A MODEL FOR THE ADOPTION AND ACCEPTANCE OF MOBILE FARMING PLATFORMS (MFPs) BY SMALLHOLDER FARMERS IN ZIMBABWE

by

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DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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This thesis is being submitted in fulfilment of the requirements for the degree of DTech Information Systems.

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ABSTRACT

The agriculture sector is the lifeblood of the economies of the world's least developed countries (LDCs). In Zimbabwe, this sector is considered to be the backbone of Zimbabwe's economy, and as a result, it is the sector that supports the economic growth of the country, food security, and poverty eradication efforts. Furthermore, the use of mobile technology has continued to rise in Zimbabwe, and farmers now can obtain agricultural information through the use of mobile technology. Mobile phones are increasingly being integrated into current agricultural trade businesses, owing to the critical role they serve in facilitating information transmission between farmers and buyers. The potential of mobile phones in agriculture spawned mAgriculture, which is the use of mobile phones to provide agricultural information and services. Various technology companies in Zimbabwe have come up with various mobile farming platforms as innovation, with the aim of improving overall performance among smallholder farmers. In order to find the usefullness of these mobile farming platforms, it imperative to measure the adoption and acceptance of this technology in the farming environment.

The study sought to investigate the adoption and acceptance of mobile farming platforms in Zimbabwe through a more comprehensive model based on UTAUT 2 that encapsulates the key factors that influence user adoption and acceptance of mobile farming platforms. The main aim of the study was to inform technology start-up companies and other mobile application developers in the development of mobile farming platforms or applications that can be fully adopted and accepted by users, taking into cognisance all salient factors affecting their adoption and acceptance. The model has been used to investigate smallholder farmers in a developing country such as Zimbabwe. The model explores the effect of attitude as one of the key determinants that affect the behavioral intention to use mobile farming platforms. In addition, the model looked at the moderating effect of Hofstede's five cultural dimensions on the key determinants that influence behavioral intention as well as actual use of mobile farming platforms at individual level.

A total of 411 questionnaires were received from smallholder farmers in Zimbabwe's three major provinces who were using mobile farming platforms. Structural Equation Modelling was utilized to test the hypothesized conceptual model. Reliability and validity checks were done to the model

instrument. As hypothesized, the findings of this study revealed that performance expectancy (PE), effort expectancy (EE) and facilitating conditions (FC) are significant determinants of the newly added variable Attitude (AT). Attitude (AT), together with social influence (SI), facilitating conditions (FC), hedonic motivation (HM), price value (PV), and habit (HB) were found to be significant determinants of behavioral intention and usage of mobile farming platforms for smallholder farmers. The results also showed that cultural dimensions have a moderating effect on user acceptance of mobile farming platforms. According to the findings, attitude and culture are significant factors to consider when analyzing farmers' behavioral intentions and use of mobile farming platforms. The findings of the study contribute to the literature by validating and supporting the applicability of the extended UTAUT 2 for the adoption and acceptance of mobile farming platforms by smallholder farmers in developing countries. The theoretical contribution of the study was through the extension of UTAUT 2 where attitude was added as one of the new key determinants of behavioral intention and cultural dimensions were added as mediators. The other contribution is to the Zimbabwean farming community where the study was conducted.

DEDICATION

With God all things are possible. This PhD study would not have been accomplished if it hadn't been for God's grace. I am particularly indebted to my good wife Sifelumusa who missed treasured moments for the success of this thesis. Your support, encouragement and understanding is second to none and I thank the Lord for you my dear wife. I dedicate this thesis to you. This study is also dedicated to my wonderful family members, who have always believed in me and have continuously encouraged me to persevere in the face of adversity. To my sons Adriel, Areli and Asher, you were a source of strength and I’m sorry for the times daddy could not join you and play with you in your games.

PUBLICATIONS

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ABBREVIATIONS

AMOS	Analysis of Moment Structures
CFA	Confirmatory Factor Analysis
DOI	Diffusion of Innovation
ICT	Information Communication Technology
MFP	Mobile farming platforms
MM	Motivational Model
MPCU	Model of Personnel Computer Utilization
SCT	Social Cognitive theory
SPSS	Statistical Package for Social Science
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
TPB	Theory of planned behavior
UTAUT	Unified Theory of Acceptance and Use of Technology

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Chapter 1: Introduction

1.0 Research Background

The agriculture sector is the lifeblood of the economies of the world's least developed countries (LDCs). It accounts for a significant portion of GDP, ranging from 30 to 60 percent in nearly two-thirds of them, and is a key source of foreign exchange, accounting for 25 percent to 95 percent in three-quarters of them (UN 2002). In Zimbabwe, this sector is considered to be the backborne of the country's economy, supporting economic growth, poverty eradication and food security for the country (Africa et al., 2012). Furthermore, approximately 70% of Zimbabwe's 15 million inhabitants live in rural areas, with the majority of them being smallholder farmers whose livelihoods are primarily reliant on agriculture (Musungwini, 2016). Despite the fact that smallholder farmers are the world's largest group of poor workers, a major portion of the world's supply will continue to rely on their efforts (Bagazonzya et al., n.d.)

For the past two decades, there has been much discussion about the critical role that information and communication technologies (ICT) can play in the more successful implementation of new agricultural policies and practices. ICT advancements can be used to provide farmers with accurate, timely, and relevant information and services, facilitating a more profitable agricultural environment (Mahant, Shukla, Dixit, & Patel, 2012). Farmers, for example, have reported using ICTs to determine market days, determine where items can be sold, and find different market sites for efficient produce selling (Oyeyinka and Bello, 2013).

In Zimbabwe, however, the use of mobile technology has continued to rise. The Postal and Telecommunications Regulatory Authority of Zimbabwe (Potraz) claimed an upward rise in the country's mobile penetration rate from 97 percent in the second quarter to 100 percent in the third quarter of 2020 in its third quarter telecommunications report (Potraz Telecoms Report 2020). This shows that cellphone penetration is currently very high, particularly in a developing country like Zimbabwe. Farmers in previously distant and excluded villages in Zimbabwe now have access to information, thanks to mobile telephony (Odunze and Hove (2015). Since the Zimbabwean economy was dollarized in 2009, the number of mobile subscribers to the three networks has increased (Odunze and Hove, 2015). The latest figures are presented in the **table 1.1 below.**

Table 1.1: Active Mobile Subscriptions

	2nd Quarter 2020	3rd Quarter 2020	% Change
Econet	6,677,531	7,137,171	6,9%
Telecel	1,788,234	1,793,580	0,3%
NetOne	4,845,458	4,868,897	0,5%
Total	**13,311,223**	**13,799,648**	**3,7%**

Table.1.1: Mobile subscription rate in Zimbabwe. Source: Postal and Telecommunication Regulatory Authority of Zimbabwe (Potraz, 2020).

With a 100% mobile penetration rate and a solid agricultural system, Zimbabwe's mobile farming platforms have a lot of potential to alter and modify the agricultural sector. Mobile technology is beginning to have an impact on how agriculture is done around the world (Maumbe, 2013). Mobile phones are increasingly being integrated into current agricultural trade businesses, owing to the critical role they serve in facilitating information transmission between farmers and buyers (Verheye, 2000). Mobile technologies, according to O'Donnel (2013), have the ability to provide better services that may be used to improve access to and dissemination of agricultural marketing information. Farmers are said to gain from mobile farming platforms in a variety of ways, including discovering new buyers, exploiting market knowledge to obtain higher pricing, and greater traceability and compliance with quality and safety regulations (Engotoit et al., 2016). In the lack of market information and market connection mechanisms, artificial food scarcities are frequent, as food surplus areas coexist with areas with food shortfalls (Mukhebi et al. (2007). As a result, it is clear that the need for an interactive marketing vehicle, such as those provided by mobile-based information communication technologies for agriculture, cannot be overstated (Odunze and Hove, 2015). Farmers want market information in order to decide what commodities to produce, what production technologies to use, when to produce, for whom to produce, and when and at what price to sell (Kizito, 2010).

The potential of mobile phones in agriculture spawned mAgriculture which is the utilization of mobile phones for the provision agricultural information and services (Gichamba, 2017). In Zimbabwe, various technological start-up companies have developed mobile farming platforms as a means of increasing overall performance among smallholder farmers. AgriMobi, ZIMACE,

Esoko, eMkambo, Eco-Farmer and more recently e-Hurudza are examples of such platforms in Zimbabwe (Odunze and Hove, 2015). These mobile farming platforms provide a variety of services, such as daily weather, rainfall guidance, weekly best farming pricing, weekly crop statistics, marketing ties, and financial linkages, to name a few. Unfortunately, most of these mobile farming platforms have not achieved their much-anticipated impact on farmers. The limited acceptability, or adoption, of these platforms has been linked to their limitations and constraints (Masuki et al., 2010).

Research has produced various technology adoption models namely the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), Technology Acceptance Model (TAM & TAM 2) (Davis, 1989; Davis et al., 1989), Motivational Model (MM) (Davis et al., 1992 as cited in Venkatesh et al., 2003), Theory of Planned Behavior (TPB) (Ajzen, 1991), combined TAM-TPB (Taylor and Todd, 1995), Model of Personnel Computer Utilization (MPCU) (Thompson, Higgins & Howell, 1991), Innovation Diffusion Theory (IDT) (Roger 1995) and Social Cognitive Theory (SCT) (Bandura,1986).

It is critical for researchers to record appropriate and comprehensive technology adoption models for use in mobile farming platforms and the Unified Theory of Acceptance and Use of Technology (UTAUT) model proposed by Venkatesh, Morris, Davis, and Davis (2003) is one of most influential models that can be employed in order to understand the factors affecting technology adoption and acceptance. Performance expectancy, effort expectancy, facilitating conditions and social influence are the four constructs proposed by UTAUT. Furthermore, the moderator variables of gender, age, experience, and voluntariness of use have an impact on these constructs (Venkatesh et al., 2003). Dwivedi et al. (2011) highlighted that over 870 studies have used the UTAUT theory, with 43 studies using UTAUT and its constructs in their empirical studies and the rest just citing UTAUT article of Venkatesh et al (2003). The wide adoption and usage of UTAUT theory in multiple research in various domains of IS (Information Systems) has been justified by the fact that it is considered to be a more appropriate model than others, given its ability to account for 70% of the variation in user behavioral intentions (Venkatesh et al., 2003; Zeinab et al., 2014). The UTAUT model combines eight previous models to create a comprehensive model for user acceptance of technology. Venkatesh et al., (2012) proposed UTAUT 2 to handle consumer technology acceptance, as the UTAUT addresses employee

technology acceptance. UTAUT 2 was created primarily to address consumer adoption and acceptance of technology. As a result, the UTAUT model was extended to UTAUT 2 to better suit the needs and context of consumers. Habit (HB), hedonic motivation (HM) and price value (PV) are three new constructs in UTAUT 2 (Miladinovic & Xiang, 2016). Farmers' use of mobile farming platforms can be studied using the UTAUT 2 model.

1.1 Problem statement

Only 16% of mobile agricultural technologies launched in developing countries are adopted widely (Qiang, Kuek, Dymond & Esselaar, 2012). Despite the fact that various mobile farming platforms exist in the Zimbabwean agricultural sector (such as E-Mkambo, Eco-farmer, E-Hurudza and E-Soko), the majority of these platforms remain underutilized. Most farmers, in particular, do not use these platforms for an extended length of time. Technology is worthless unless and until it is embraced and put to use (Oye, Iahad and Ab-Rahim, 2012). Davis et al., (1989), Johansen & Swigart (1996), Moore & Benbasat (1991), Norman (1993), Venkatesh (2000), and Wiener (1993) all pointed out that while technology is improving, its acceptance is inadequate. Reasons for discontinuing use of these mobile farming platforms must be identified and addressed, as well as factors that encourage continued use of these mobile platforms. Although many research in the field of technology adoption have thrown light on several key factors influencing technology acceptance, existing frameworks for successful technology adoption still need to be improved and modified. Existing technology acceptance models emphasized more on social factors (facilitating conditions and social influence), usefulness and ease of use as independent variables that affect behavioral intention to use a system (the dependent variable) (Fishbein & Ajzen, 1975; Bandura, 1986; Davis, 1989; Ajzen, 1991; Venkatesh, Morris, Davis & Davis, 2003; Venkatesh et al., 2012). To date, there have been a few number of studies that have looked at technology acceptance while taking into account attitude and cultural factors in various locations. The current UTAUT 2 model is a comprehensive model that incorporates and consolidates earlier studies on technology acceptance models. Though UTAUT 2 is a unified model, however recent literature suggests that there are crucial elements that are still lacking from the model, particularly attitude and culture. This is reinforced by Alushola and Abiola (2017), who point out that the UTAUT models do not account for cultural influences, which are likely to be significant in the majority of countries around the world. The impact of one's cultural background on the adoption and use of technology is substantial (Hofstede; 1980; Del Gado, 1996). Cultural elements should be included

in technology acceptance models, according to several researchers (Park, Yang, & Lehto, 2007), since culture influences how individuals utilize information systems (Im, Hong, & Kang, 2011), and cultural values operate as inflential moderators in technology adoption (Srite & Karahanna, 2006). The influence of attitude on behavioral intention to use technologies has been investigated through research. The influence of attitude on behavioral intention is spurious, according to Venkatesh et al., (2003), and only appears when effort expectancy and perfomance expectancy are removed from the model but Nassuora (2012) and Jairak et al. (2009) highlighted that attitude has a positive influence on behavioral intention, with both effort expectancy and performance expectancy included, however it was not included in UTAUT 2. To develop complete and comprehensive technology adoption models, these factors should be identified and incorporated into technology adoption models.

1.2 Research objectives

The primary objective of this study was to inform agriculture technology start-up companies and other stakeholders on the successful adoption of mobile farming platforms. This was accomplished by implementing the following specific objectives:

1. To explore the constraints of the usage of mobile farming platforms;
2. To study the various underlying factors that influence behavior towards successful adoption of mobile farming platforms;
3. To develop a comprehensive mobile farming platform adoption model inclusive of constraints and factors in the adoption and usage of mobile farming platforms, and
4. To measure and evaluate the effectiveness of the proposed conceptual model.

1.3 Research questions

1. What are the constraints in the usage of farming mobile platforms in Zimbabwe?
2. What are the key underlying factors that influence behavior towards successful adoption of mobile farming platforms?
3. How can a comprehensive mobile farming platform adoption model be developed?
4. How can the effectiveness of the proposed model be measured and evaluated?

1.4 Contribution to the body of knowledge

The study contributes to the body of knowledge in the mobile technology adoption and acceptance area. Firstly, the study developed a conceptual framework by modifying the UTAUT 2 model that was proposed by Venkatesh, Thong and Xu (2012). Habit, price value, facilitating conditions, hedonic motivation, social influence, effort expectancy and perfomance expectancy are all direct predictors of usage intention and behavior, according to the model (Venkatesh et al., 2012). The study brings fresh perspectives to the subject of mobile technology adoption, which could lead to a comprehensive model for using mobile platforms in agriculture. The fresh perspectives are based on recent literature which suggests that there are crucial elements that are still lacking from all the current technology acceptance models namely attitude and culture and therefore this study is bringing these new constructs to the existing models. Secondly, most mobile farming platforms do not achieve widespread adoption due to ineffective adoption techniques (Gichamba, 2017). As a result, this study is critical since it aids in the construction of a comprehensive, workable model which is inclusive of attitude and culture for the deployment of mobile farming platforms in agriculture. The theoretical contribution of the study was through the extension of UTAUT 2 where attitude was added as one of the new key determinants of behavioral intention and cultural dimensions were added as mediators. The practical contribution is to the Zimbabwean farming community where the study was conducted. In terms of the research impact, the findings of this study provide agricultural technology start-up enterprises and other stakeholders with a greater understanding of how mobile technologies can be successfully used to increase production. Table 1.2 below shows the gap filled by the current study, all the previous technology acceptance models including the integrated UTAUT 2 did not include a combination of attitude and cultural values as other factors affecting individual acceptance of technology. The current study sought to fill this gap by including those factors as shown in the **table 1.2 below.**

COMPARISON OF THE CURRENT MODEL TO OTHER SIMILAR TECHNOLOGY ADOPTION MODELS

Table 1.2: Contribution of the Current Study

Criteria	Theory of Reasoned Action (TRA): (Fishbein & Ajzen, 1975)	Theory of Planned Behavior (TPB): (Ajzen, 1991)	Technology Acceptance Model (TAM): (Davis, 1989)	UTAUT 1 (Venkatesh, Morris, Davis & Davis, 2003)	UTAUT 2 (Venkatesh Thong & Xu, 2012	Current Study
Subjective norm/Social Influence						
Perceived Behavior Control/ Facilitating conditions						
Perceived usefulness/ Performanc e expectancy						
Perceived ease of use/Effort expectancy						
Attitude Towards behavior						
Hedonic motivation						
Price value						
Habit						
Attitude						
Cultural factors						

1.5 Limitations of the study

Despite making significant and positive contributions to the body of knowledge in the subject of mobile technology adoption, this study, like all others, has limitations. The study's first limitation was that it only looked at three mobile farming platforms namely Eco-farmer, E-Hurudza, and E-Mkambo. Although the research and conclusions were limited to these three applications, other mobile platforms, such as Esoko, may have displayed different features and qualities. This limitation however, did not have significant effect because Eco-farmer, E-Hurudza and E-Mkambo are the major mobile farming platforms being used by farmers hence the findings from these three major platforms can safely be generalized in other platforms not included in the study, so the effect of this limitation was reduced. The other limitation was that the study population and sample were taken from only three provinces, namely Mashonaland West, Mashonaland East and Harare

Metropolitan. This was a study drawback because data from different provinces could have varied, thus impacting the dataset and conclusions. However, in the three provinces mentioned, that is where most of the agricultural activities are done because of the good climatic conditions in those regions hence the findings from these three provinces give a good picture of what could have been happening in other provinces hence the effect of this limitation was reduced. Finally, the study only looked at the acceptability of mobile farming platforms, not the design and development of these applications, which could influence acceptance if factors influencing acceptance are linked to the design and development of these applications. However, the socio-cultural factors affecting the initial acceptance of any technology are the most important factors to consider before looking at developmental and design issues hence this limitation does not have significant effect.

