 |
| 10 | Utumiaji wa simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali kutasaidia kutimiza mahitaji yangu katika kilimo. | 1 | 2 | 3 | 4 | 5 |

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 11 | Wakulima ambao watatumia simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali wataheshimiwa zaidi na jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 12 | Wakulima ambao watatumia simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali watapewa kipaumbele zaidi katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 13 | Wakulima ambao watatumia simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali watajulikana zaidi katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 14 | Wakulima ambao watatumia simu zao za mkononi kupata taarifa za kilimo zinazotolewa na Serikali wataonekana kuwa watu muhimu sana katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 15 | Wakulima ambao watatumia simu zao za mkononi kupata taarifa za kilimo zinazotolewa na Serikali watakuwa na hadhi ya juu katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 16 | Haitakuwa vigumu kwangu kujifunza namna ya kutumia programu za simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 17 | Ninaamini kuwa taarifa za kilimo zinazotolewa na Serikali zitakuwa sahihi na zitaeleweka vizuri endapo zitapatikana kwa njia ya simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 18 | Haitakuwa vigumu kwangu kutafuta taarifa za kilimo zinazotolewa na Serikali kwa njia ya simu ya mkononi ili kukidhi mahitaji yangu ya kilimo. | 1 | 2 | 3 | 4 | 5 |
| 19 | Haitakuwa vigumu kwangu kuwa mzoefu katika kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 20 | Haitakuwa vigumu kwangu kuwashirikisha wakulima wengine juu ya manufaa ya taarifa za kilimo zinazotolewa na Serikali ambazo nitakuwa nimezipata kwa njia ya simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 21 | Ninaamini kuwa nitawasiliana na wakulima wengine juu ya matokeo yatakayojitokeza katika kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 22 | Manufaa ya kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali yanafahamika kwangu. | 1 | 2 | 3 | 4 | 5 |

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 23 | Itaniwia vigumu kuelezea namna ya kutumia na sababu za kutumia simu ya mkononi kwa ajili ya kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 24 | Nimeshaona wakulima wengine wakitumia simu zao za mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 25 | Katika kijiji changu, ni rahisi mtu kuona wakulima wakitumia simu zao za mkononi kutafuta taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 26 | Nimeshaona wakulima wa vijiji vingine wakitumia simu zao za mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 27 | Ni rahisi kwangu kujifunza kutoka kwa wakulima wengine namna wanavyotumia mfumo wa simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 28 | Kabla ya kuanza kupata taarifa za kilimo zinazotolewa na Serikali, nitapenda kwanza kufanya majaribio ya kutosha juu ya namna ya kutumia programu za simu ya mikononi. | 1 | 2 | 3 | 4 | 5 |
| 29 | Ili nihamasike kutumia simu ya mkononi kupata taarifa za kilimo, ni lazima kwanza muda wa kipindi cha majaribio utolewe ili niweze kufanya tathimini ya namna programu za simu ya mkononi zinavyoweza kuwa na manufaa katika kazi zangu za kilimo. | 1 | 2 | 3 | 4 | 5 |
| 30 | Muda wa majaribio wa matumizi ya mfumo ya huduma za kiserikali kwa njia ya simu za mkononi lazima uwe mrefu ili unisaidie kufanya tathimini juu ya ufanyaji kazi na utumiaji wa simu ya mkononi katika kupata taarifa za kilimo. | 1 | 2 | 3 | 4 | 5 |
| 31 | Ninafahamu kuwa Serikali inatoa taarifa za kilimo kwa njia ya simu za mkononi kupitia mifumo mbalimbali kama vile M-Kilimo, Magriculture, na mFarming. | 1 | 2 | 3 | 4 | 5 |
| 32 | Taafira za kutosha zimeshasambazwa kwa wakulima kuwa taarifa za kilimo zinazotolewa na Serikali zinaweza kupatikana kupitia simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 33 | Nina uelewa wa elimu na mafunzo yatolewayo kwa wakulima juu ya kupata huduma za Serikali na taarifa mbalimbali za kilimo kupitia simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 34 | Nimeshawahi kuona/kusikia juu ya kuwepo kwa kampeni na matangazo sehemu za vijijini ambazo zilikuwa zinahamasisha wakulima juu ya matumini ya simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 35 | Ninaelewa manufaa ambayo yatapatikana kutokana na kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 36 | Serikali imeruhusu usambazaji wa taarifa za kilimo kwa wakulima kwa njia ya simu ya mkononi kupitia taasisi zake zote. | 1 | 2 | 3 | 4 | 5 |
| 37 | Serikali iko mstari wa mbele kuweka miundombinu rafiki ya teknolojia ya habari na mawasiliano ili kuwawezesha wakulima kupata taarifa za kilimo kwa njia ya simu zao za mkononi. | 1 | 2 | 3 | 4 | 5 |
| 38 | Serikali ya Tanzania inahamasisha matumizi ya teknolojia ya simu za mkononi ili kusambaza taarifa za kilimo kwa wakulima walioko vijijini. | 1 | 2 | 3 | 4 | 5 |
| 39 | Kanuni na sheria za Serikali zinazohusiana na matumizi ya simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali zinanifanya nijisikie vizuri. | 1 | 2 | 3 | 4 | 5 |
| 40 | Katika siku zijazo, natarajia kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 41 | Nitatumia simu ya mkononi ili kupata taarifa za kilimo zilizo na manufaa kwangu. | 1 | 2 | 3 | 4 | 5 |
| 42 | Nitatumia programu mbalimbali za simu ya mkononi kuwasiliana na mamlaka mbalimbali za Serikali zinazohusika na masuala ya kilimo. | 1 | 2 | 3 | 4 | 5 |
| 43 | Nitawashauri wakulima wengine kutumia programu mbalimbali za simu ya mkononi ili kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |

## Appendix E: Final Measurement Items - Swahili Version

**MAELEKEZO**

Tafadhali onesha ni kwa kiasi gani unakubaliana ama kutokubaliana na kauli hizi katika jedwali. Weka alama ya (√) katika namba yoyote kuanzia 1 mpaka 5 kulingana na kiasi cha kukubalina ama kutokubaliana kwako. Namba zilizopo kati ya 1 na 5 zina maana ifuatayo:-

[1] - Sikubaliani Kabisa [2] - Sikubaliani [3] - Sijui [4] - Nakubaliana [5] - Nakubaliana Kabisa

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 1 | Kwa kutumia simu ya mkononi naweza kupata taarifa za kilimo zinazotolewa na Serikali kwa gharama ndogo. | 1 | 2 | 3 | 4 | 5 |
| 2 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali kwa wepesi. | 1 | 2 | 3 | 4 | 5 |
| 3 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali wakati wowote na mahali popote. | 1 | 2 | 3 | 4 | 5 |
| 4 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali kwa ufanisi. | 1 | 2 | 3 | 4 | 5 |
| 5 | Kwa kutumia simu ya mkononi ninaweza kupata taarifa za kilimo zinazotolewa na Serikali kwa muda mfupi | 1 | 2 | 3 | 4 | 5 |
| 6 | Utumiaji wa simu ya mkononi utanisaidia kwa namna nitakavyopenda kupata taarifa mbalimbali za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 7 | Utumiaji wa simu ya mkononi kwa kuwasiliana na mamlaka za Serikali za kilimo utanifaa sana. | 1 | 2 | 3 | 4 | 5 |
| 8 | Utumiaji wa simu ya mkononi katika kukusanya taarifa za kilimo zinazotolewa na Serikali utaendana vyema na mtindo wangu wa maisha. | 1 | 2 | 3 | 4 | 5 |
| 9 | Utumiaji wa simu ya mkononi kuwasiliana na mamlaka za Serikali kupata taarifa za kilimo hakutaendana na namna ninavyopenda kufanya mambo yangu. | 1 | 2 | 3 | 4 | 5 |
| 10 | Utumiaji wa simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali kutasaidia kutimiza mahitaji yangu katika kilimo. | 1 | 2 | 3 | 4 | 5 |