1.6 Related work in literature

Technology adoption, according to Louho, Kallioja, and Oittinen (2006), refers to how individuals accept and use technology. User acceptance of technology has also been defined as a user group's demonstrated willingness to use IT for the tasks it was created to assist (Dillon, 2001). Below is a discussion of existing technology acceptance theories/models with the goal of proposing an improved model. Fishbein and Ajzen (1975) proposed the Theory of Reasoned Action (TRA), which was the first theoretical model in technology acceptance study to receive universal acceptance. TRA is a behavioral theory that models the link between attitude and behavior. This theory maintains that individuals would employ technology if they could see positive benefits linked with its use (Samaradiwakara & Gunawardena, 2014). The Theory of Reasoned Action (TRA), according to Kurland (1995), is concerned with consciously intended behaviors and ties behavioral intention to actual behavior of an individual. In a nutshell, TRA contends that individual beliefs influence attitude, resulting in intentions that lead to behavior. Many studies use Theory of Reasoned Action (TRA), however it does have certain drawbacks. TRA is restricted because it presupposes that acts are entirely under volitional control, which ignores the possibility that people' behaviors are influenced by other factors such as systemic restrictions (Mamary et al., 2016).

Ajzen (1991) proposed the Theory of Planned Behavior (TPB), which introduced “perceived behavior control” as a third construct to the Theory of Reasoned Action (TRA). This construct was included as an addition to the TRA because of the theory’s limitations in dealing with

behaviors over which individuals have inadequate volitional control. Perceived behavioral control is thought to be another determinant of intention and behavior in the TPB. To better understand which persons behave in particular ways, the TPB has been applied to a wide range of behaviors. It is one of the most well-supported social psychological theories for predicting human behavior but however it has got its own limitations. The TPB belongs to the so-called group of 'rational choice models', but in some cases the use of the system is compulsory. Users have no choice over whether or not to use the system. This means this theory is more appropriate as an optional alternative only (Samaradiwakara & Gunawardena, 2014; Mamary, Nashmi & Shamsuddin, 2016).

Bandura (1986) developed the Social Cognitive Theory (SCT), which defines human behavior as a three-dimensional, dynamic, and reciprocal interplay amongst three factors which are the environment, behavior and personal factors. Each of these three components, according to this theory, determines an individual's conduct in a unique way (Mamary et al., 2016). According to Venkatesh *et al*. (2003), Social Cognitive Theory (SCT) is one of the most powerful theories of human behavior and it has five core constructs, namely anxiety, self-efficacy, effect, outcome expectations performance and outcome expectations personal. SCT is a large and broad theory that is not meant for observing human behavior in specific areas. As a result, it can be used in a wide range of situations, including computer use, internet use, and gratification. Although Social Cognitive Theory can be used to expand some human behavioral notions, putting it into practice is a tough process. Furthermore, this theory is more closely associated with education and motivation.

Davis (1989) introduced the Technology Acceptance Model (TAM) as an adaptation of TRA. The Technology Acceptance Model was the first model to mention psychological factors affecting acceptance and it was developed from Theory of Reasoned Action (TRA) by Davis (Davis, 1989). Davis (1989) developed and validated better measures through TAM for predicting and explaining technology use. TAM was created with the intention of simulating users' acceptance of technology. The TAM is one of the most often used study models for determining an individual's level of IT adoption. It proposes that an individual's intention to use a system is controlled by perceived ease of use and perceived usefulness, with intention to use acting as a mediator of actual system use

(Lai, 2017; Samaradiwakara & Gunawardena, 2014). In this model, the behavioral intention is predicted by at perceived usefulness and attitude, while attitude is determined by perceived ease of use and perceived usefulness. The perceived ease of use and perceived usefulness are the two most important elements in TAM. Davis (1989) defines perceived usefulness as the extent to which people think that employing a certain technology will improve their job performance. Perceived ease of use on the other hand is defined as the extent to which people think that using a system will be free of effort and simple to use (Davis, 1989). People are more likely to use or not utilize an application if they believe it would improve their performance at work.

Venkatesh, Morris, Davis and Davis (2003) proposed the UTAUT model and this model consists of four constructs which are performance expectancy, facilitating conditions, effort expectancy and social influence. This model combines the TRA, TAM, MM, MPCU, SCT, Combined TAM-TPB, IDT and the TPB to create a comprehensive model for user acceptance (Attuquayefio et al., 2014). According to Venkatesh et al. (2003), UTAUT is made up of a number of factors that are taken into account when determining an individual's behavioral intention to use and level of acceptance of a technology. According to Venkatesh et al. (2003), four variables, including age, gender, voluntariness of use and experience moderate these four factors. According to Samaradiwakara and Gunawardena (2014), UTAUT has a lot of potential for explaining behavioral intention and technology use. The UTAUT model is a widely utilized theory that has been used to explain technology acceptance in various research (Engotoit, Moya & Kituyi, 2016).

UTAUT 2 was introduced by Venkatesh, Thong, and Xu (2012) as an extension of UTAUT. The goal of UTAUT 2 was to focus on the customer use context rather than the employee use context that was present in UTAUT. UTAUT was created to describe how employees accept and use technology, but in 2012 it was expanded to UTAUT 2 in the context of consumer technologies, which is a multibillion-dollar market as seen by the amount of consumer-facing technology gadgets, apps, and services (Stofega and Llamas, 2009). Therefore, UTAUT was extended to UTAUT 2 to suit consumer context. Habit (HB), price value (PV) and hedonic motivation (HM) are three new components added to the theory. UTAUT 2 retained UTAUT's effort expectancy, social influence, perfomance expectancy and facilitating conditions constructs while adapting them to a consumer use context.

Behavioral intention to use technology in UTAUT 2 is influenced by effort expectancy, social influence, perfomance expectancy, price value, facilitating conditions, hedonic motivation and habit, whereas behavioral intention to use technology determines use behavior. The influence of these constructs on behavioral intention and technology use are moderated by individual differences in age, experience and gender (Venkatesh et al., 2012). After carefully analysing the previous models, the current study expands on the UTAUT 2 model in an attempt to develop a more comprehensive farming mobile platform adoption model. A conceptual model is presented below.

CONCEPTUAL MODEL:

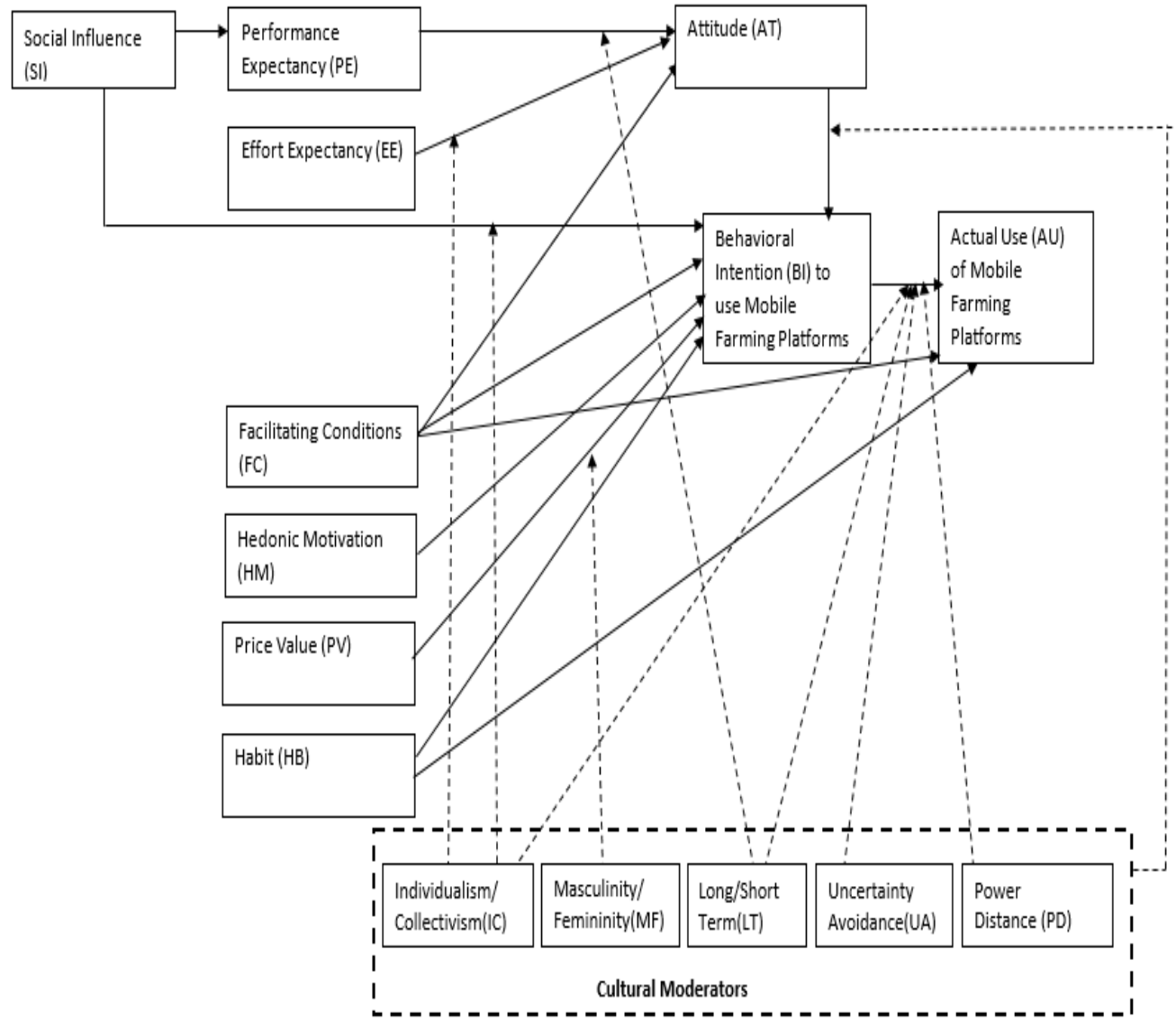

Figure 1.1: Proposed Extended UTAUT 2 (E-UTAUT 2)

1.6.1 Explanation of the constructs in the conceptual model

Attitude

Attitude is the first new construct that the study added. Alsharif (2013) defines attitude as an individual's total emotional response to using a system. The influence of attitude on behavioral intention to use technologies behavior has been investigated through research. The influence of attitude on behavioral intention is spurious, according to Venkatesh et al. (2003), and only appears when effort expectancy and perfomance expectancy are removed from the model, but Nassuora (2012) and Jairak et al. (2009) highlighted that attitude has a positive influence on behavioral intention even when both effort expectancy and performance expectancy are included. Research has also been carried out on the relationships that exist between attitude and social factors, performance expectancy and effort expectancy. According to studies, social factors have a positive influence on attitude (Jairak et al., 2009; Nassuora 2012). However, Jairak et al. (2009) reported that effort expectancy and perfomance expectancy have positive influence on attitude, whereas Nassuora (2012) found no such effects.

Performance expectancy

Performance expectancy is defined as the extent to which users of technology believe that their job perfomance will improve if they use that particular technology (Davis,1989). In other words, it is the degree to which users of a system believe that by utilizing the technology or application, they would be able to increase their productivity and effectiveness at work (Rouibah & Abbas, 2006).

Effort Expectancy

This is the extent to which user of a system or technology expects it to be easy to use and effortless (Davis, 1989). In other words, effort expectancy indicates that the user perceives the system to be very simple to use, and that when the system is not difficult to use, the user's behavioral intention increases (Kabir, Saidin & Ahmi, 2017).

Social influence

The extent to which a user believes others encourage him to use the system is referred to as social influence (Engotoit, Moya & Kutiyi, 2016). In other words, this is the degree to which an individual believes important others think that he or she should use the system (Venkatesh et al., 2003). This construct is represented by items that pertain to the influence of key people in the surroundings as well as support systems (Muriithi, Horner & Pemberton, 2016).

Facilitating conditions

Facilitating conditions refer to an individual's belief that the system's organizational, governmental, and technical infrastructure are in place to enable its use (Venkatesh, Morris, Davis & Davis, 2003). In other words, facilitating condition is the state where an individual has all of the essential facilities, tools, equipment, and help to enable the usage of a system (Kabir, Saidin & Ahmi, 2017).

Hedonic motivation

Hedonic motivation has been shown to play an important role in determining technology acceptance in a consumer context. It is described as the pleasure derived from using a technology (Venkatesh et al., 2012; Brown & Venkatesh, 2005). In information systems, it is also known as perceived pleasure. According to research and literature, hedonic motivation has a direct influence on technology acceptance and use (Van der Heijden, 2004; Thong et al., 2006).

Price value

Price value is defined as the cognitive trade-off that consumers make between the perceived benefits of technology and the monetary costs of adopting it (Venkatesh et al., 2012; Dodds, Monroe & Grewal, 1991). The cost and price structure could have a big impact on how people use technology. For example, research suggests that the popularity of short message services (SMS) in China is due to SMS's inexpensive cost compared to other mobile Internet applications (Chan et al., 2008). According to Moon and Chang (2014), pricing influences users' attitudes toward technology adoption. According to Wagner (2005), the most significant impediment to the acceptance and adoption of mobile technologies is the cost. Customers, according to Pagani (2004) and Sharples (2005), see cost as the third most important criterion when choosing mobile services,

behind ease of use and perceived usefulness. Other investigations (Habbaoush, Nassuora, & Hussein, 2011) have found that the cost of service providers and phone charges had a negative influence on behavioral intention when utilizing technology. When the benefits of adopting a technology are judged to be larger than the monetary cost, the price value is positive, and this price value has a positive influence on intention (Venkatesh et al., 2012).

Habit

The degree to which individuals tend to perform behaviors automatically as a result of learning has been defined as habit (Venkatesh et al., 2012; Limayem, Hirt, & Cheung, 2007). In accordance with this definition, in this study habit is seen as the extent to which individuals tend to use mobile farming platforms automatically. When users or customers get more familiarity with a technology, they begin to use it on a regular basis. If a user has been repeating a certain behavior several number of times in the past, then it becomes automatic in the future (Aarts, Verplanken & Knippenberg, 1998). Therefore, is users continue to use a system for a long time, this action becomes routine for them and eventually a habit, which will then influence the individuals to continue to use the system in future.

Behavioral intention

UTAUT2 supports the view that behavioral intention has a significant influence on technology use (Venkatesh et al., 2003), and this is consistent with all other models which indicate that individual behavior is predictable and influenced by individual intention (Yu, 2012).

1.7 Research hypotheses

A combination of unified theory of acceptance and use of technology (UTAUT2) with Hofstede's cultural moderators was used as the theoretical support base-line for the current study and therefore the hypotheses shown below were formulated. Considering that culture has been shown to influence how people use technology from previous studies, the cultural dimensions by Hofstede were also used in this study to formulate the hypotheses for this study as shown below.

Hypotheses for this study were as follows;

H1a: SI of mobile farming platforms adoption in Zimbabwe have a positive influence on PE.

H1b: SI of mobile farming platforms adoption in Zimbabwe have a positive influence on BI.

H2. PE of mobile farming platforms in Zimbabwe has a positive influence on Attitude (AT).

H3. EE of mobile farming platforms in Zimbabwe have a positive influence on Attitude (AT).

H4a. FC of mobile farming platforms in Zimbabwe has a positive influence on Attitude (AT).

H4b. FC of mobile farming platforms in Zimbabwe has a positive influence on Behavioral Intention (BI).

H4c. FC of mobile farming platforms in Zimbabwe has a positive influence on Actual Usage (AU).

H5. HM of mobile farming platforms in Zimbabwe has a positive influence on Behavioral Intention (BI).

H6. PV of mobile farming platforms in Zimbabwe has a positive influence on Behavioral Intention (BI).

H7a. Habit (HB) of mobile farming platforms adoption in Zimbabwe has a positive influence on Behavioral Intention (BI).

H7b. Habit of mobile farming platforms in Zimbabwe has a positive influence on Actual Use (AU).

H8. Attitude towards using mobile farming platform in Zimbabwe has a positive influence on Behavioral Intention (BI).

H9. Behavioral Intention (BI) of mobile farming platforms has a positive influence on Actual Use (AU).

H10a. Individualism/collectivism (IC) moderates the relationship between effort expectancy (EE) and attitude (AT).

H10b. Individualism/collectivism (IC) moderates the relationship between social influence (SI) and behavioral intention (BI).

H10c. Individualism/collectivism (IC) moderates the relationship between behavior intention (BI) and actual use (AU).

H11. Masculinity/femininity (MF) moderates the relationship between price value (PV) and behavioral intention (BI).

H12a. Long/Term (LT) moderates the relationship between performance expectancy (PE) and attitude (AT).

H12b. Long/short term (LT) moderates the relationship between behavior intention (BI) and actual use (AU).

H13: Uncertainty avoidance (UC) moderates the relationship between behavior intention (BI) and actual use (AU).

H14. Power distance (PD) moderates the relationship between behavior intention (BI) and actual use (AU).

H15. Individualism/collectivism (IC) moderates the relationship between attitude (AT) and behavioral intention (BI).

H16. Masculinity/femininity (MF) moderates the relationship between attitude (AT) and behavioral intention (BI).

H17. Long Term (LT) moderates the relationship between attitude (AT) and behavioral intention (BI).

H18. Uncertainty avoidance (UC) moderates the relationship between attitude (AT) and behavioral intention (BI).

H19. Power distance (PD) moderates the relationship between attitude (AT) and behavioral intention (BI).

The term significance level (alpha) is used to refer to a pre-chosen probability and the term "P value" is used to indicate a probability that you calculate after a given study. If your P value is less than the chosen significance level then you reject the null hypothesis. This study referred to statistically significant as $P < 0.05$ and statistically highly significant as $P < 0.001$.

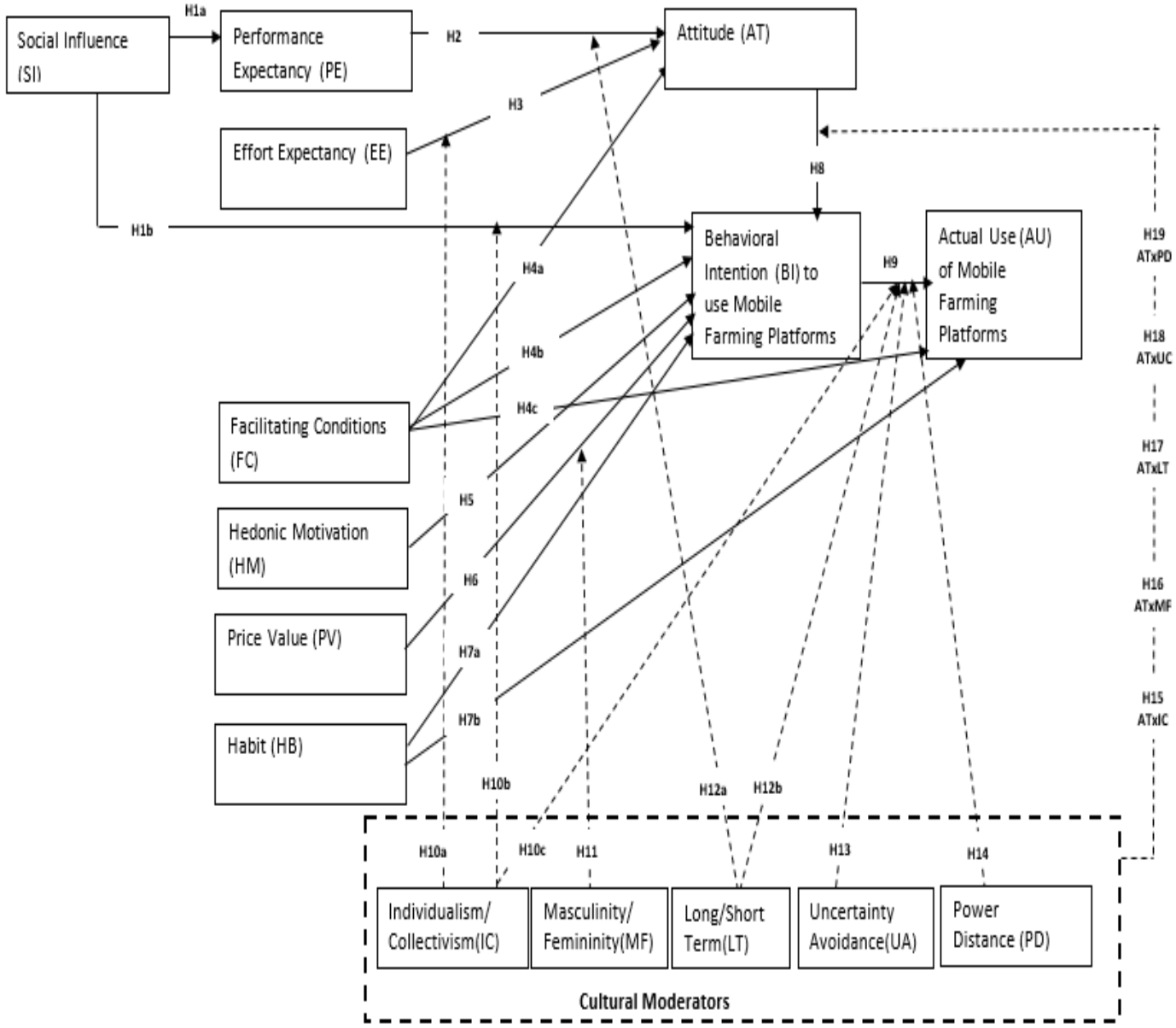

Figure 1.2: Research Model; Extended UTAUT 2 (E-UTAUT 2)

Notes: ——→ Direct effect

- - - - - - - - → Moderating effect

Cultural values as moderators

Cultural values are the second new construct introduced in this study, and it was investigated. Culture and its five dimensions were added as moderators in this study. Culture, according to Hofstede (1991), is the mind's collective mental training that distinguishes members of one group

or category from those belonging to another. Hofstede (1991) goes on to describe culture as human beings' thoughts, feelings, and behaviors. The UTAUT 2 is a unified model, however recent literature suggests that one essential element, namely culture, is still lacking from the model. This is reinforced by Alushola and Abiola (2017), who point out that the UTAUT models do not account for cultural influences, which are likely to be significant in the majority of countries around the world. Several studies have been published in the last thirty years that suggest that cultural background has a substantial impact on technology adoption and use (Hofstede, 1980; Del Gado, 1996).

Cultural aspects should be included in acceptance models, according to several researchers (Park, Yang, & Lehto, 2007), because culture influences how people utilize information systems (Im, Hong & Kang, 2011). Srite and Karahanna (2006) found that cultural factors act as important moderators in technology acceptance. Technology users around the world have varied views, thinking styles, cognitive and cultural values, and assumptions, according to Ziefle and Jakobs (2010). Even if a developing country or government makes the necessary infrastructure investments, Chiemeke and Evwiekpaefe (2011) argue that unless e-commerce industry participants understand and address cultural issues that are unique to that country and relate to off-site transactional processes, large-scale diffusion and success of such endeavors will be greatly hampered. In this study, this construct involves five dimensions, namely uncertainty avoidance, individualism/collectivism, power distance, masculinity/femininity and long/short term (Hofstede, 1980).

Masculinity/femininity

Individuals who are masculine and feminine have opposing and distinct qualities. Masculine individuals' preferences include achievement, heroism, sucesss, assertiveness, ambition, money and material success while on the other hand individuals with feminine qualities determine achievement in terms of close human relationships, consensus, valuing equality, caring for the weak, solidarity, and incentives such as free time and flexibility and quality of life (Hofstede, 2014). Sivakumar (2018) revealed that users that are strong on masculinity seek to maximize the value derived out of using mobile farming platforms.

Individualism/collectivism (IC)

People in individualistic communities are more concerned with their personal interests and those of their immediate families, whereas individuals in strongly collectivistic societies are defined by the group's activities rather than their own. To put it differently, people in collectivist societies have a close bond with their fellow citizens, but people in individualistic cultures have a shaky bond with one another (Bergiel, Bergiel & Upson, 2016). People who share collectivist beliefs, according to Zakour (2004), will be interested in other people's perspectives on technology.

Long-term versus short-term orientation.

Hofstede and Hofstede (2005) differentiate long-term versus short term orientation. They emphasized that long-term orientation fosters virtues that are oriented toward future rewards, such as perseverance, whereas short-term orientation fosters virtues that are related to the past and present, such as respect for tradition, maintaining one's appearance, and fulfilling social obligations.

Uncertainty avoidance (UA)

Mobile farming acceptance is likely to be low in societies with high degrees of uncertainty avoidance. The reason for this is that this medium is not well suited to uncertainty reduction compared to face to face interactions or conversation with agricultural extension officers (Straub et al., 1997). Individuals in high uncertainty avoidance socities are less likely to employ technology because they are not comfortable with uncertainty and ambiguity (Zakour, 2004). People in weak uncertainty avoidance societies are more calm and willing to take chances (Hofstede, 2014). Low uncertainty-avoiding people are more willing to experiment with new technologies (Png & Tan, 2001).

Power distance (PD)

People in hierarchical cultures with high power distance values are more concerned with following the beliefs of their superiors or communities and are afraid of disagreeing with them (Hofstede, 1980). Centralization is popular in these societies, with hierarchy perceived as reflecting underlying inequities and subordinates expecting to be given orders by their superiors (Hofstede,

2014). If the community accepts mobile farming platforms, then the chances are high that other farmers will accept them as well.

Moderations

Effort expectancy and attitude moderated by individualism/collectivism

Individualism/collectivism (IC) moderates the relationship between effort expectancy (EE) and attitude (AT).

Social influence and behavioral intention moderated by individualism/collectivism

Individualism/collectivism (IC) moderates the relationship between social influence (SI) and behavioral intention (BI).

Price value and behavioral intention moderated by masculinity/femininity

Masculinity/femininity (MF) moderates the relationship between price value (PV) and behavioral intention (BI).

Performance expectancy and attitude moderated by long/short term

Long/Short term (LT) moderates the relationship between performance expectancy (PE) and attitude (AT).

Behavioral intention and actual use moderated by individualism/collectivism

Individualism/collectivism (IC) moderates the relationship between behavioral intention (BI) and actual use (AU).

Behavioral intention and actual use moderated by long/short term

Long/short term (LT) moderates the relationship between behavioral intention (BI) and actual use (AU).

Behavioral intention and actual use moderated by uncertainty avoidance

Uncertainty avoidance (UC) moderates the relationship between behavioral intention (BI) and actual use (AU).

Behavioral intention and actual use moderated by power distance

Power distance moderates the relationship between behavioral intention and actual use.

Attitude and behavioral intention moderated by individualism/collectivism

Individualism/collectivism moderates the relationship between attitude and behavioral intention.

Attitude and behavioral intention moderated by masculinity/femininity

Masculinity/femininity moderates the relationship between attitude and behavioral intention.

Attitude and behavioral intention moderated by long/short term

Long/short term moderates the relationship between attitude and behavioral intention.

Attitude and behavioral intention moderated by uncertainty avoidance

Uncertainty avoidance moderates the relationship between attitude and behavioral intention.

Attitude and behavioral intention moderated by power distance

Power distance moderates the relationship between attitude and behavioral intention.

1.8 Research methodology

The survey design was used in this study, which entails collecting data via a survey questionnaire (Cresswell, 2013:155). The study employed a cross-sectional field survey research design with quantitative research methodologies, with a focus on collecting and evaluating numerical data while focusing on assessing the scale, range, and frequency of phenomena (Neville, 2007). This method was chosen because it allowed for more cost-effective data collection across a large sample and because it works well with quantitative designs (Alan, 2015).

1.8.1 Data collection

A literature review was carried out in order to gather secondary data on mobile technology adoption models. The dependent and independent variables were examined at the same time using a structured questionnaire after data was collected from the respondents.

1.8.2 Study population and sample

A quantitative survey method was used to collect data from four provinces, namely Mashonaland West, Mashonaland East and Harare Metropolitan. The above provinces were excellent for

intensive farming of various crops, including horticulture, tobacco, maize, sugar beans, potatoes, paprika, soya beans, and tiny grains (sorghum, millet, and rapoko), due to their climatic and geographic characteristics (GRDC, 1996 cited in Njaya, 2010). A purposive sampling method was used because only farmers who were using mobile farming platforms (MFPs) in the provinces were targeted.

1.8.3 Data analysis

Through SPSS software, data was analyzed using the descriptive statistics analysis method, which employs the use of percentages, means and frequencies (Janssens et al., 2008) and the data then presented in tables.

Chapter overview

Chapter One: **Introduction**

The chapter discussed the introduction and background to the study. It provided the statement of the problem and outlined the research objectives guiding this study.

Chapter Two: ICT innovations in agriculture.

This chapter reviews literature on ICT innovations in agriculture and how these have been adopted in agriculture.

Chapter Three: **Technology adoption models**

This chapter reviews literature on technology adoption models. Previous technology models are reviewed and critiqued. This chapter also presents a literature review on the Unified Theory of Acceptance and use of Technology and its constructs.

Chapter Four: Culture and technology acceptance

The chapter discusses the research methodology and design that was adopted during the study. It further directs the discourse to the sampling design that was used in selecting the research sample.

Chapter Five: Research design and methodology

This chapter describes and justifies the philosophical approach, methods and techniques used in this study to achieve the main research objectives and to answer the research questions.

Chapter Six: Data analysis

This chapter presents the study's findings based on the statistical analysis performed. It also addresses how the data were interpreted, as well as the implications of the findings.

Chapter Seven: Discussion

This chapter discusses the findings of the study. It also focuses on conclusions drawn from the research findings.

Chapter Eight: Conclusion and further research

This final chapter provides the conclusion and recommendations for future research**.**

Chapter 2: ICT innovation and agriculture

2.1 Introduction

An in-depth review of relevant literature is very important and key towards a successful research exercise. The first few paragraphs of this chapter are devoted to a brief discussion on the importance of agriculture in developing nations and challenges faced. It also has a review of ICT innovations in agriculture. The chapter finishes with a thorough examination of mobile technology's application in agriculture.

Agriculture is vital to the economies of developing countries, as it is the primary source of food, employment and income for urban and rural populations (Alhassan and Kwakwa, 2012). Agriculture is also regarded as the world's most profitable industry, employing over one billion people and producing $1.3 trillion in annual food (Majumder, 2015). Agriculture, being the principal source of economic growth and stability in many developing countries (Aker, 2010; Munyua et al., 2009), is seen as a significant contributor to social and economic development). As stated in the United Nations Sustainable Development Goals (Loewe, 2015), agriculture is also viewed as a vital contributor to alleviating hunger and poverty in many developing countries by 2030. Thus, economic growth and development initiatives, with agriculture as a main engine, can be used to achieve long-term poverty reduction (Awuor, 2013; Aker, 2010).

Agriculture is the most important sector in Uganda's economy, contributing up to 20% of GDP and employing 70% of the country's population, both formally and informally, and is seen as a contributor to poverty reduction among the rural poor (Monitoring African Food and Agricultural Policies, 2013; Masuki et al., 2010; Ministry of Agriculture, 2010). Improvements in agricultural performance, according to Masuki et al. (2010), enhance farmers' lives as well as economic growth, hence alleviating poverty levels in Uganda). Despite the benefits, agricultural output is minimal, despite the fact that agricultural production is practiced by over 70% of Ugandan families for domestic or commercial uses (Monitoring African Food and Agricultural Policies, 2013).

Omorogbe (2014) indicates that in Nigeria, the agriculture sector never went away; it is still very important and it was just overtaken by the oil boom that began in the 1970s. Awokuse (2009) argues that the growth of most African economies depends on the development of the agricultural sector. He further argues that previous attempts by many developing countries to industrialize their economies without first expanding their agricultural sectors resulted in poor economic growth and a lopsided income distribution. Meijerink and Roza (2007) estimate that 60% of the economically active population in Sub-Saharan Africa works in agriculture. Ethiopia's main source of foreign exchange is agricultural exports (Adenew, 2004). Xinshen (2010) supports this viewpoint, stating that agriculture has been the backbone of Ghana's economy throughout its post-independence history. The findings of these research reaffirm the relevance of agriculture in emerging countries' economic development.

2.2 Challenges facing the agricultural sector in developing countries

Having outlined the importance of agriculture in the economic growth of developing nations, a number of countries in Africa continue to face challenges in improving their agriculture sector.In Ethiopia, the lack of efficient and effective input and output market mechanisms is a major hindrance to Ethiopian agriculture and food production development. Surplus food may be generated in some parts of Ethiopia, but it cannot be easily moved to food-deficit areas due to poor transportation and market links (Adenew, 2004). Stringer and Pingali (2004) suggest that the fall in agriculture's GDP contribution in African economies is partially due to post-farm gate activities becoming commercialized and taken up by professionals in the service sector, and partly due to producers substituting chemicals and machinery for labor.

Masaba (2014) highlights that in Uganda, farmers in the agricultural sector face a number of challenges, which include limited markets and market access and related marketing infrastructure as well as high costs and limited access to improved farm inputs and production technology. According to Dwivedy (2011), in Nigeria, adverse conditions including high cost of inputs and technological knowhow/farm mechanization leasing services and inefficient extension services hinder the development of agriculture. Idachaba (2006) holds similar views. The outcomes of these studies serve as a confirmation of challenges that most developing nations are facing in their agricultural sectors.

The agricultural sector is critical to Zimbabwe's economy, accounting for 14-18 percent of GDP, 40 percent of export revenues, and 60 percent of raw materials for industry (AMID, 2012a). Growing vegetables, producing crops, and breeding and rearing livestock are all examples of smallholder farming operations in Zimbabwe (Musungwini, 2016).

Despite the fact that agriculture is critical to Zimbabwe's economy, a number of challenges continue to be faced in trying to improve this critical sector. The relatively new farmers in Zimbabwe, the majority of which are smallholders, continue to face marketing challenges, and this has hindered their growth over the years since the land reform program (Odunze and Hove, 2015). Information asymmetry is often cited as one of the major challenges facing small farmers and agri-businesses in Zimbabwe (Sibjenga, 2012). This also seems to be the case in many other countries. According to Svensson and Yanangizawa (2010), information asymmetry still exists in most developing nations.