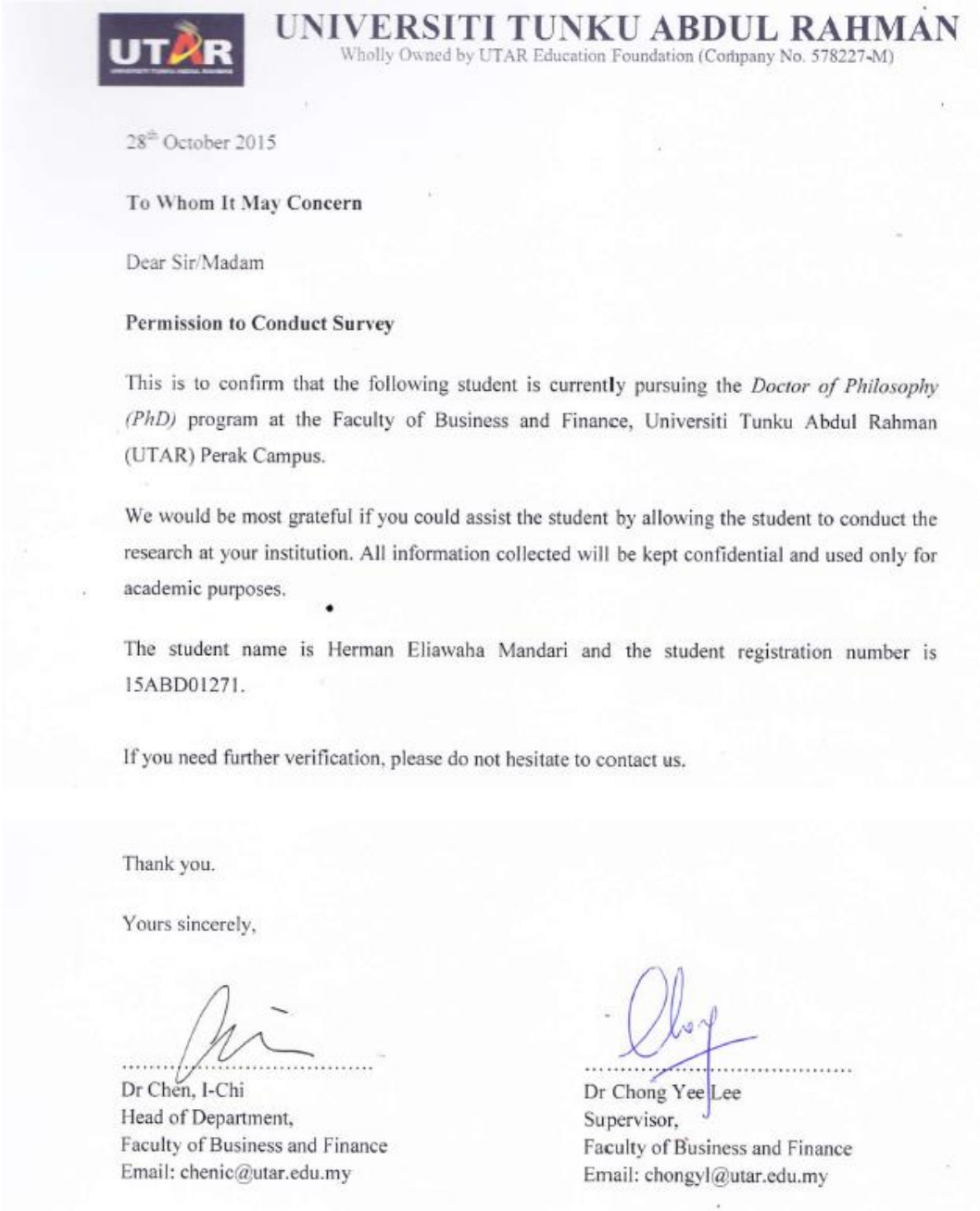
| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 11 | Wakulima ambao watatumia simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali watapewa kipaumbele zaidi katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 12 | Wakulima ambao watatumia simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali watajulikana zaidi katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 13 | Wakulima ambao watatumia simu zao za mkononi kupata taarifa za kilimo zinazotolewa na Serikali wataonekana kuwa watu muhimu sana katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 14 | Wakulima ambao watatumia simu zao za mkononi kupata taarifa za kilimo zinazotolewa na Serikali watakuwa na hadhi ya juu katika jamii zao. | 1 | 2 | 3 | 4 | 5 |
| 15 | Haitakuwa vigumu kwangu kujifunza namna ya kutumia programu za simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 16 | Ninaamini kuwa taarifa za kilimo zinazotolewa na Serikali zitakuwa sahihi na zitaeleweka vizuri endapo zitapatikana kwa njia ya simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 17 | Haitakuwa vigumu kwangu kutafuta taarifa za kilimo zinazotolewa na Serikali kwa njia ya simu ya mkononi ili kukidhi mahitaji yangu ya kilimo. | 1 | 2 | 3 | 4 | 5 |
| 18 | Haitakuwa vigumu kwangu kuwa mzoefu katika kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 19 | Haitakuwa vigumu kwangu kuwashirikisha wakulima wengine juu ya manufaa ya taarifa za kilimo zinazotolewa na Serikali ambazo nitakuwa nimezipata kwa njia ya simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 20 | Ninaamini kuwa nitawasiliana na wakulima wengine juu ya matokeo yatakayojitokeza katika kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 21 | Manufaa ya kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali yanafahamika kwangu. | 1 | 2 | 3 | 4 | 5 |
| 22 | Nimeshaona wakulima wengine wakitumia simu zao za mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 23 | Katika kijiji changu, ni rahisi mtu kuona wakulima wakitumia simu zao za mkononi kutafuta taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 24 | Nimeshaona wakulima wa vijiji vingine wakitumia simu zao za mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| 25 | Ni rahisi kwangu kujifunza kutoka kwa wakulima wengine namna wanavyotumia mfumo wa simu za mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 26 | Kabla ya kuanza kupata taarifa za kilimo zinazotolewa na Serikali, nitapenda kwanza kufanya majaribio ya kutosha juu ya namna ya kutumia programu za simu ya mikononi. | 1 | 2 | 3 | 4 | 5 |
| 27 | Ili nihamasike kutumia simu ya mkononi kupata taarifa za kilimo, ni lazima kwanza muda wa kipindi cha majaribio utolewe ili niweze kufanya tathimini ya namna programu za simu ya mkononi zinavyoweza kuwa na manufaa katika kazi zangu za kilimo. | 1 | 2 | 3 | 4 | 5 |
| 28 | Muda wa majaribio wa matumizi ya mfumo ya huduma za kiserikali kwa njia ya simu za mkononi lazima uwe mrefu ili unisaidie kufanya tathimini juu ya ufanyaji kazi na utumiaji wa simu ya mkononi katika kupata taarifa za kilimo. | 1 | 2 | 3 | 4 | 5 |
| 29 | Ninafahamu kuwa Serikali inatoa taarifa za kilimo kwa njia ya simu za mkononi kupitia mifumo mbalimbali kama vile M-Kilimo, Magriculture, na mFarming. | 1 | 2 | 3 | 4 | 5 |
| 30 | Taafira za kutosha zimeshasambazwa kwa wakulima kuwa taarifa za kilimo zinazotolewa na Serikali zinaweza kupatikana kupitia simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 31 | Nina uelewa wa elimu na mafunzo yatolewayo kwa wakulima juu ya kupata huduma za Serikali na taarifa mbalimbali za kilimo kupitia simu ya mkononi. | 1 | 2 | 3 | 4 | 5 |
| 32 | Nimeshawahi kuona/kusikia juu ya kuwepo kwa kampeni na matangazo sehemu za vijijini ambazo zilikuwa zinahamasisha wakulima juu ya matumini ya simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 33 | Ninaelewa manufaa ambayo yatapatikana kutokana na kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 34 | Serikali imeruhusu usambazaji wa taarifa za kilimo kwa wakulima kwa njia ya simu ya mkononi kupitia taasisi zake zote. | 1 | 2 | 3 | 4 | 5 |
| 35 | Serikali iko mstari wa mbele kuweka miundombinu rafiki ya teknolojia ya habari na | 1 | 2 | 3 | 4 | 5 |

| Na | Kauli | Sikubaliani Kabisa | Sikubaliani | Sijui | Nakubaliana | Nakubaliana Kabisa |
|---|---|---|---|---|---|---|
| | mawasiliano ili kuwawezesha wakulima kupata taarifa za kilimo kwa njia ya simu zao za mkononi. | | | | | |
| 36 | Serikali ya Tanzania inahamasisha matumizi ya teknolojia ya simu za mkononi ili kusambaza taarifa za kilimo kwa wakulima walioko vijijini. | 1 | 2 | 3 | 4 | 5 |
| 37 | Kanuni na sheria za Serikali zinazohusiana na matumizi ya simu ya mkononi katika kupata taarifa za kilimo zinazotolewa na Serikali zitanifanya nijisikie vizuri. | 1 | 2 | 3 | 4 | 5 |
| 38 | Katika siku zijazo, natarajia kutumia simu ya mkononi kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |
| 39 | Nitatumia simu ya mkononi ili kupata taarifa za kilimo zilizo na manufaa kwangu. | 1 | 2 | 3 | 4 | 5 |
| 40 | Nitatumia programu mbalimbali za simu ya mkononi kuwasiliana na mamlaka mbalimbali za Serikali zinazohusika na masuala ya kilimo. | 1 | 2 | 3 | 4 | 5 |
| 41 | Nitawashauri wakulima wengine kutumia programu mbalimbali za simu ya mkononi ili kupata taarifa za kilimo zinazotolewa na Serikali. | 1 | 2 | 3 | 4 | 5 |

**Nakushukuru sana kwa kutenga muda kujibu maswali haya na msaada wako**

## Appendix F: Introduction Letter from UTAR



UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

28th October 2015

**To Whom It May Concern**

Dear Sir/Madam

**Permission to Conduct Survey**

This is to confirm that the following student is currently pursuing the *Doctor of Philosophy (PhD)* program at the Faculty of Business and Finance, Universiti Tunku Abdul Rahman (UTAR) Perak Campus.

We would be most grateful if you could assist the student by allowing the student to conduct the research at your institution. All information collected will be kept confidential and used only for academic purposes.

The student name is Herman Eliawaha Mandari and the student registration number is 15ABD01271.

If you need further verification, please do not hesitate to contact us.

Thank you.

Yours sincerely,

Dr Chen, I-Chi
Head of Department,
Faculty of Business and Finance
Email: chenic@utar.edu.my

Dr Chong Yee Lee
Supervisor,
Faculty of Business and Finance
Email: chongyl@utar.edu.my

## Appendix G: Introduction Letter from IFM


**CHUO CHA USIMAMIZI WA FEDHA**
**THE INSTITUTE OF FINANCE MANAGEMENT**
**(ESTABLISHED UNDER THE ACT No. 3 OF 1972)**

5 SHAABAN ROBERT STREET
P. O . BOX 3918
11101 **DAR ES SALAAM**
TANZANIA
TEL: +255 22 2112931 - 4; 2114817
FAX: +255 22 2112935
rector@ifm.ac.tz


**REF. NO.** IFM/PF.841

29th December, 2015

**TO WHOM IT MAY CONCERN**

**RE: INTRODUCTION FOR MR. HERMAN E. MANDARI**

The bearer of this letter is a Staff of the Institute of Finance Management pursuing PhD Studies at the Universiti Tunku Abdul Rahman, Malaysia. As a part of requirements for completion of his studies, he is collecting information on" **The Impacts of Public Awareness and Government Support on Intention to Adopt M-Government Services in Tanzania**".

This letter serves to achieve three purposes. Firstly, to introduce him to you, secondly, to request you to grant him permission to undertake the research, and thirdly, to request you to facilitate any form of assistance he might need. We can assure you that this activity is entirely for academic purposes.

We trust that you will accord this staff member with necessary assistance.

We trust that you will accord our staff with necessary assistance.

Sincerely yours,

Hassan H. Semkiwa

## Appendix H: Sample Acceptance Letter to Conduct Research

**HALMASHAURI YA WILAYA YA MKURANGA**

*(Barua zote ziandikwe kwa Mkurugenzi Mtendaji Wilaya)*

*Simu Na 023 2402738*
*Fax Na. 023 - 2402706*

S.L.P 10,
**MKURANGA,**
**PWANI.**

*Unapojibu tafadhali taja:*

Kumb. Na. MDC/S.30/28/VOL.I/72

14 Januari, 2016

Mtendaji Kata Kiparang'anda,
Mtendaji Kata Tambani,
**MKURANGA.**

**YAH: KUFANYA UTAFITI BW. HERMAN E. MANDARI**

Husika na somo tajwa hapo juu.