In the lack of market information and market connection mechanisms, artificial food scarcities are frequent, according to Mukhebi et al. (2007), as food surplus areas coexist with areas with food shortfalls. As a result, it is clear that the requirement for an interactive marketing vehicle, such as those provided by mobile-based information communication technologies, cannot be overstated. Farmers require market information to decide what commodities to grow, what production technologies to use, when to grow, for whom to grow, and when and at what price to sell (Kizito, 2010). Market information also gives the farmer bargaining leverage in the market, allowing him to get a better price. Without it, farmers are at a significant disadvantage to intermediaries and dealers, who generally have better access to market information (Sibjenga 2012). Lack of market information is a significant barrier to market access, particularly for smallholders, as most of their difficulties come from a lack of basic information needed to boost their production and escape the poverty traps in which many of them find themselves (Siamachira, 2011).

There is evidence that the challenge of inadequate agricultural marketing information is not limited to Zimbabwe but extends to other developing nations also. Farmers in Uganda, according to Nkonya (2002), face agricultural marketing challenges such as a lack of agricultural marketing information, a lack of information on value-addition opportunities, low and fluctuating farm

produce prices that prevent farmers from selling their products at a profit, and late access to agricultural market information. The limited acceptance and utilization of mobile-based communication technology has been blamed for several of these marketing obstacles (Masuki et al., 2010; Ministry of Agriculture, 2010). According to previous studies by Miwanda et al. (2014), just 0.5 percent of respondents in the western area of Uganda used mobile phone technology to obtain agricultural market information among the many ICT tools used to access agricultural information. However, according to O'Donnell (2013), mobile-based communication technologies (MBCTs) can help commercial farmers develop better marketing strategies and hence have the potential to increase access to and dissemination of agricultural marketing information.

Revolution in information and communication technology, particularly mobile phones, in developing countries like Zimbabwe has given rise to increased anticipation of improved marketing efficiency in the agri-business sector (Sibjenja, 2012). Research carried out by SNV Zimbabwe (2012) suggests that the widespread use of mobile phones and internet improves farmer linkage to input and output markets by improving access to information.

2.3 ICT innovation in agriculture

ICT in agriculture is a new field that focuses on improving agriculture and rural development. It entails the use of ICT in rural settings in novel ways. ICT advancements can be used to provide farmers with accurate, timely, and relevant information and services, facilitating a more profitable agricultural environment (Mahant, Shukla, Dixit, & Patel, 2012). Farmers, for example, have reported using ICTs to determine market days, determine where items can be sold, and find different market sites for efficient produce selling (Oyeyinka and Bello, 2013).

For the past two decades, there has been much discussion about the critical role that information and communication technologies (ICT) can play in the more successful implementation of new agricultural policies and practices. Farmers, on the other hand, have been observed to use ICT applications such as calls and Short Messaging Services often (Mtega and Msungu, 2013). Simultaneously, researchers believe that ICT systems can improve the quality of life in rural and remote places, raise agricultural production, increase farmers' income, and contribute significantly to their willingness to live in rural areas (Sideridis, Koukouli, & Antonopoulou, 2010). The

strategic application of ICT to the agriculture business, which is the most important economic sector in most African countries, offers the continent's best prospect for poverty alleviation and economic growth (Zyl, 2012).

Given the availability of available ICTs, coupled with the challenges and constraints faced by smallholder farmers, the impact of ICT developments on the agricultural sector in developing nations, as well as their potential to revolutionize it, cannot be overstated (Gichamba, 2017). As indicated by Qiang et al. (2012), in view of increased investments in agricultural research, the corporate sector's significant interest in the development and spread of ICTs, and the rise of organizations dedicated to the agriculture development agenda, the possibility of ICT to revitalize the agriculture sector becomes even more compelling.

According to FAO (2011), disseminating information is crucial for players in the agriculture value chain to eliminate information and communication asymmetries, as well as to break the poverty cycle. Furthermore, at the World Summit on the Information Society (WSIS) 2003-2005 (IICD, 2007), the significance of ICTs in gaining access to more information in order to improve food security and assist rural livelihoods was widely recognized and officially endorsed). The input of information and knowledge is one factor that can help enhance agricultural production. The appication of ICT in agriculture, which is the most important field of business in most countries in the African continent, offers the best chance for poverty eradication and economic (Gichamba, 2017). Deloitte (2012) highlights that farmers, researchers, government, corporations, and the general public all benefit from ICT adoption in agriculture. With the widespread availability of low-cost technology, even among poor smallholder farmers, there is a huge opportunity to use ICT to improve yields, provide useful information, and generally empower farmers, and some of the challenges facing agriculture stakeholders in developing countries can be addressed through ICT innovations (Gichamba, 2017).

Since agricultural extension relies heavily on information interchange on the one hand and a wide range of other actors on the other (Mabe and Oladele, 2012), ICTs can be utilized to bridge the information gap. As a result, ICTs provide chances to reach a wider audience by facilitating access to local and worldwide information and knowledge. As a result of the new agricultural

development paradigm, old ways of providing important services to citizens are being challenged; traditional societies are also being transformed into knowledge societies all over the world, causing people in villages to think and act differently (Meera et al., 2004). According to Jabir (2011), ICT-based information delivery has aided livestock producers in Uttar Pradesh, India, in making much higher quality decisions on numerous livestock practices than non-users of ICT. In addition, farmers in Madhya Pradesh, Uttar Pradesh, and Tamil Nadu claimed that ICT-based initiatives had helped them reduce transaction costs by acquiring information and enabling transactions in input and output marketplaces (Adhiguru and Devi, 2012).

2.4 Mobile technology in agriculture.

In this 'Global Information Age,' the significance of ICTs as a tool for advancement and development has been widely recognised, and it has been observed that people from all walks of life are touched by the IT industry, either directly or indirectly (Syiem & Raj, 2015). Mobile telephony, among other ICTs, has become a favorate for many people both in rural and urban areas (Ansari and Pandey, 2013). Previous research claim that mobile phones are a widely used ICT tool among farmers (Hassan et al., 2008; Okello et al., 2010). This implies that ICTs are becoming more widely used among rural communities, and that, if used properly, they can provide a significant opportunity for development in rural regions. Mobile phones, in particular, have become a need in today's society, regardless of status, career, age, income group or area of residence. As a result, mobile phones have been recognized as the most extensively used instrument among farmers especially for their communication in establishing markets prices, knowing weather patterns and other agricultural-related information (Chhachar et al., 2014). In this sense, mobile technologies may provide a mechanism for developing countries to develop (Rashid and Elder, 2009). Mittal and Mehar (2012) point out that the rapid growth of mobile telephony, as well as the introduction of mobile farming platforms helps to overcome information asymmetry among farmers. It also contributes to closing the gap between agricultural input availability and delivery and agricultural infrastructure, at least in part.

Mobile applications for agriculture and rural development, according to Qiang et al. (2012), have tremendous promise in advancing development. Despite the lack of rural electrification, the use of mobile phones is increasing at an unprecedented rate and rural people have benefited from mobile

technology in a variety of ways. In the sense of haste and emergency (Sife et al., 2010), its significance in usage is obvious.) According to anecdotal evidence from research findings, cell phones, radio, and television are the most essential communication tools that farmers can use to obtain agricultural-related information and knowledge (Olaniyi, 2013; Chhachar et al., 2014). Telephone service (including mobile phones) has been found to improve access to persons living in remote areas (Gupta, 2005). Ferris et al. (2008) also discovered that 86 percent of farmers had access to a cellphone, which aided in the development of farmers' relationships with others, particularly extension professionals (Gupta, 2005).

Farmers are now using mobile technology as a channel to obtain crucial information for their various farming activities. According to Mittal et al. (2010), the broad categories of information required by farmers, regardless of their location or crop, may be classified as know-how, which provides a farmer with basic information such as what to plant and which seed kinds to use; market information such as prices, demand indicators, and logistical information, as well as contextual information such as weather and optimal farming practices in the area. According to Mittal and Mehar (2012), a 2011 survey of farmers in Indian states found that having access to information via a mobile phone allowed them to be more linked to the markets, and that mobile phones also helped them achieve higher pricing. After the introduction of mobile phones, 87.2 percent of farmers felt they were more connected to the markets, and 71.7 percent believed they had better access to pricing information. Other studies, such as those by Aker (2008), Muto, and Yamano (2009), showed that the introduction of mobile phones resulted in price increases, but this was more apparent in commodities or regions where price information asymmetry was high or markets for specific high-value commodities were underdeveloped. By reducing the information asymmetry that existed between farmers and traders, the expansion of mobile phone networks and increased mobile-density in Uganda enabled farmers producing perishable crops such as bananas to participate in the market more actively, resulting in nearly 20% higher prices (Muto and Yamano, 2009).

According to Jensen (2007), the adoption of mobile technology in Kerala reduced wastage and pricing dispersion by promoting the sharing of information amongst fishermen. This improved both consumer and producer welfare by making markets more efficient. Mobile phones help

fisherman, especially the wealthier ones, to acquire real-time market information and determine where to land and sell their daily harvest. Abraham (2007) observed that widespread usage of mobile phones boosted market efficiency by reducing risk and uncertainty, albeit it cautioned that attaining potential economies required simple access to capital. Fishermen who use mobile phones out at sea are able to respond rapidly to market demand and avoid wasting their catch, which was a regular occurrence before to the use of cell phones. Mobile phones aid supply and demand coordination, allowing dealers and transporters to benefit from the free flow of price information by catering to demand in under-supplied marketplaces.

In most developing countries, information search expenses account for a large portion (up to 11%) of overall costs experienced by farmers throughout the agricultural cycle, from sowing to commercialization (Bhatnagar, 2008). Farmers' use of mobile phones can minimize information search costs, lower transaction costs, and allow more farmers to participate in commercial agriculture (De Silva and Ratnadiwakara, 2008). According to Aker and Mbiti (2010), cell phones are a new search technique that has cut the cost of searching for farmers in Niger by nearly half.

Users of mobile phones have the advantage of engagement and access to numerous sources of information, rather than being passive recipients of information via television, radio, or newspapers and this enables them to assess the information's quality. In a separate study that was done in India, almost all small farmers said that utilizing their mobile phones as basic communication devices to seek information such as input availability or market pricing increased their convenience and cost savings. Farmers in Uganda were able to utilize mobile phones to find out the latest agricultural prices, and farmers in Tanzania were able to save time and money by using mobile phones (Adel, 2005).

In Niger, Aker (2008) discovered that the adoption of mobile phones reduced grain price dispersion by 10% among markets. The effect is bigger for market pairs with higher transportation expenses, such as those that are further apart and connected by bad roads. Mobile phones are increasingly being integrated into current agricultural trade businesses, owing to the critical role they serve in facilitating information flow between farmers and buyers (Verheye, 2000). Farmers in Uganda make use of mobile technology for a variety of their agricultural activities, according to Martin

and Abbott (2011), including coordinating access to farming inputs (such as pesticides, seeds or training) (87 percent of farmers), accessing information on markets (70 percent), requesting agricultural emergency assistance (57 percent), monitoring financial transactions (54 percent), and consulting (52 percent).

Crawford and Gorman (1995) note that technology should be used to improve the lives of communities as reflected by the following law; "Use technology intelligently to enhance services". Mobile services are being used in agriculture, mostly to share and acquire information in order to boost productivity (Chisita & Malapela, 2014). They further highlight that because of these mobile devices, we now have mobile-based market information systems and services, which now provide farmers with the opportunity to send SMS text messages to a specific number that then gives them wholesale and retail prices of crops.

Aker (2008) looked at the impact of mobile phones on grain markets in Niger and found that they reduced grain price dispersion between markets by 6.4 percent and intra-annual price variance by 10%. In Zimbabwe, m-technologies have the potential to reduce information gaps and constraints with regards to the development of agriculture. Urban and rural farmers will have an opportunity to receive, analyze, create and exchange agricultural content through m-Technologies.

Telecommunications, particularly mobile phones, offer the ability to address existing information asymmetry in industries such as agriculture (Jehan, Aujla, and Shahzad, 2014). The cell phone is the most recent information and training instrument, which many farmers currently have in their pockets. In theory, both smart and non-smart phones, if set up with the appropriate software, have the ability to inform, train, and monitor farmers, as well as change operational processes, when used as open platforms that incorporate input suppliers and marketplaces (Henze Jet al., 2010). ICT tools have proved to be a solution in solving problems of accessing market information which are often faced by farmers in the Zimbabwe's agricultural sector. Research carried out by SNV Zimbabwe (2012) suggests that the widespread use of mobile phones and internet improves farmer linkage to input and output markets by improving access to information. Farmers in Zimbabwe's previously isolated and excluded areas now have access to information because to mobile telephony.

According to Tegegn and Dafisa (2017), mobile phones also allow farmers to keep track of current market pricing for agricultural commodities in their community and beyond, allowing them to negotiate and sell their produce at competitive prices. It is also likely that throughout these transactions, new interactions with purchasers will be made. In order to connect harvesting and bulking of agricultural products with higher prices, the link to market also includes acquiring inputs (seed and pesticides) and receiving price and market information (Masuki et al., 2007). Price information has an influence since it improves farmers' bargaining power with traders, results in greater price realization, and reduces arbitrage, wastage, and spoilage. Price information has an influence since it improves farmers' bargaining power with traders, results in greater price realization, and reduces arbitrage, wastage, and spoilage. An integrated mobile platform for knowledge and information can assist improve the value chain and lower transaction costs for farmers (Mittal & Mehar, 2012). Farmers appreciating the importance of prior knowledge of current market pricing in order to strengthen negotiating for better prices for their goods is the most significant contribution of phone usage, especially when it comes to accessing marketplaces (Masuki et al., 2007).

2.5 Deployments of mAgriculture in developing countries.

Because of the agricultural potential of mobile technologies, a majority of mobile farming platforms have been developed in Africa and in developing countries in general. Farmers in developing countries need mobile farming platforms since they do not have access to relevant, actionable, and timely agriculture information that can help them improve their farming practices and increase productivity (Global System for Mobile Communication Association [GSMA], 2015). Most mobile farming platforms focus on improving agriculture supply chain integration through providing market knowledge, expanding access to extension services, and promoting market connections (Qiang et al., 2012). These mobile farming platforms offer quite a number of services, however, the majority of the services supplied focus on providing information about produce markets, climate and disease, good agricultural practices, extension services, linkage between farmers, suppliers, and buyers, documentation, accounting, and traceability, credit, insurance, and payment methods. Banks (2011) notes that farmers can utilize mobile technologies to communicate agricultural information through SMSs; for example, in Kenya, they have a number of mobile-based farming applications, including the iCow and iKilimo applications.

The iCow platform which was invented by Green Dreams Ltd in Kenya, is a mobile phone-based program that allows cattle herders to register each cow and receive personalized text messages on their phones with advise on veterinary care and feeding plans, as well as access to a network of experts and current market rates on cattle prices. The service uses a variety of technologies to provide extension and guidance, including USSD, SMS, and the web (Qiang et al., 2012). Farmers sign up for iCow by dialing a USSD code, which records their information and allows them to begin using the various services. The iCow assists dairy farmers in maximizing their breeding potential by tracking their animal's reproductive cycle and providing them with valuable breeding, animal nutrition, and milk production efficiency suggestions in order to help them raise milk yields and, eventually, their income (Brown, 2014). The other service that farmers also get from iCow is the use of a dairy animal gestation calendar, in which farmers receive personalized information throughout the animal's gestation time. Besides the services mentioned above, this application also provides a feature known as *Vetenari Find*, which enables farmers to find the closest veterinary doctor in their area.

The other application is called iKilimo. This application was developed by Avallain Foundation, a foundation that provides farmers with detailed knowledge on a variety of areas such as animal production, agricultural equipment, food processing, high-value crops, plant production, and marketing. This application also provides some other information which include health management advice on mastitis symptoms, causes, and prevention, milk fever, ketosis, acidosis, painful hooves, bloat, and intestinal parasites, among other issues. This mobile-based farming platform is available as an android application on Google Play store; it is also available as a mobile web application as well as an SMS inquiry service. The information provided on the application is considered to be reliable because it was prepared and edited by a group of agronomists and agricultural professionals, and the information was gathered from credible agricultural periodicals, personal professional experience, and other publicly available sources.

2.6 Deployments of mAgriculture in Zimbabwe.

A number of technology start-ups in Zimbabwe have developed various mobile-based agricultural platforms as an answer to the challenge of information asymmetry. These start-up enterprises in the technology sector developed these mobile based platforms due to the crucial role they play in

reducing information asymmetry as well as cutting transaction costs. The use of mobile technology in farming can also improve market access, improve income as well as increase agricultural productivity among smallholder farmers. The goal is to improve smallholder farmers' overall performance.

According to Musungwini (2016), there are four major mobile farming platforms used in the sector of agriculture in Zimbabwe, which are eHurudza, eMkambo, Esoko and Ecofarmer. The EcoFarmer platform, a farming insurance project supplied by Zimbabwe's largest mobile network operator, Econet Wireless, began operations in 2013, according to Odunze and Hove (2015). It is a cutting-edge method of farming that makes use of mobile technologies.

The EcoFarmer platform provides Zimbabwe with the country's first Micro Insurance product, which protects inputs and crops from drought and excessive rainfall. A farmer registers with Ecofarmer first, then pays a daily subscription. The farmer receives daily weather data from a weather station linked to their field, crop information, weekly crop data, monthly pricing requests, credit rating, free adverts, daily rainfall updates and advice, best farming practices, financial linkages and marketing links once they are fully registered and have paid their daily subscription.

E-Hurudza is a new mobile platform for farming developed by Hurudza Africa, which is a local Zimbabwean agricultural technology firm. It is a software solution for electronic farm management. This mobile application, which was introduced in 2016, provides agricultural information to smallholder farmers in all regions. It provides instructions on how to cultivate crops that are relevant to one's region, including land preparation and input requirements such as fertilizers, insecticides/chemicals, seeds, personnel, and projected yield per hectare. Smallholder farmers can use the knowledge to make better farming decisions, such as planting the right crops, on the right soil and at the right time.

eMkambo is another application which has since been turned into a mobile app. According to Musungwini (2016), this is a farming mobile app that began as a call center at Mbare Musika in 2012, where they receive frequent updates from farmers on the various produce ready for the market and pass that information to the appropriate mix of traders in their database. After that, the traders will communicate with the farmers and negotiate rates, as well as delivery and payment

procedures. Smallholder farmers settle for the best prices as a result of this strategy, which involves traders bidding for the produce in a traditional auction style. The system's proprietors go to the market and negotiate with farmers who bring their produce there; if a farmer shows interest, he or she uploads information with details about their agricultural activities and where they originate from.

Esoko is a mobile platform that is also employed in the agricultural sector, which according to Ifeoma and Mthitwa (2015), began its operations in Zimbabwe in 2012. According to Ifeoma and Mthitwa (2015), Esoko currently services 17 fresh produce marketplaces in Zimbabwe, covering 33 commodities and providing services to over 170 000 smallholder farmers. Esoko distributes its services to farmers through a network of non-governmental organizations (NGOs) and contractors. Sms Push and Pull, which enables for interactive engagement with receivers, bids and offers to ease trading of agricultural products between buyers and farmers, and profiling of sms recipients using factors like gender, age, ward and crop are all services provided by the Esoko platform (Musungwini, 2016).

Despite the presence of various mobile-based solutions in Zimbabwe's agriculture sector (notably E-Mkambo, Eco-farmer, E-Hurudza, and E-Soko), the bulk of these mobile platforms are not being used, which is a challenge, as Oye, Iahad, and Ab-Rahim (2012) pointed out that technology is worthless unless it is embraced and put to use. The limited adoption of these platforms demonstrates the need to investigate existing technology acceptance models and identify missing but critical factors so that we may develop a comprehensive model for smallholder farmers' acceptance of these mobile farming platforms.

2.7 Constraints facing the usage of mobile farming platforms.

The potential impact of mobile technology in agriculture cannot be underestimated. Farmers can receive critical information including newly discovered agricultural practices, timely soil preparations and planting, weeding methods, irrigation methods, harvesting, cultivation and storage procedures via texts (Falola & Adewuni, 2012). Falola and Adewuni (2012) further highlight that mobile technology is fundamental in agriculture since it can enhance and improve the agricultural sector through its contribution to the effective sharing of agricultural information

on weather forecasts, as well as farming decisions like which crops to produce at what time of year, when to plant, what to plant, when to harvest and which agrochemical to use.

Prices and trading information can be delivered more quickly using mobile telecommunications technology (Aker, 2008). Mobile services, according to Baye et al. (1999), can facilitate transactions by connecting farmers with a variety of customers and sellers. It can assist them in determining where and at what price to sell their produce, as well as lowering the expenditures of searching for outlets (Abraham, 2007). This indicates that mobile technology can help farmers deal with information asymmetry by allowing them to communicate with a variety of stakeholders, such as buyers and suppliers, and thereby lessen social isolation. Farmers can now acquire supplies such as fertilizer, herbicides, and enhanced varieties at their doorsteps by connecting with providers via Short Message Service (SMS), which will reduce shipping expenses, theft, accidents, and perishability on farmers' crops. Farmers can also benefit from mobile technology since it improves their ability to negotiate and represent their communities when dealing with various stakeholders, particularly when it comes to input and output prices and land rights.

Individuals who gain the ability to access information often see their social position improve, according to IICD (2009). According to Gough and Grezo (2005), mobile phones open up new business prospects and make it easier to communicate with farmers' friends and relatives. All of this points to the various areas where mobile technology services can be useful in agricultural operations. The literature has demonstrated beyond a shadow of a doubt that mobile technology is beneficial to farmers.

Previous research has focused on mobile technology's role in agriculture and how farmers and other agricultural agents use it (Aker, 2009; Goyal, 2009; Jensen, 2009; Muto and Yamano, 2009; Svensson and Yanagizawa, 2009; Falola & Adewuni, 2012). Little attention, however, has been paid to the genuine elements that influence smallholder farmers' actual use and acceptance of mobile technology for agricultural tasks. According to Qiang, Kuek, Dymond, and Esselaar (2012), only 16 percent of mobile agricultural innovations implemented in developing countries reach widespread acceptance. Davis et al. (1989), Johansen and Swigart (1996), Moore and Benbasat (1991), Norman (1993), Wiener (1993), and Venkatesh (2000) all point out that, while technology is improving, its application is inadequate. Worldwide, ICT adoption in agriculture

continues to lag behind expectations (Gelb and Voet, 2009; Alvarez and Nuthall, 2006; McBratney et al., 2005; Lamb et al., 2008; Csoto, 2011). Technology has little value unless it is adopted and employed (Oye, Iahad and Ab-Rahim, 2012). Csoto (2015) goes on to say that, despite the fact that technology has become critical to effective agricultural output, adoption of these agricultural mobile based platforms remains limited, particularly among smallholder farmers. In light of the significance of mobile technologies in modern agriculture, this section tried to explore the factors influencing smallholder farmers in Zimbabwe's usage of mobile technology for agricultural productivity. This is accomplished by conducting a qualitative evaluation of these factors in depth. The findings of this study help to fill in the gaps in our understanding of the technology acceptance process among smallholder farmers in Zimbabwe.

While agricultural technology development is still largely driven by a need to solve a problem, adoption or acceptance is closely linked to other agricultural system drivers, most notably economic, social, and political factors, according to Sassenrath et al. (2008). According to Watson (2015), technology adoption is influenced by a variety of personal, social, economic, and cultural factors. Lamb et al. (2008) further underlines that in many situations, new technologies have been generated through developer push rather than user pull, with insufficient attention being made to well- established technology adoption paradigms.

2.8 Factors influencing the adoption of mobile technology among smallholder farmers.

1) Demographic factors

According to Islam and Gronlund (2011), there are numerous studies that describe the importance of the demographic background in the use and adoption of new technologies. According to Crabbe, Standing, and Karjaluoto (2009), demographic factors have a significant influence on the adoption of modern technology. Demographic factors, according to recent studies, include age (Jain and Hundal, 2002), gender (Hultberg, 2008), income and household (Kalba, 2008), and education (Kalba, 2008). Gender, age, and education are among the demographic factors that influence mobile technology adoption (Sohail and Aljabri, 2014). They must be investigated in order to learn more about farmers' attitudes toward mobile technology adoption (Mattila, 2003). Farmers' perceptions of mobile technology acceptance and adoption decisions are influenced by their demographic traits, according to a research on demographic variables.

One of the most explored demographic parameters in the literature on technology adoption is age. A survey conducted by Jain and Hundal (2007) among rural farmers in India indicated that 62 percent of mobile technology users are between the ages of 20 and 40. People aged 20 to 30 are more likely to be responsive to a greater selection of mobile technology services, according to Islam and Gronlund (2011). Csoto (2015) performed a research among smallholder farmers in Hungary and found that, in contrast to senior farmers, the majority of younger farmers utilize smart phones for agriculture. According to Frimpong (2009), the bulk of technology users are young individuals aged 20 to 45 years old. According to Jain and Rekha (2017), the majority of farmers above the age of 25 are adopting mobile technologies to acquire agricultural information in order to improve farm operations efficiency. As a result, multiple research have established that there is a link between age and mobile technology usage through correlation and regression analysis.

Another demographic aspect that determines farmers' adoption of mobile technology is their level of education. Education, according to Falola and Adewuni (2012), has a positive influence on mobile technology acceptance because educated individuals are more aware of mobile technology, how to operate it, access it, and use it. According to Mittal and Mehar (2015), the findings of numerous research studies revealed that as education levels rise, farmers would increasingly use current ICT tools to acquire agricultural information. More educated people, according to DiMaggio and Cohen (2003), further revealed that better educated people are better equipped to understand and use new technologies, and hence are more likely to be inventive. Farmers with more education use mobile technology for agriculture more than farmers with less education, according to Csoto (2015). Fuglie and Kascak (2001) argue that dissemination of new technology among groups of less educated individuals is relatively slow due to their low education level. Furthermore, Alampay (2003) discovered that those with a tertiary education have more access to and use of mobile devices than those with a lower level of education.

Many prior research have found a substantial and positive relationship between technology use and income, resulting in farmers with more disposable income being able to obtain more information than those farmers with less disposable income (Mittal et al., 2010). The level of income and the adoption of new technology are positively related (DiMaggio and Cohen, 2003). Only smallholder farmers with a lot of money are likely to be able to buy the mobile devices and

then the subscription fees if the user wants to use some of the services offered through the device. The daily income for farmers has a high statistically significant influence on mobile phone use in sharing agricultural information, according to Nyamba and Mlozi (2012). Their research also found that income levels had a significant impact on the adoption of mobile technologies to disseminate agricultural information. Farmers with a high income are more resourceful and have personal electronic devices such as computers, internet access, television, and mobile technologies, which can be utilized to access and acquire agricultural data (Mittal and Mehar, 2015). According to Kalba (2008), the acceptance of a certain technology (such as post-paid vs. pre-paid services and fixed vs. mobile connections) is dependent on the amount of household income over time. Furthermore, according to Cheong (2002), the bulk of users of mobile devices are young people who are better educated and have greater earnings. Chowdhury and Wolt (2003) discovered a substantial positive link between farmers' income and mobile technology use.

Gender has a big impact on mobile technology uptake. Despite the rising increase in mobile dispersion levels over the world, according to the GSMA Development Fund (2010), women own less than 21% of mobile phones as compared to their male counterparts. In a study conducted by Islam and Gronlund (2011) on the gender ratio of mobile technology adoption by farmers in Bangladesh, the findings revealed that the majority of farmers who possessed mobile phones were male. Men make 70% of cellphone calls compared to women, according to the same study, indicating a clear gender divide. In terms of mobile banking, males who are more educated and have higher salaries are more likely to use the technology (Sulaiman et al., 2006). Males and females both use mobile technology to obtain agricultural information, according to Jain and Rekha (2017), however males view mobile technology to be more valuable than females.

2. Facilitating conditions

This is the extent to which a user thinks that the system's organizational and technological infrastructure are in place to facilitate its use (Venkatesh, Morris, Davis, and Davis, 2003). Seneler, Basoglu, and Daim (2008) define facilitating conditions (FC) as all the assistance and support that users get from friends, family members and colleagues for them to use the system. The choice by users to decide on which network service provider to subscribe to is all influenced by facilitating conditions such as network coverage, affordability and availability of subscriptions, locations for

bill payments and service quality (Jain and Hundal, 2007). Rural connection and access time (Lu and Swatman, 2009), technological infrastructure (Kalba, 2008), availability of support services (Jain and Hundal, 2007), and market structure and mechanism (Hobijin and Comin, 2003) are examples of facilitating conditions in mobile technology).

3. Tech-service attributes

The traits, characteristics or features of a technology or system that differentiates it from other systems, technologies or services are referred to as tech-service attributes by Islam and Gronlund (2011). Farmers' opinions of the attributes of technology have a considerable impact on their adoption decisions (Adesina & Baidu-Forson, 1995). Variables such as technology service characteristics (Kargin and Basoglu, 2007), handset and service cost (Lu and Swatman, 2009), and technology characteristics, such as network and interface characteristics (Sarker and Wells, 2003), are examples of tech-service attributes). According to Carlson, Walden, and Bouwaman (2006), the cost of mobile-based services is a significant obstacle to adoption.

4. Tech-service promotion

The practice of telling people about a product or endeavor is known as tech-service promotion. Any technological breakthrough must be pushed in order to raise awareness, which is a prerequisite for any new technology's acceptance. According to Doss (2003), one of the main reasons farmers do not adopt new technologies is a lack of awareness. One of the first stages toward any initiative's adoption is raising awareness. As a result, Cook (2006) proposes that suppliers or technology startup firms should publicize their projects in order to raise user awareness.

5. Perceived Usefulness (PU) and Perceived ease of Use (PEU)

According to previous research, these two factors are the most important in terms of mobile service usage, as well as the most recognized aspects that influence a person's attitude and behavioral intentions (Davis, 1989; Kargin and Basoglu, 2007). People will adopt or accept a technology if they think it will help them with their job. If a system is effective but difficult to use, user may ignore its effectiveness because of its difficulty in use. Perceived usefulness and perceived ease of use accounted for 88 percent of the variance in behavioral intention, according to Agarwal and

Karahanna (2000). New opportunites coming with the use of new technology (Carlsson, Hyvönen, Repo and Walden, 2005) and productivity are two elements that influence perceived usefulness.

6. Social Influence

In some circumstances, the effect of social norms on users' behavioral intentions is stronger than the influence of attitudes, according to Stiff and Mongeau (2003). A person's sense of society norms may prohibit him or her from acting in accordance with his or her personal values. According to Kargin and Basoglu (2007), besides neighbors, there are additional sources of influence that influence technology adoption, such as relatives, friends, and influential community members. In their study of rural farmers in India, Jain and Hundal (2007) found that farmers' acceptance of technology was impacted more by their neighbors' use of that technology as well as media. Farmers want to share their farming expertise and experience and to do this, they rely on educated family members, friends, and neighbors who are either early adopters or knowledgeable about the products and services.

2.9 Conclusion

Previous research has shown that using mobile technology improves agricultural performance since it plays a critical role in increasing farmers' operations and activities. However, demographic considerations, facilitating conditions, technology-service features, technology-service advertising, perceived usefulness and perceived ease of use, and social influence all have a significant impact on farmers' adoption of this technology. If farmers are to adopt and fully exploit this technology, these issues must be solved. Policymakers, technology start-up firms, service and technology designers and marketers, and researchers with a special interest in technology acceptance will find the elements that affect technology adoption mentioned in this section interesting.

Chapter 3: Technology adoption models

3.0 Technology adoption models

Technology acceptance is about how people accept and adopt some technology for use (Louho, Kallioja and Oittinen, 2006). Dillion (2001) defines user acceptance of technology as a user group's demonstrated willingness to use technology or any innovation for the tasks it was meant to assist. The success or failure of any technology or innovation depends on the acceptance and adoption of that technology by the users; thus, acceptance becomes a critical factor. Technology is worthless unless the intended users accept and employ it (Oye, Iahad, and Ab-Rahim, 2012). Research studies in the technology acceptance field have yielded many competing technology adoption models, each with a different set of acceptance variables (Venkatesh, Morris & Davis, 2003). This chapter includes an overview of the existing technology adoption theories which help to understand the human behavior involved in adopting new technology. This overview is important since the main aim of the current study is to examine the key underlying factors that influence behavior towards successful adoption and acceptance of mobile farming platforms.

3.1 The adoption process and its stages.

The process of adoption is defined as the mental process through which an person passes from first hearing about a system to final adoption, and adoption as the decision by an individual to become a regular user of a system (Kotler, 2004). Kotler (2004) further submits that the process of adoption consists of five stages as shown in **table 3.1 below**.

Table 3.1: Stages in the Adoption Process (Kotler, 2004).

Stages	**Effects/Activities**
1. Awareness	The consumer becomes aware of the new product, but lacks information about it.
2. Interest	The consumer seeks information about the new product.
3. Evaluation	The consumer considers whether trying the new product makes sense.
4. Trial	The consumer tries the new product on a small scale to improve his or her estimate of its value.
5. Adoption	The consumer decides to make full and regular use of the new product.

3.2 IT adoption theories and models

There are many different theories and models of behavior associated with technology usage that can help in understanding and predicting the behavior of an individual. These theories help to predict the behavior of an individual whether to accept or reject the adoption of a new technology. This is supported by Schaupp and Carter (2009), who indicate that the question of why and how users choose to adopt new technologies has forever been the focal point of information system research. The following section assesses these theories and provides details. An assessment of these theories is essential, as Dubin (1978) highlights that a theory is a necessary prerequisite for conducting research because any data collected without theory is not research but a simple observation or reporting.

3.2.1 Theory of Reasoned Action (TRA)

The TRA was originally developed by Fishbein (1967) and later refined and tested by Fishbein and Ajzen (1975). It is the first theory to gain widespread acceptance and it is one of the most popular theories in the technology acceptance research field (Olushola and Abiola, 2017). TRA is also one of the most influential and fundamental theories of human behavior and has been used to predict a wide range of behaviors (Venkatesh et al., 2003). According to this theory, people would use technology if they could perceive the benefits. TRA posits that beliefs drive attitudes, which in turn influence intentions and then generate behavior (Olushola and Abiola, 2017). The TRA predicts the user's behavior by considering the effect of attitude (personal feelings) and subjective norm (perceived social pressure). An individual's attitude towards the behavior, coupled with the subjective norm concerning the behavior, determines the behavioral intention and then generates behavior (Kurland, 1995). Figure 3.1 below indicate the TRA

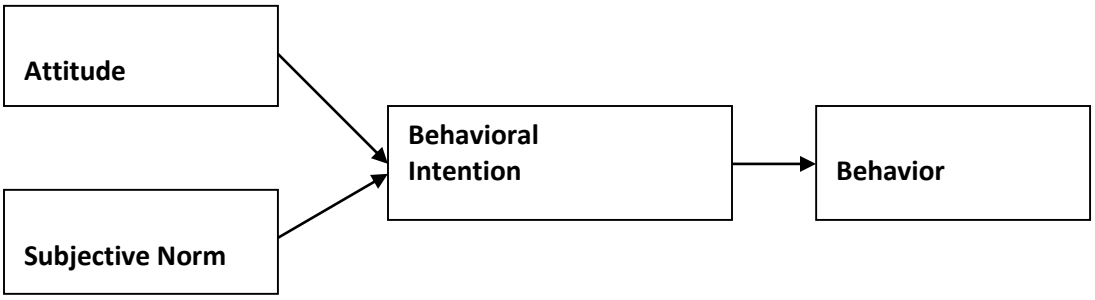

Figure 3.1: Theory of Reasoned Action (TRA). **Source**: Fishbein and Ajzen (1975)

Attitude

Attitude is defined as the good or negative feelings that an individual has about completinng the desired behavior. Attitudes are formed through assessing one's views about the effects of a particular behavior and evaluating the attractiveness of those effects (Alsharif, 2013).