Mtajwa hapo juu amekubaliwa kufanya utafiti katika Halmashauri hii kuhusu "The Impacts of Public Awareness and Government Support on Intention to Adopt M-Government Services in Tanzania". Tafadhali mpatie ushirikiano ili aweze kufanya utafiti huo kwa muda wa miezi miwili kuanzia tarehe ya barua hii.

Nakutakia kazi njema.

J. W. Mumangi
**Kny: MKURUGENZI MTENDAJI (W)**
**MKURANGA.**

Kny: MKURUGENZI MTENDAJI (W)
MKURANGA

Nakala: Mkurugenzi Mtendaji (W), - Aione katika jalada
S. L. P. 10,
**MKURANGA.**

## Appendix J: Non Significant results from Chi-Square Test

| S/N | Association between the variables | Symetric Measure | |
|---|---|---|---|
| | | Crammer' V | Approx. Sign |
| 1 | Gender (2) Vs Behavioural Intention (3) | 0.042 | 0.694 |
| 2 | Gender (2) Vs Relative Advantage(3) | 0.060 | 0.484 |
| 3 | Gender (2) Vs Compatibility (3) | 0.084 | 0.239 |
| 4 | Gender (2) Vs Image (3) | 0.071 | 0.354 |
| 5 | Gender (2) Vs Ease-of-Use(3) | 0.035 | 0.775 |
| 6 | Gender (2) Vs Result Demonstrability (3) | 0.074 | 0.323 |
| 7 | Gender (2) Vs Visibility (3) | 0.114 | 0.074 |
| 8 | Gender (2) Vs Trialability (3) | 0.048 | 0.621 |
| 9 | Gender (2) Vs Awareness (3) | 0.074 | 0.326 |
| 10 | Gender (2) Vs Government Support (3) | 0.030 | 0.829 |
| 11 | Language (2) Vs Behavioural Intention (3) | 0.058 | 0.510 |
| 12 | Language (2) Vs Relative Advantage (3) | 0.045 | 0.656 |
| 13 | Language (2) Vs Compatibility (3) | 0.069 | 0.382 |
| 14 | Language (2) Vs Image (3) | 0.030 | 0.829 |
| 15 | Language (2) Vs Ease-of-Use (3) | 0.058 | 0.504 |
| 16 | Language (2) Vs Result Demonstrability (3) | 0.093 | 0.173 |
| 17 | Language (2) Vs Visibility(3) | 0.064 | 0.430 |
| 18 | Language (2) Vs Trialability (3) | 0.056 | 0.533 |
| 19 | Language (2) Vs Awareness (3) | 0.021 | 0.917 |
| 20 | Language (2) Vs Government Support (3) | 0.044 | 0.678 |
| 21 | Mobile ownership (2) Vs Behavioural Intention (3) | 0.074 | 0.324 |
| 22 | Mobile ownership (2) Vs Relative Advantage (3) | 0.093 | 0.173 |
| 23 | Mobile ownership (2) Vs Compatibility (3) | 0.044 | 0.679 |
| 24 | Mobile ownership (2) Vs Image (3) | 0.071 | 0.358 |
| 25 | Mobile ownership (2) Vs Ease-of-Use (3) | 0.034 | 0.769 |
| 26 | Mobile ownership (2) Vs Result Demonstrability(3) | 0.034 | 0.793 |
| 27 | Mobile ownership (2) Vs Visibility (3) | 0.050 | 0.605 |
| 28 | Mobile ownership (2) Vs Trialability (3) | 0.087 | 0.217 |
| 29 | Mobile ownership (2) Vs Awareness (3) | 0.028 | 0.850 |
| 30 | Mobile ownership (2) Vs Government Support (3) | 0.100 | 0.132 |

## Appendix K: Non Significant results from Correlation Test

| S/N | Association between the variables | Symetric Measure | |
|---|---|---|---|
| | | Kandall's tau-c | Approx. Sign |
| 1 | Age (3) vs Relative Advantage (3) | -0.007 | 0.850 |
| 2 | Age (3) vs Compatibility (3) | -0.031 | 0.422 |
| 3 | Age (3) vs Image (3) | -0.035 | 0.228 |
| 4 | Age (3) vs Ease-of-Use (3) | -0.061 | 0.117 |
| 5 | Age (3) vs Result Demonstrability (3) | -0.016 | 0.658 |
| 6 | Age (3) vs Visibility (3) | -0.071 | 0.068 |
| 7 | Age (3) vs Trialability(3) | 0.039 | 0.126 |
| 8 | Age (3) vs Awareness(3) | -0.073 | 0.06 |
| 9 | Age (3) vs Government Support (3) | -0.022 | 0.496 |
| 10 | Income (4) vs Compatibility (3) | -0.075 | 0.059 |
| 11 | Income (4) vs Image (3) | -0.033 | 0.254 |
| 12 | Income (4) vs Ease-of-Use(3) | -0.077 | 0.070 |
| 13 | Income (4) vs Result Demonstrability (3) | -0.056 | 0.062 |
| 14 | Income (4) vs Visibility (3) | -0.073 | 0.082 |
| 15 | Income (4) vs Trialability (3) | 0.001 | 0.961 |
| 16 | Income (4) vs Awareness (3) | -0.034 | 0.123 |
| 17 | Income (4) vs Government Support (3) | -0.028 | 0.389 |
| 18 | Education level (5) vs Relative Advantage (3) | -0.010 | 0.774 |
| 19 | Education level (5) vs Compatibility (3) | -0.033 | 0.339 |
| 20 | Education level (5) vs Image (3) | -0.037 | 0.222 |
| 21 | Education level (5) vs Ease-of-Use (3) | -0.028 | 0.444 |
| 22 | Education level (5) vs Result Demonstrability (3) | 0.025 | 0.495 |
| 23 | Education level (5) vs Visibility (3) | -0.044 | 0.249 |
| 24 | Education level (5) vs Trialability(3) | -0.042 | 0.830 |
| 25 | Education level (5) vs Awareness (3) | -0.041 | 0.272 |
| 26 | Education level (5) vs Awareness (3) | -0.027 | 0.361 |

## Appendix L: Regression Weights

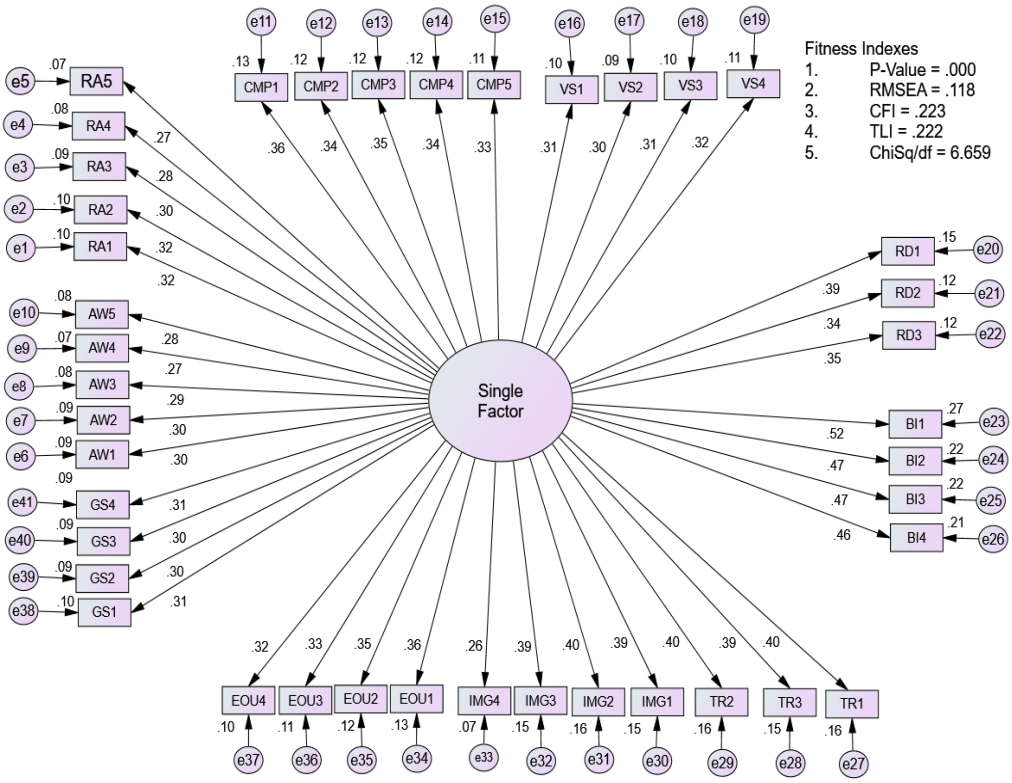
| Item | Path | Construct | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| AW1 | <--- | Awareness | 1.000 | | | | |
| AW2 | <--- | Awareness | 1.068 | .090 | 11.844 | *** | par_1 |
| CMP1 | <--- | Compatibility | 1.000 | | | | |
| CMP2 | <--- | Compatibility | 1.252 | .084 | 14.897 | *** | par_2 |
| RD1 | <--- | Demonstrability | 1.000 | | | | |
| RD2 | <--- | Demonstrability | 1.233 | .108 | 11.401 | *** | par_3 |
| BI1 | <--- | Intention | 1.000 | | | | |
| BI2 | <--- | Intention | 1.153 | .090 | 12.819 | *** | par_4 |
| BI3 | <--- | Intention | 1.221 | .092 | 13.334 | *** | par_5 |
| BI4 | <--- | Intention | 1.191 | .093 | 12.805 | *** | par_6 |
| RA2 | <--- | R_Advantage | .912 | .085 | 10.695 | *** | par_7 |
| GS3 | <--- | Gv_Support | .937 | .069 | 13.528 | *** | par_8 |
| IMG2 | <--- | Image | 1.373 | .129 | 10.657 | *** | par_9 |
| CMP3 | <--- | Compatibility | 1.239 | .083 | 14.927 | *** | par_10 |
| AW4 | <--- | Awareness | 1.212 | .100 | 12.159 | *** | par_11 |
| AW5 | <--- | Awareness | 1.259 | .099 | 12.654 | *** | par_12 |
| GS4 | <--- | Gv_Support | .801 | .067 | 12.002 | *** | par_13 |
| GS2 | <--- | Gv_Support | 1.000 | | | | |
| RA3 | <--- | R_Advantage | .879 | .085 | 10.316 | *** | par_14 |
| RA1 | <--- | R_Advantage | 1.000 | | | | |
| RD3 | <--- | Demonstrability | .778 | .083 | 9.391 | *** | par_15 |
| GS1 | <--- | Gv_Support | .896 | .066 | 13.667 | *** | par_16 |
| TR3 | <--- | Trialability | 1.127 | .105 | 10.748 | *** | par_17 |
| TR2 | <--- | Trialability | 1.033 | .098 | 10.597 | *** | par_18 |
| TR1 | <--- | Trialability | 1.000 | | | | |
| IMG3 | <--- | Image | 1.091 | .104 | 10.495 | *** | par_19 |
| IMG1 | <--- | Image | 1.000 | | | | |
| VS3 | <--- | Visibility | .994 | .076 | 13.045 | *** | par_20 |
| VS4 | <--- | Visibility | .854 | .074 | 11.561 | *** | par_21 |
| VS2 | <--- | Visibility | 1.158 | .082 | 14.106 | *** | par_22 |
| VS1 | <--- | Visibility | 1.000 | | | | |
| EOU3 | <--- | Ease_of_Use | 1.330 | .099 | 13.441 | *** | par_23 |
| EOU2 | <--- | Ease_of_Use | 1.192 | .093 | 12.866 | *** | par_24 |
| EOU1 | <--- | Ease_of_Use | 1.000 | | | | |
| EOU4 | <--- | Ease_of_Use | 1.366 | .102 | 13.398 | *** | par_25 |
| CMP4 | <--- | Compatibility | 1.189 | .087 | 13.647 | *** | par_26 |
| CMP5 | <--- | Compatibility | 1.226 | .087 | 14.079 | *** | par_27 |