Subjective Norm

The subjective norm is described as a user's assessment of whether others think the activity should be performed because it is essential to them. The subjective norms reflect the person's perception of social pressures put on him or her to potray or not to potray the behavior in question (Ramayah and Janta, 2004). In other words, an individual who believes that most people with whom he or she is motivated to comply think he or she should perform the behavior will perceive social pressure to do so (Al-Mamary, Al-Nashmi, Hassan and Shamsuddin, 2016).

Strengths and weaknesses of the TRA

The TRA is still being applied in various academic disciplines by many researchers today. This researcher noted that though this theory has got a number of strengths, it has got several limitations. In terms of strengths, the TRA has proved that it has got a strong predictive power of consumers' behavioral intention after being tested with a wide variety of consumer products and technologies. The theory is a well-researched theory which has the capability to explain almost any human behavior (Olushola and Abiola, 2017). In terms of its limitations, Kurland (1995) notes that TRA is deficient in that it assumes that actions are totally under volitional control and this assumption fails to acknowledge that individuals' behavior may be directed by, for example, systematic constraints. Baraghani (2008) highlights that TRA is very general in that it does not specify the beliefs that are operative for a particular behavior and this means that researchers using TRA must first identify beliefs that are salient for subjects regarding the behavior under investigation. Olushola and Abiola (2017) also note that TRA does not include demographic and personality characteristics of individuals which influence behaviors. TRA is also limited in that consumers or individuals do not have complete control over their behavior in some conditions. With these limitations of TRA, Ajzen (1991) proposed a new theory called Theory of Planned Behavior (TPB). The TPB is an extension of TRA which was done to address the limitations of TRA where a variable perceived behavioral control was added to come up with the TPB. This theory predicts

that the stronger the consumer's perceived behavioral control, the more likely the consumer will intend to perform the behavior.

3.2.2 Theory of Planned Behavior (TPB)

TPB was propounded by Ajzen (1985). It extended the Theory of Reasoned Action (TRA) by including an additional factor, which is perceived behavioral control (PBC) (Olushola and Abiola, 2017). This extension was necessitated by the TRA's inadequacy when dealing with activities over which persons have only a limited amount of volitional control (Ajzen, 1991). The perceived behavioral control construct that was added to TRA is described as the perceived ease of use or difficulty with which the person will be able to carry out the behavior (Morris et al. 2012). The argument behind perceived behavioral control as an additional factor in TPB is that, in addition to attitudes towards use, subjective norms and perceived behavior control such as resources, opportunities and skills needed to use the system also influence behavior. In other words perceived behavioral control is an estimate of the skills needed for expressing the behavior and the possibility to overcome barriers (Al-Mamary, Al-Nashmi, Hassan and Shamsuddin, 2016). Chau and Hu (2001) argue that an individual's behavior can be explained by his/her behavioral intention, which is jointly influenced by subjective norms, attitude and perceived behavioral control. Egmond and Bruel (2007) posit that in the TPB, attitudes, subjective norms and perceived behavioral control predict the intention which in turn predicts the behavior. Kriponant (2007) notes that by changing perceived behavior control, subjective norm and attitude, the chance that the person will intend to do a desired action can be increased, which thus increases the chance of the person actually doing it. The TPB is shown in Figure 3.2 below.

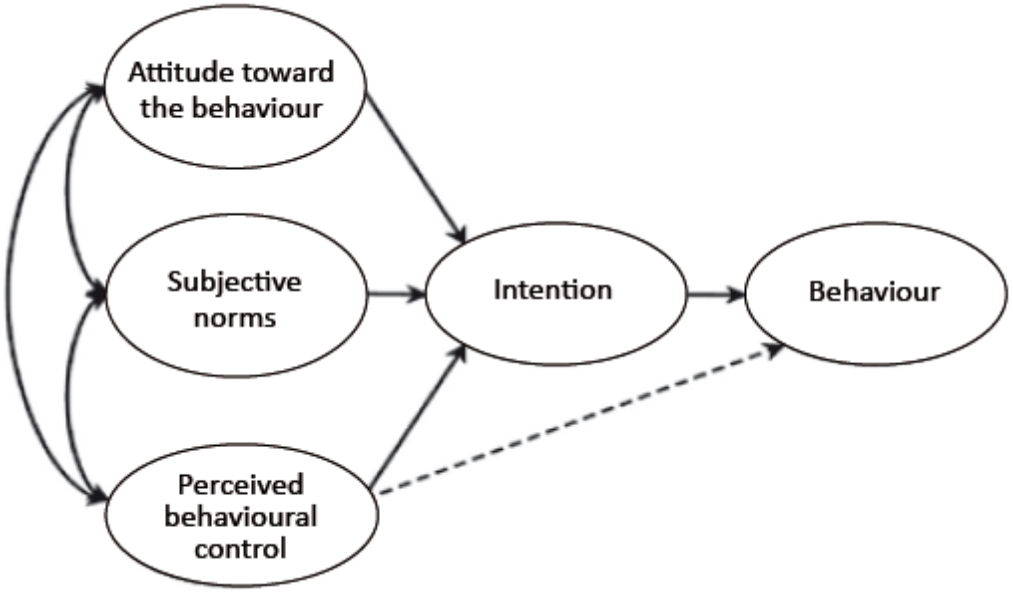

Fig 3.2 Theory of Planned Behavior (TPB). **Source**: Ajzen (1985, 1991).

Ajzen (1991) further highlights that perceived behavioral control relates to the extent that a user believes he has control over personal or external circumstances that help or hinder behavioral performance. As with any other theory, the Theory of Planned Behavior (TPB) has got its own strengths and weaknesses. The strengths of the TPB include the fact that it is a broader model in comparison to TRA mainly because of the perceived behavioral control as an additional construct. The theory has received substantial empirical support for accurately predicting behavior in information systems and many other domains (Olushola and Abiola, 2017). TPB is one of the best supported social psychological theories with respect to predicting human behavior (Sommer, 2011). However, TPB is limited because its constructs are sometimes difficult to define and measure when carrying out research. The theory also suffers from multicollinearity among the independent variables (Olushola and Abiola, 2017).

3.2.3 Technology Acceptance Model (TAM)

The TAM was developed by Davis (1989) and it was adapted from the TRA by Ajzen and Fishbein (1980) and the TPB by Ajzen (1985). Surendram (2012) indicates that TAM is considered to be one of the most influential and popular models used to predict the acceptance and adoption of information systems and technology by users. In other words, TAM is designed specifically for predicting user acceptance of information systems as it is used to determine the level of acceptance

of technology by users at the individual level. TAM has two constructs, which are perceived usefulness (PU) and perceived ease of use (PEOU). These are the constructs that determine the individual's attitude towards use of that specific technology, which then, influences the behavioral intention to use technology. Perceived usefulness (PU) is described as the extent to which users believe that employing a certain system would improve their job perfomance (Davis, 1989). On perceived usefulness, the thinking is that people tend to emply or not to employ a certain technology to the extent that they believe it will help them to do their job better. According to Davis (1989), perceived ease of use is the extent to which a user thinks that utilizing a system will be simple. It can also be described as the user's perception of the amout of effort required to use a system. In other words, perceived ease of use relates to a prospective user's expectation that the target system will be easy to use (Davis, Bagozzi, and Warshaw, 1989). There is also a link between perceived usefulness (PU) and perceived ease of use (PEOU), as perceived ease of use has a direct impact on perceived usefulness. Peter and McLean(2009) argue that ease of use is a measure of the system quality and this is the reason why some researchers include ease of use as a measure of the system quality. Figure 3.3 below shows the Technology Acceptance Model.

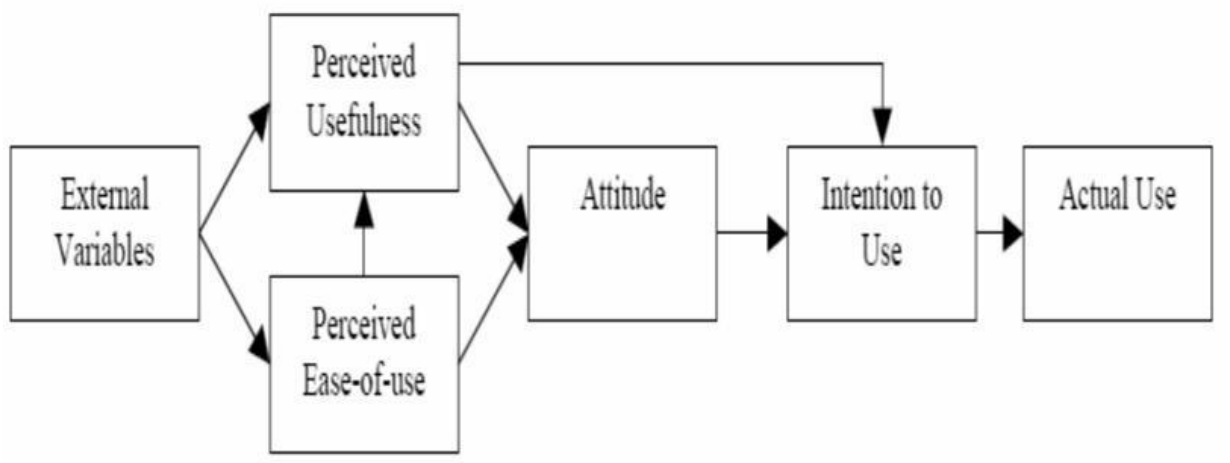

Figure 3.3: Technology Acceptance Model (TAM). **Source** Davis (1989)

The main objective of TAM is to provide or demonstrate the impact of external variables on internal beliefs, attitudes and intentions. TAM suggests that perceived usefulness and perceived ease of use are considered to be the most crucial constructs in explaining and predicting technology or system use (Davis, 1989). Two other factors in TAM are attitude towards use and behavioral intention towards use. The attitude towards use is defined as the individual's evaluation of the

desirability of employing a particular information system. Behavioral intention is then desrcibed as the likelihood of a person to employ the information system (Ajzen and Fishbein, 1980).

TAM has a number of strengths in comparison to other models. Firstly, TAM is a strong and robust model for predicting individual acceptance and adoption of systems. This is supported by numerous empirical studies which have been conducted and proved that TAM explains a significant amount of the variance in usage intentions and behaviors with a variety of information systems (Olushola and Abiola, 2017). Secondly, TAM used perceived usefulness and perceived ease of use to replace subjective norm in the TPB. The direct impact of subjective norms on behavioral intention has produced mixed results in the past. The limitations of TAM are that it assumes usage is volitional, particularly that there are no barriers that would prevent a person from using a system if he or she chose to do so. However, there are so many barriers preventing a person from using a system, and these are perceived behavior control and perceived user resources (Mathieson, Peacok and Chin, 2001). The other limitation of TAM is that it does not indicate the variety of user task environments and constraints (Olushola and Abiola, 2017).

3.2.4 Technology Acceptance Model (TAM 2)

In 2000, Venkatesh and Davis proposed the TAM 2 on the basis of TAM. TAM2 theorizes that the user's mental assessment of the match between significant work goals and the consequences of doing job activities serves as a foundation for generating judgments about the system's effectiveness (Venkatesh and Davis, 2000). TAM2 expanded the original TAM to describe perceived usefulness and usage intentions in terms of cognitive instrumental processes and social influence. TAM2 was assessed using longitudinal data acquired from four distinct systems at four separate institutions, two of which were voluntary and two of which were mandatory, and the results indicated that TAM2 performed admirably in both voluntary and mandatory environment (Lai, 2017).

According to Moore & Benbasat (1991), voluntariness is desribed as the degree to which the usage of an technology is seen as voluntary. Both social influence processes (image, voluntariness and subjective norm) and cognitive instrumental processes (perceived ease of use, output quality, job relevance and result demonstrability) greatly influenced user adoption of technology. Wu and

Wang (2003) highlight that in TAM2, subjective norm, perceived ease of use and perceived usefulness all indirectly influence actual system use through behavioral intention. In other words, in TAM2, subjective norm, perceived ease of use and perceived usefulness jointly determine behavioral intention. Subjective norm directly influences perceived usefulness while perceived ease of use also influences perceived usefulness but to a smaller extent (Al-Mamary, Al-Nashmi, Hassan and Shamsuddin, 2016). Figure 3.4 below shows the TAM 2.

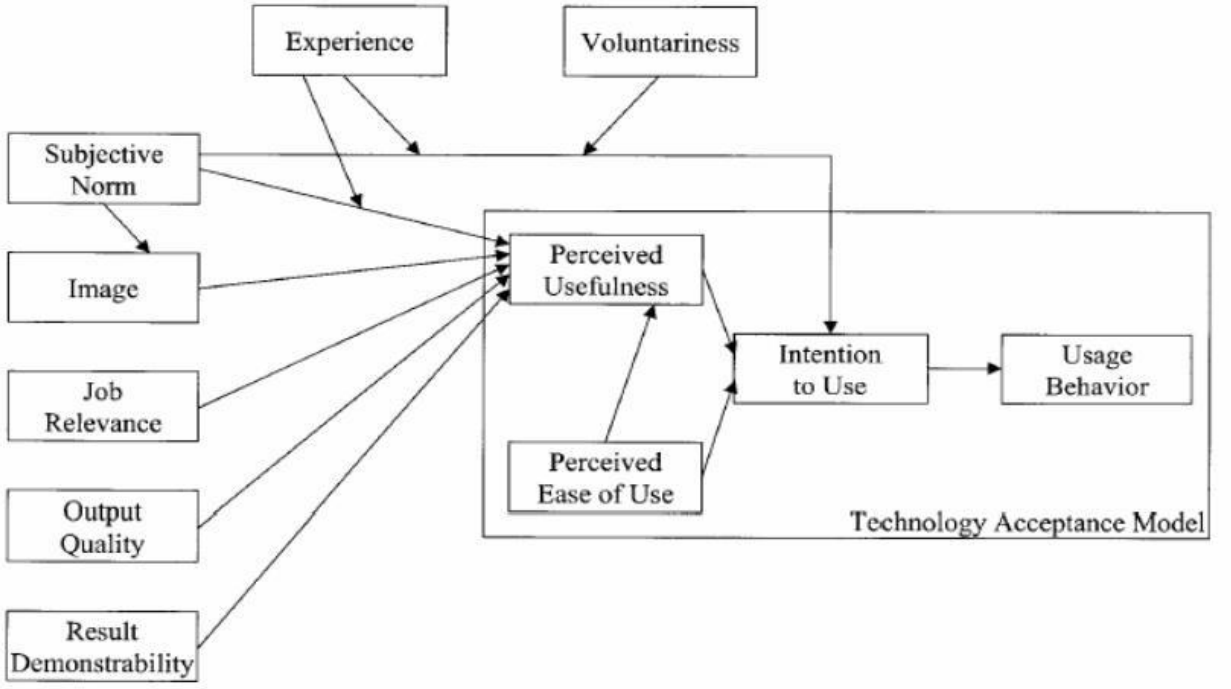

Figure 3.4: Technology Acceptance Model 2 (TAM2). **Source:** Venkatesh and Davis (2000)

Social influence processes

Social influence processes include subjective norm, voluntariness as determinants of perceived usefulness, and intention to use the system. These three interrelated social forces are the forces that an individual faces when deciding to use or not to use a new technology. Fishbein and Ajzein (1975) define subjective norm as a person's perception that the majority of key individuals in his life believe he should or should not conduct the behavior in question. In TAM2, the direct compliance-based effect of a subjective norm on intention over and above perceived usefulness and perceived ease of use will occur in mandatory but not voluntary system usage. Voluntariness is a moderating variable and it is defined as the degree to which potential adopters believe the adoption decision is optional (Agarwal and Prasad, 1999). Kelman (1958) states that in order for

individuals to establish a favorable image within a reference group, they often respond to social normative influences. Moore and Benbasat (1991) define image as the extent to which the employment of technology is considered to improve one's social position. Subjective norms will positively influence image, according to TAM2, because if important members of a person's social group at work believe that he or she should use a system, then using it will tend to enhance his or her standing within the group (Blau, 1964).

Cognitive instrumental processes

Venkatesh and Davis (2000) propose four cognitive instrumental determinants of perceived usefulness: perceived ease of use, job relevance, result demonstrability and output quality. They describe job relevance as an individual's sense of how applicable the target technology is to their particular job. In contrast to social influence processes, job relevance is seen as a cognitive assessment that has a direct effect on perceived usefulness (Alsharif, 2013). Venkatesh and Davis (2000) argue that users will examine how well a system does those activities, which is refered to as perceptions of output quality, in addition to what functions a system is able to do and the degree to which those functions match their job goals which is then described as job relevance. TAM2 posits that result demonstrability will directly influence perceived usefulness. Moore and Benbasat (1991) define result demonstrability as the tangibleness of the innovation's outcomes. The influence of result demonstrability on perceived usefulness implies that individuals can be expected to form more positive perceptions of the usefulness of a system if the co-variation between usage and positive results is readily discernible. Alsharif (2013) indicates that the relationship between result demonstrability and perceived usefulness is also consistent with the job characteristics model. One of the strengths of TAM2 is that it encompasses both social influence processes and cognitive instrumental processes; this presents a detailed analysis of the primary forces that influence perceived usefulness judgements. Alsharif (2013) revealed that TAM2 proves that subjective norm has a large direct effect on usage intentions for required systems, but not for voluntary systems, over and above perceived usefulness and perceived ease of use.

3.2.5 Technology Acceptance Model (TAM3)

Venkatesh and Bala (2008) combined TAM2 (Venkatesh and Davis, 2000) and the model of the determinants of perceived ease of use (Venkatesh, 2000) to develop a combined model of technology adoption and acceptance known as TAM3, shown in Figure 3.5 below. Technology Acceptance Model 3 (TAM3) posits three relationships that were not empirically tested in Venkatesh (2000) and Venkatesh and Davis (2000). Venkatesh and Bala (2008) suggest that experience will moderate perceived ease of use to perceived usefulness, computer anxiety to perceived ease of use and perceived ease of use to behavioral intention. TAM3 is based on a theoretical framework consisting of four major categories of constructs from all previous TAM researches, namely individual differences, system characteristics, social influence and facilitating conditions. Each of the four categories, namely individual differences (Computer Self Efficacy, Computer Anxiety, Computer Playfulness), system characteristics (Job Relevance, Output Quality, Result Demonstrability, Perceived Enjoyment, Objective Usability), social influence (Subjective Norm, Image) and facilitating conditions (Perception of External Control) are made up of their own variables based on the two main determinants of PU and PEOU (Howard, Marshall & Swatman, 2010). Figure 3.5 below shows the Technology Acceptance Model 3.

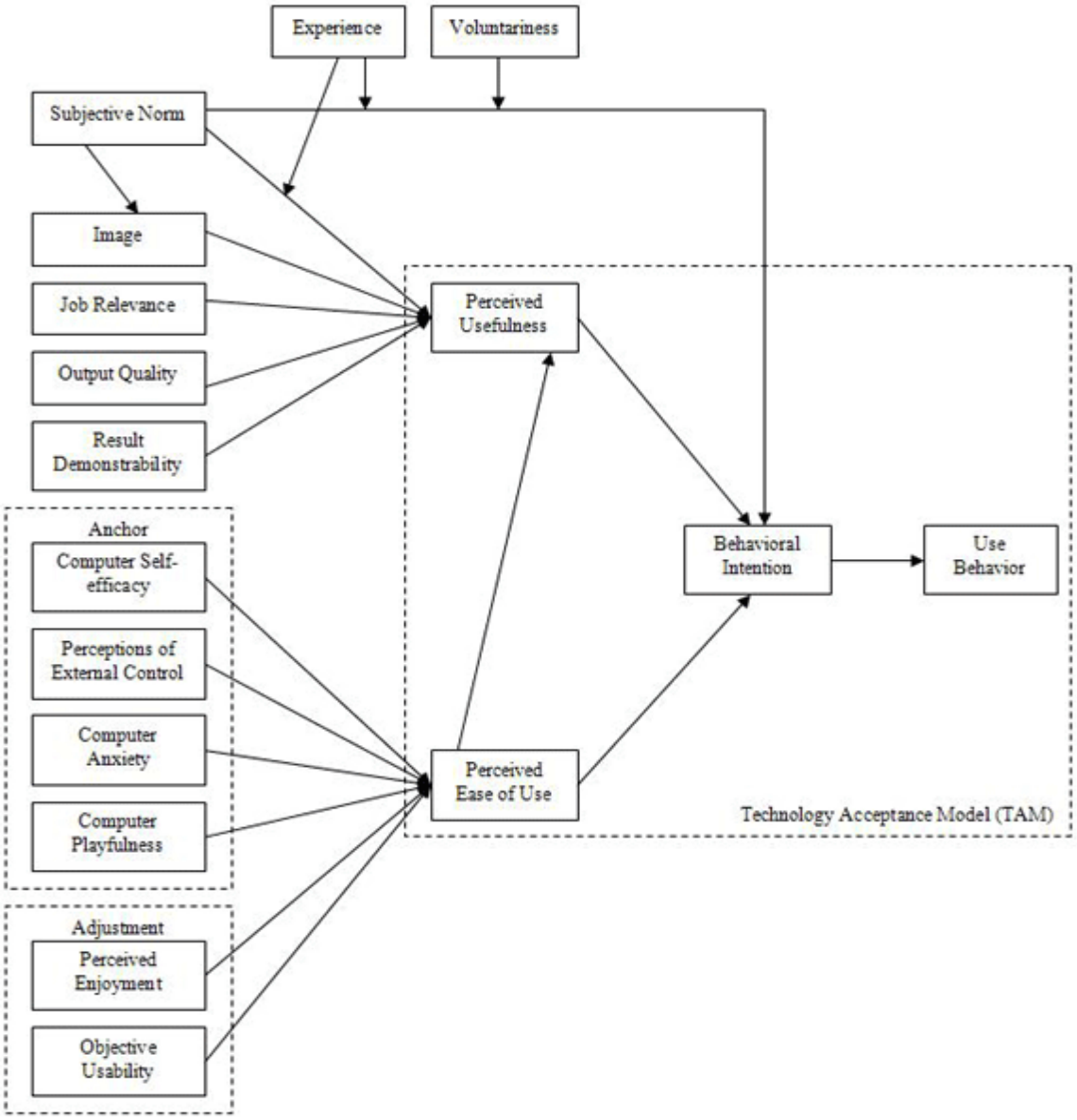

Figure 3.5: Technology Acceptance Model 3 (TAM3). **Source** Venkatesh and Bala (2008)

3.2.6 Combined TAM-TPB (C-TAM-TPB)

Taylor and Todd (1995) proposed de-composing the elements of Theory of Planned Behavior (TPB) into detailed constituents. Once the theory of Planned Behavior was broken out into these constituencies, it elaborated the TPB through the inclusion of elements from the Diffusions of Innovation (DOI) perspective. The key determinants of TPB, influence of social and control factors which are not used to measure the behavior in TAM, were joined to form the C-TAM-TPB (Samaradiwakara & Gunawardena, 2014). In other words, Taylor and Todd (1995) added two

more constructs, namely perceived behavioral control and subjective norm to TAM to provide a more complete test of the important determinants of system acceptance and usage, because of their predictive utility in IT usage research and their wide use in social psychology. In this model, behavior is influenced by behavioral intention, which in turn is influenced by attitude, perceived behavioral control and subjective norm. Attitude, perceived behavioral control and subjective norm are jointly influenced by perceived usefulness and ease of use. norm Taylor and Todd (1995) also suggest that user experience would moderate the relationships among the elements appearing in the combined TAM-TPB model. The Combined TAM-TPB model is demonstrated in Figure 3.6 below.

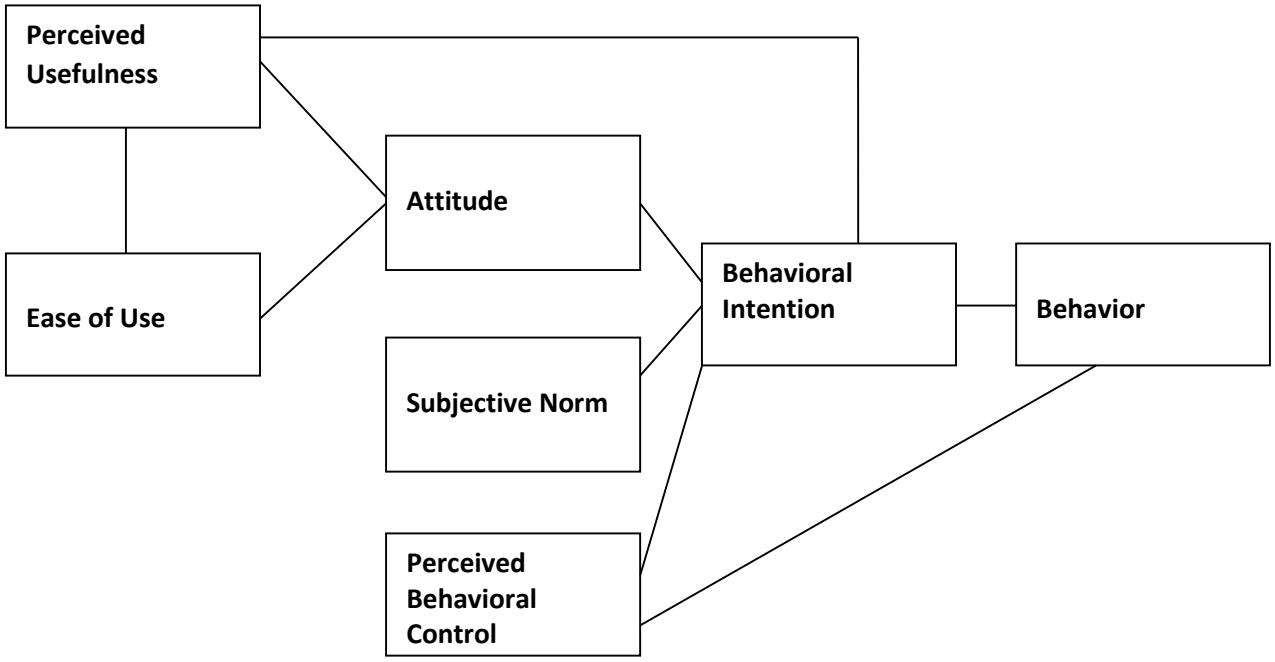

Figure 3.6: Combined TAM-TPB. **Source:** Taylor and Todd (1995)

3.2.7 Motivational Model (MM)

The motivational theory in the field of psychology by Davis, Bagozzi and Warshaw (1992) is the keystone concept behind the Motivational Model (MM). Venkatesh and Sepeir (1999) highlight that several studies have examined the motivational theory and adapted it for specific contexts as well as using it to better understand the acceptance and utilization of new technology. The general motivational theory has become popular because of its ability to explain behavior as supported by a significant body of research in psychology. In the information systems domain, the applied

motivational theory is used to study and understand new technology adoption and use (Davis, Bagozzi and Warshaw, 1992). The core constructs of the model are extrinsic motivation and intrinsic motivation. Davis, Bagozzi and Warshaw (1992) define extrinsic motivation as the belief that users will want to do something because it will help them achieve desirable outcomes that are not related to the action itself, such as better job perfomance, promotions or salary. Intrinsic motivation is described as the belief that users will want to do something for no apparent reason other than the act of doing it (Venkatesh, Morris, Davis and Davis, 2003).

3.2.8 Model of Personnel Computer Utilization (MPCU)

The Model of PC Utilization (MPCU), according Venkatesh, Morris, Davis and Davis (2003), is derived from Triandis' (1977) theory of human behavior. Thompson, Higgins and Howell (1991) adapted and refined the theory of human behavior by Trandis and they came up with their own model to predict PC Utilization. The model of PC Utilization presents a competing perspective to the TRA and the TPB. Venkatesh et al. (2003) argues that the nature of MPCU makes it more relevant in predicting user adoption and use of a number of technologies

3.2.9 Innovation Diffusion Theory (IDT)/Diffusion of Innovation (DOI)

The IDT or DOI theory describes the acceptance or non-acceptance of new technology in a systematic way. It is a theory that tries to explain how, why, and how quickly technology spreads across cultures. Rogers (1995) describes diffusion as the process through which a technology is conveyed to users of a social system over time through certain channels. He also defines the adoption process as a mental process that a person goes through from first hearing about an innovation to final adoption. Dillon and Morris (2001) argue that the Diffusion of Innovation theory offers a principal theoretical perspective on technology acceptance both at individual and organizational level of analysis by providing an account of the manner in which any technological innovation moves from the stage of invention to widespread use or not.

The argument in this theory is that when users start to share their views and opinions to other potential users on a new technology using available communication channels, then diffusion start to occur gradually among users, and people gain personal knowledge of the new technology (Al-Mamary, Al-Nashmi, Hassan and Shamsuddin, 2016). Rogers (1995) came up with a five stage

process of innovation adoption, and the five stages are knowledge, persuasion, decision, implementation and confirmation. Knowledge occurs when a person is made aware of the existence of a technology and learns how it works. Persuasion occurs when a person develops a positive or negative attitude toward an innovation. Decision takes place when an user starts to do those activities that lead to a choice in accepting or rejecting the innovation. Implementation is the stage where the user starts to operationalize the innovation that is putting it to use. Last comes confirmation, which occurs when a person seeks confirmation of an innovation decision they have previously made, but they may change their minds if they are exposed to contradicting messages regarding the innovation (Alsharif, 2013). This five stage process of adoption led to the development of Rogers' (1995) S-shaped adoption curve of innovators, early adopters, early majority, late majority and laggards as shown in the figure below.

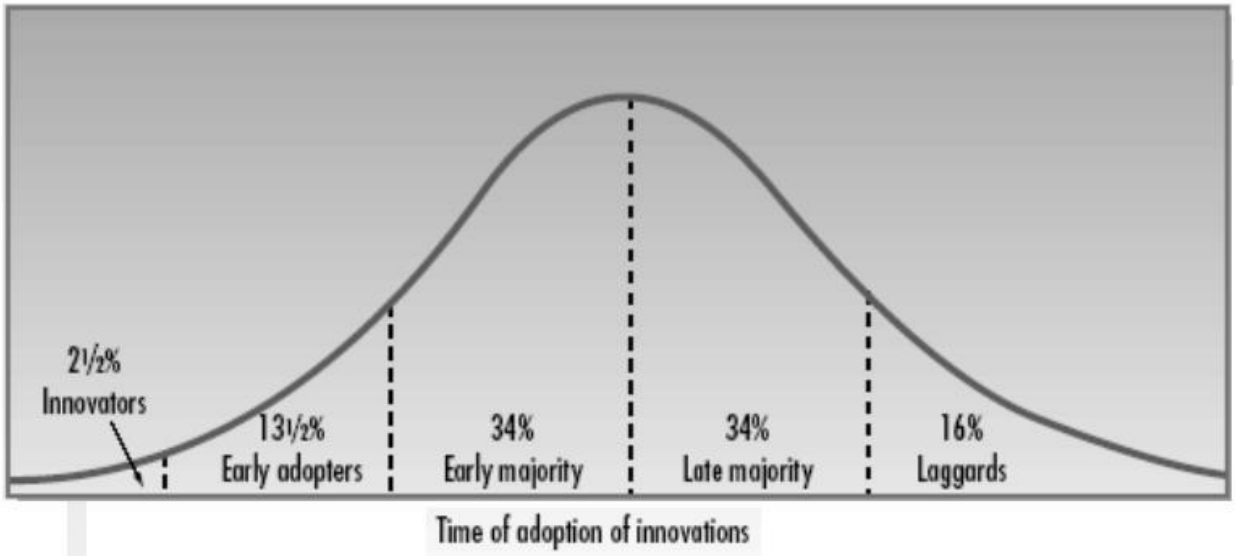

Figure 3.7: Innovation Adoption Curve (Roger, 1995)

Rogers (1995) categorized adopters into several classes as shown in Figure 3.7 above. He argues that individuals in a social system do not all adopt an innovation at the same time, but they adopt in an over-time sequence. He further highlights that individuals can be classified into adopter categories on the basis of when they first began that innovation. These categories of types of adopters are:

- Innovators: These are individuals who are obsessed with being venturesome and they always want to be the first. What leads them out of a local circle of peer networks into more cosmopolitan social relationships is their interest in new ideas.

- Early Adopters: Early adopters have the highest degree of opinion leadership in most systems and they are a more integrated part of the local system than innovators. Alsharif (2013) highlights that whereas innovators are cosmopolites, early adopters are 'localities'.
- Early Majority: These are the people who interact frequently with their peers but seldom hold a position of the leadership in a system.
- Late Majority: Late majority make up one third of the members of the system but they are skeptical.
- Laggards: These individuals are traditional; they adopt an innovation but they possess almost no opinion on leadership.

The innovation adoption curve is very important in that it shows that users or individuals differ in their readiness to use new products. Some individuals adopt new innovations earlier than others, and this helps mostly technology startup companies and policy makers such as the government as they develop new technologies for use by different individuals. In terms of strengths, DOI is a powerful theory in predicting the behavior of individuals at the firm level and is very relevant when studying higher education and educational environments (Oliveira and Martins, 2011). However, DOI has limitations in that first, it does not offer adequate constructs to deal with collective adoption behaviors and it focuses solely on an innovation and ignores other factors that determine how the innovation is adopted. DOI have weaknesses in predicting the behavior of individuals.

3.2.10 Social Cognitive Theory (SCT)

The SCT is a theory that was developed by Bandura (1986). It defines human behavior as a triple and shared interplay of personal factors, behavior and the environment. The SCT propound that a user's behavior is uniquely determined by personal factors, behavior and environment (Al-Mamary, Al-Nashmi, Hassan and Shamsuddin, 2016). In other words, Social Cognitive Theory (SCT) is based on the notion that environmental influences such as social pressure, situational characteristics, cognitive and demographic characteristics significantly determine behavior. 'Environment' here refers to the social and physical environments that can affect a person's behavior. Family members, friends and colleagues constitute the social environment and the physical environments include elements such as size of a room, the ambient temperature and the availability of certain foods. Bandura (1986) argues that the environment or the situation provides

the framework for understanding behavior. He further highlights that the situation is a person's perception of the place, time, physical features or the cognitive or mental representations of the environment that may affect a person's behavior.