Where: *** $p < 0.001$

## Appendix M: Correlations Values

| Construct | Path | Construct | Estimate |
|---|---|---|---|
| Awareness | <--> | R_Advantage | .161 |
| Image | <--> | Trialability | .160 |
| Compatibility | <--> | Visibility | .372 |
| Demonstrability | <--> | Visibility | -.121 |
| R_Advantage | <--> | Ease_of_Use | .046 |
| Awareness | <--> | Compatibility | .164 |
| Intention | <--> | Trialability | .202 |
| Intention | <--> | Image | .268 |
| Compatibility | <--> | Demonstrability | -.074 |
| Awareness | <--> | Ease_of_Use | .294 |
| Awareness | <--> | Gv_Support | -.078 |
| Trialability | <--> | Ease_of_Use | .301 |
| Gv_Support | <--> | Trialability | -.053 |
| R_Advantage | <--> | Gv_Support | .049 |
| R_Advantage | <--> | Visibility | -.063 |
| Compatibility | <--> | R_Advantage | .039 |
| Gv_Support | <--> | Image | .054 |
| Compatibility | <--> | Gv_Support | -.138 |
| R_Advantage | <--> | Image | .160 |
| Demonstrability | <--> | Image | .056 |
| Demonstrability | <--> | R_Advantage | .054 |
| Intention | <--> | Gv_Support | .060 |
| Image | <--> | Visibility | .120 |
| Compatibility | <--> | Ease_of_Use | .212 |
| Awareness | <--> | Visibility | .311 |
| Compatibility | <--> | Intention | .294 |
| Awareness | <--> | Trialability | .061 |
| Intention | <--> | Ease_of_Use | .458 |
| Compatibility | <--> | Image | -.011 |
| Demonstrability | <--> | Ease_of_Use | .015 |
| Awareness | <--> | Intention | .335 |
| Compatibility | <--> | Trialability | .051 |
| R_Advantage | <--> | Trialability | .084 |
| Visibility | <--> | Ease_of_Use | .403 |
| Demonstrability | <--> | Gv_Support | .165 |
| Awareness | <--> | Demonstrability | -.008 |
| Intention | <--> | R_Advantage | .285 |
| Gv_Support | <--> | Visibility | -.110 |
| Demonstrability | <--> | Trialability | .199 |
| Demonstrability | <--> | Intention | .126 |
| Image | <--> | Ease_of_Use | .309 |
| Gv_Support | <--> | Ease_of_Use | -.135 |
| Trialability | <--> | Visibility | .230 |
| Intention | <--> | Visibility | .374 |
| Awareness | <--> | Image | .383 |

## Appendix N: Harman's Single-Factor Model in CFA



## Appendix P: Common Latent Factor Standardised Values

| Item | Path | Construct | Estimate without CLF | Estimates with CLF | Difference |
|---|---|---|---|---|---|
| AW1 | <--- | Awareness | 0.685 | 0.647 | 0.038 |
| AW2 | <--- | Awareness | 0.709 | 0.651 | 0.058 |
| AW3 | <--- | Awareness | 0.479 | 0.396 | 0.083 |
| AW4 | <--- | Awareness | 0.722 | 0.687 | 0.035 |
| AW5 | <--- | Awareness | 0.766 | 0.722 | 0.044 |
| BI1 | <--- | Intention | 0.708 | 0.535 | 0.173 |
| BI2 | <--- | Intention | 0.730 | 0.613 | 0.117 |
| BI3 | <--- | Intention | 0.768 | 0.674 | 0.094 |
| BI4 | <--- | Intention | 0.730 | 0.618 | 0.112 |
| CMP1 | <--- | Compatibility | 0.696 | 0.637 | 0.059 |
| CMP2 | <--- | Compatibility | 0.824 | 0.775 | 0.049 |
| CMP3 | <--- | Compatibility | 0.825 | 0.771 | 0.054 |
| CMP4 | <--- | Compatibility | 0.746 | 0.676 | 0.070 |
| CMP5 | <--- | Compatibility | 0.771 | 0.718 | 0.053 |
| EOU1 | <--- | Ease_of_Use | 0.661 | 0.574 | 0.087 |
| EOU2 | <--- | Ease_of_Use | 0.764 | 0.697 | 0.067 |
| EOU3 | <--- | Ease_of_Use | 0.812 | 0.757 | 0.055 |
| EOU4 | <--- | Ease_of_Use | 0.810 | 0.761 | 0.049 |
| GS1 | <--- | Gv_Support | 0.747 | 0.703 | 0.044 |
| GS2 | <--- | Gv_Support | 0.777 | 0.724 | 0.053 |
| GS3 | <--- | Gv_Support | 0.737 | 0.693 | 0.044 |
| GS4 | <--- | Gv_Support | 0.647 | 0.602 | 0.045 |
| IMG1 | <--- | Image | 0.619 | 0.505 | 0.114 |
| IMG2 | <--- | Image | 0.774 | 0.645 | 0.129 |
| IMG3 | <--- | Image | 0.749 | 0.704 | 0.045 |
| IMG4 | <--- | Image | 0.464 | 0.411 | 0.053 |
| RA1 | <--- | R_Advantage | 0.748 | 0.713 | 0.035 |
| RA2 | <--- | R_Advantage | 0.696 | 0.666 | 0.030 |
| RA3 | <--- | R_Advantage | 0.667 | 0.602 | 0.065 |
| RA4 | <--- | R_Advantage | 0.236 | 0.129 | 0.107 |
| RA5 | <--- | R_Advantage | 0.474 | 0.373 | 0.101 |
| RD1 | <--- | Demonstrability | 0.799 | 0.731 | 0.068 |
| RD2 | <--- | Demonstrability | 0.838 | 0.770 | 0.068 |
| RD3 | <--- | Demonstrability | 0.517 | 0.441 | 0.076 |
| TR1 | <--- | Trialability | 0.685 | 0.555 | 0.130 |
| TR2 | <--- | Trialability | 0.694 | 0.593 | 0.101 |
| TR3 | <--- | Trialability | 0.763 | 0.704 | 0.059 |
| VS1 | <--- | Visibility | 0.732 | 0.681 | 0.051 |
| VS2 | <--- | Visibility | 0.804 | 0.772 | 0.032 |
| VS3 | <--- | Visibility | 0.722 | 0.675 | 0.047 |
| VS4 | <--- | Visibility | 0.634 | 0.559 | 0.075 |

## BIODATA OF THE CANDIDATE

Herman Eliawaha Mandari is a PhD candidate at Universiti Tunku Abdul Rahman (UTAR) in Malaysia. He obtained his Master Degree in Web Technology from Southampton University, England in 2008 and Bachelor of Science Degree with Computer Science from University of Dar es Salaam, Tanzania in 2006. He is a full time assistant lecturer from Computer Science Department, Faculty of Computing, Information Systems, and Mathematics, The Institute of Finance Management located in Dar es Salaam, Tanzania.

He has research interest in technology acceptance and usage which includes e-government services, m-government services, e-learning and e-banking; Web technologies which includes hypertext, web accessibility and usability, Web Science, hypermedia, semantic web, web services and web 2.0; and web programming technologies.

During his PhD he has authored and published three journal articles which are related to his PhD research.

1. **Mandari, H.E**, Chong, Y.L. & Wye, C.K. (2017). The Influence of Government Support and Awareness on Rural Farmers' Intention to Adopt Mobile Government Services in Tanzania. *Journal of Systems and Information Technology*, 19 (1/2), 42-64.
2. **Mandari, H.E.** & Chong, Y.L. Gender and Age Differences in Rural Farmers' Intention to Use M-Government Services. *Electronic Government, an Int. J.* Inderscience, (*Accepted*).

3. **Mandari, H.E.** & Chong, Y.L. The Moderating Effects of Awareness on Antecedents of Behavioral Intention to Adopt Mobile Government Services. *International Journal of E-Adoption*, IGI Global, *(Under Review).*

Furthermore, Mandari has published several journal articles which are not direct related to his PhD research area as shown below:

1. **Mandari, H.E.**, Koloseni, D. & Nguridada, J. (2017). Electronic Fiscal Device (EFD) Acceptance for Tax Compliance among Trading Business Community in Tanzania: The Role of Awareness and Trust. *International Journal of Economics, Commerce and Management*, 5 (3), 142-158

2. Koloseni, D. & **Mandari, H.E.** (2017). The Role of Personal Traits and Learner's Perceptions on the Adoption of E-learning Systems in Higher Learning Institutions. *The African Journal of Finance Management*, 26 (1), 61-75

3. **Mandari, H.E.** & Koloseni, D. (2016). Biometric Authentication in Financial Institutions: The Intention of Banks to Adopt Biometric Powered ATM. *Advances in Computer Science: an International Journal*, 5 (4), 9-17

4. **Mandari, H.E.** (2016). An Evaluation of Web Accessibility: The Context of Tanzanian Public Websites. *The African Journal of Finance Management*, 23 (1/2), 46-54

5. **Mandari, H.E.** & Koloseni, D. (2016). Evaluating Social Media Utilization on the Implementation of E-Government Goals in Tanzania. *Journal of African Research in Business & Technology*, 1 (1), 1-8