Glanz, Rimer and Viswanath (2002) indicate that the three factors, namely environment, people and behavior, are constantly influencing each other; hence, behavior is not simply the result of the environment and the person, just as the environment is not simply the result of the person and behavior. Venkatesh, Morris, Davis and Davis (2003) state that the SCT is considered to be one of the most powerful theories in explaining human behavior. It also applies to a wide spectrum of areas of study, for example human functioning as career choice, organizational behavior, physical and mental health. The Social Cognitive Theory (SCT) provides ground-breaking concepts of self-efficacy, experience, training and social influence, and it has also been used to study behavior in the classroom as well (Abbasi, 2011). Though the theory is very powerful, its limitation is that it cannot be generalized easily and it is very difficult to apply. In addition, the Social Cognitive Theory (SCT) is more related to education and motivation than technology adoption. The theory is represented in the figure below.

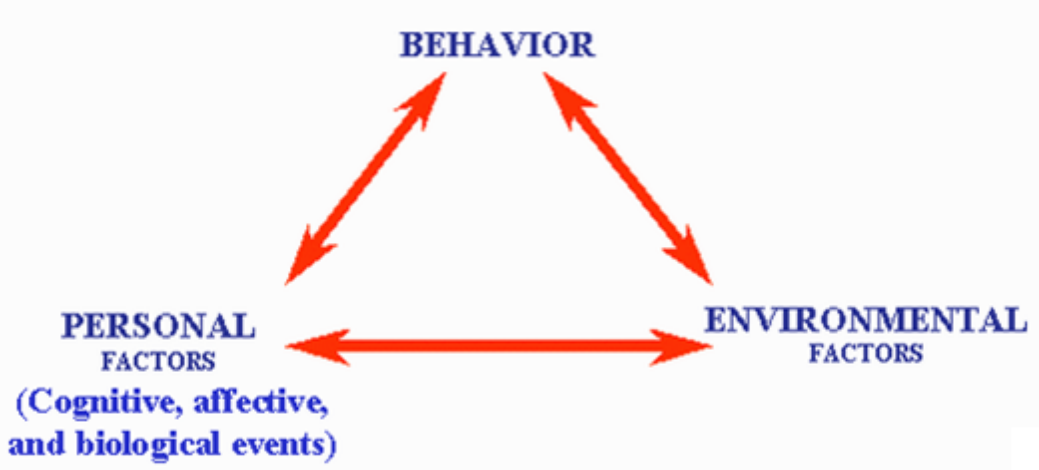

Figure 3.8: Social Cognitive Theory (SCT). **Source:** Wood and Bandura (1989)

3.2.11 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh, Morris, Davis and Davis (2003) developed the UTAUT. The model integrated the elements of eight prominent theories that were previously used to study technology adoption

behaviour of users. These included the TRA, TAM, MM, TPB, combined TAM-TPB, MPCU, IDT and SCT. Venkatesh et al. (2003) adopted the unified view because they argued that information system researchers have a choice of models and thus tend to ignore some models while favoring others and in doing so, they necessitate a combination so as to arrive at a coherent understanding of individual adoption of technology.

The UTAUT contains four major constructs or determinants of intention and usage and these include facilitating conditions, performance expectancy, effort expectancy and social influence Venkatesh et al. (2003). The key relationships in the UTAUT model are moderated by the variables of age, gender, experience and voluntariness of use. In UTAUT, effort expectancy, performance expectancy and social influence are theorized to influence behavioral intention to use a system and then behavioral intention and facilitating conditions are determinants of technology use (Venkatesh, Thong and Xu, 2012). Figure 3.9 below shows the UTAUT.

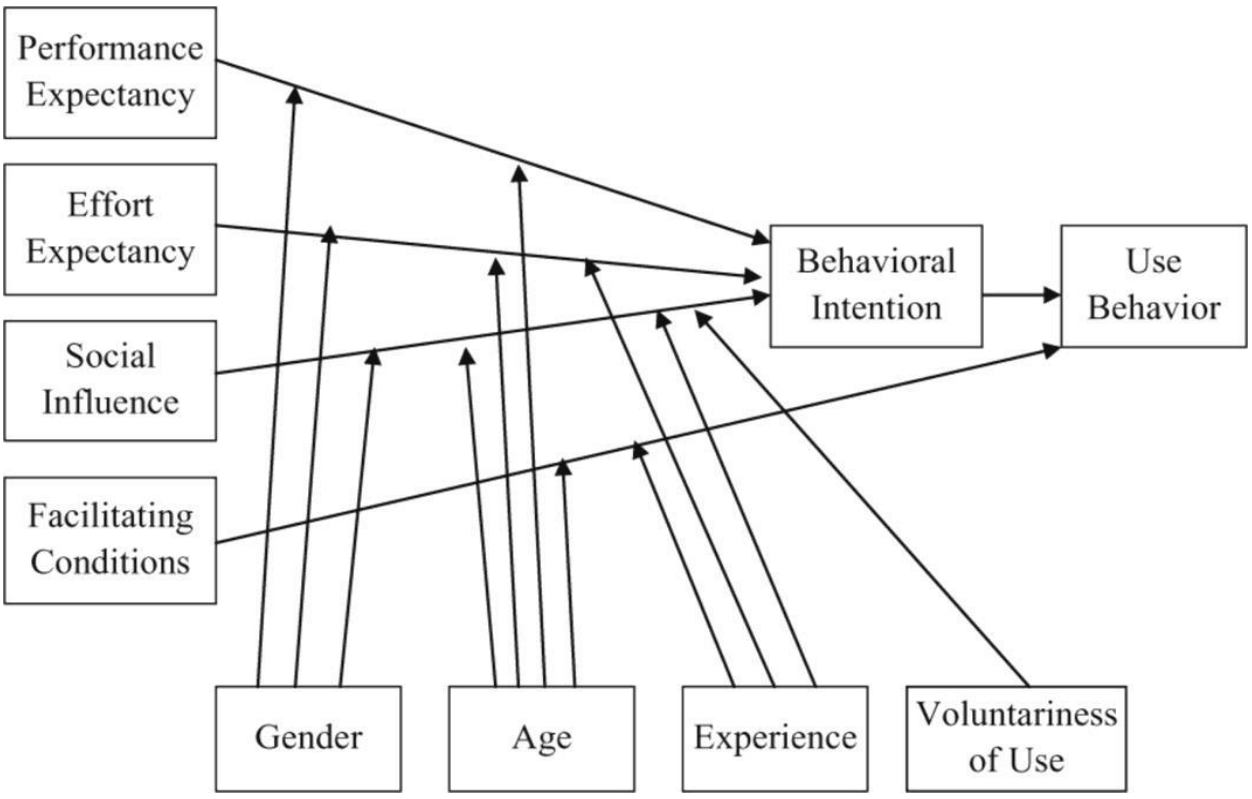

Fig 3.9: The Unified Theory of Acceptance and Use of Technology (UTAUT). **Source:** Venkatesh, Morris, Davis and Davis (2003)

Venkatesh, Morris, Davis and Davis (2003) define each of the determinants of the UTAUT and specify the role of key moderators (age, gender voluntariness and experience) and provides the theoretical justification for the hypotheses. These are presented below.

Performance expectancy (PE)

Perfomance expectancy is described as a person's belief that by employing a certain technology, they will be able to improve their job performance (Shin, 2009). Performance Expectancy (PE) can also be described as the extent to which a person thinks that using a certain technology will help him do his job better (Al-Qeisi, 2009). In other words, PE can be decribed as the extent to which users are confident and sure that employing a new system will improve their productivity and effectiveness in their jobs (Rouibah & Abbas, 2006). Compeau and Higgins (1995) indicate that the theoretical background of this variable comes from usefulness perceptions (TAM), job-fit (MPCU), extrinsic motivation (MM), relative advantage (IDT) and outcome expectations (SCT). Shin (2009) further highlights that performance expectancy is affected by three main factors which are perceived usefulness, extrinsic motivation and job fit. Performance Expectancy (PE) is the strongest determinant of behavioral intention both in either voluntary or mandatory contexts. According to the UTAUT model, gender and age moderates the impact of PE on behavioral intention.

Effort expectancy (EE)

Effort expectancy (EE) is the extent to which users think that a system will be easy to use for them. In other words, it refers to the degree of comfort with which consumers use technology. EE is based on perceived ease of use from TAM, complexity from DOI and MPCU. According to Davis (1989), users have a tendence of accepting a technology if using it is easier to them . In other words, effort expectancy means that if the user considers the system to be simple to use then his behavioral intention will increase (Kabir, Saidin & Ahmi, 2017). De Sena Abrahaoa, Moriguchi and Andrade (2016) indicate that Performance Expectancy (PE), Effort Expectancy (EE) and Social Influence (SI) explained 76.2% of the variance of the intention of adoption of mobile payment and the three factors had significant effect on the adoption. According to the UTAUT model, gender, age and experience moderate the influence of effort expectancy on behavioral intention.

Social influence (SI)

Venkatesh et al. (2003) defines SI as an individual's perception of how important others, such as family and friends, believe he or she should adopt new technology. Diaz and Loaas (2010) define social influence (SI) as the degree to which a user perceives that significant persons believe technology use is important. The influence of other people is an important factor in influencing new users to believe whether they should adopt a particular technology or not. Social influence (SI) assumes that people who are considered to be important create a positive influence on the adoption of new technology through these people influencing the individual (Mutlu and Der, 2017). Muriithi, Horner and Pemberton (2016) further highlight that SI is represented by items referring to influence from important individuals in the surrounding environment and support systems. Social influence is similar to the factor "subjective norm" as defined in TRA, TAM2, TPB, and combined TAM-TPB. SI is also defined as "social factors" in the MPCU or "image" in DOI. Image is the extent to which a user thinks that using a certain system or technology will enhance the individual's image or status in his or her social group (Moore and Benbasat, 1991). According to the UTAUT model, gender, age, voluntariness and experience affect social influence and its relation to intentions. Alsharif (2013) further advances that the effects of gender, age, voluntariness and experience are more in women in compulsory situations in the early phases of experience since they may have greater social pressure on them to conform.

Facilitating conditions (FC)

Facilitating condition (FC) is described as the extent to which a user thinks that the system's organizational and technological infrastructure are in place to facilitate its use (Al-Qeisi, 2009). In other words, facilitating condition is the condition where all tools, materials, equipment, facilities and assistance are availed to the user as support to the use of the new system (Kabir, Saidin & Ahmi, 2017). Keong et al. (2012) indicate that the underlying construct of facilitating condition is operated to include aspects of the technological and organizational environment that are meant to promote use of the system. Facilitating condition is also found in other similar models like TPB, combined TAM-TPB where it is referred to as "perceived behavioral control", in MPCU where it is called "facilitating conditions" and in DOI where it is known as "compatibility". Like effort expectancy, the power of this variable predicts usage decreases after initial acceptance. In other words, facilitating condition becomes insignificant when both effort expectancy and

performance expectancy constructs are present. In the Theory of Planned Behavior (TPB), facilitating conditions are directly precursor of usage. According to the UTAUT model, experience and age influence the link between facilitating conditions (FC) and use, and the effect of this construct would be stronger for older individuals. As a result, facilitating conditions (FC) affects both behavioral intention and use (Mutlu and Der, 2017).

The four constructs suggested by UTAUT to explain and predict how users will react to new technology, namely effort expectancy, facilitating conditions, perfomance expectancy and social influence, explain up to 70% of the differences in usage intent, which is a considerable improvement from the previous eight models and their extensions (Olushola and Abiola, 2017). The strength of UTAUT is that it is predictive and is more integrative; however, its limitation is that it is weak in its explanatory ability (Olushola and Abiola, 2017). Brown, Dennis and Venkatesh (2010) further submit that the UTAUT model is considered to be a reflection of a user's internal logic of beliefs, where the external part is being ignored.

3.2.12 The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

Venkatesh, Thong and Xu (2012) introduced UTAUT2, which was an extension of UTAUT. The objective of developing UTAUT2 was to pay particular attention to the consumer use context and move away from employee use context in UTAUT. UTAUT was originally constructed to describe employee technology adoption and acceptance in organizational settings, but in 2012 it was extended to UTAUT2, which is in the context of consumer technologies or individual acceptance. Therefore, UTAUT was extended to UTAUT 2 to suit consumer context. Three more constructs were added to the theory, and these are price value (PV), hedonic motivation (HM), and habit (HT). These three key constructs explain the consumer's behavior in the use of technology. Individual differences, namely age, name, gender and experience are hypothesized to moderate the effects of these constructs on behavioral intention and technology use. UTAUT2 kept the constructs and definitions of facilitating conditions, effort expectancy, social influence and perfomance expectancy suggested by UTAUT, adapting them to a consumer use context. In the UTAUT2, facilitating conditions (FC), performance expectancy (PE), hedonic motivation (HM), price value (PV), habit (HT), effort expectancy (EE) and social influence (SI) affect the behavioral

intention to use a technology, while the behavioral intention to use a technology determines the use behavior, which is the individual's actual usage of technology.

UTAUT2 is a validated model and because of the additional extensions of hedonic motivation, price value and habit, this model further increased the predictive ability to explain consumer behavioral intention to use a technology as compared to UTAUT (Venkatesh et al., 2012). Chang (2012) highlights that compared to UTAUT, the extensions proposed in UTAUT2 produced a considerable improvement in the differences explained in behavioral intention. The variance explained in behavioral intention improved from (56% to 74%) and technology use (40% to 52%) in UTAUT2.UTAUT2 consists of most of the external factors that directly affect the behavioral intention to use a technology compared to previous models, and this has increased its ability to explain the behavioral intention to use technology. The UTAUT2 model is shown below.

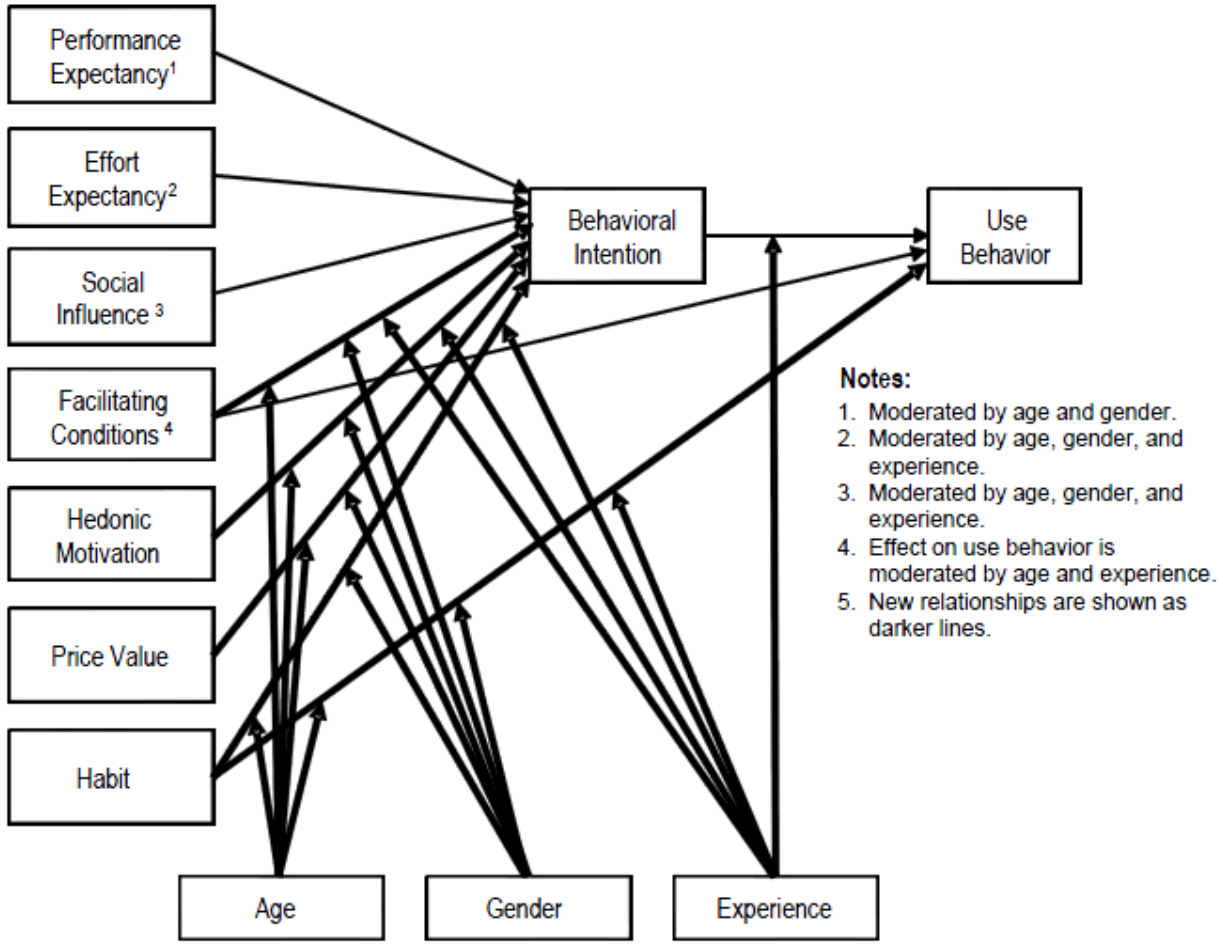

Figure 3.10: The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). **Source:** Venkatesh, Thong and Xu (2012)

Performance expectancy (PE)

Venkatesh, Morris, Davis and Davis (2003) define performance expectancy (PE) as a user's belief that using a certain system will help him or her in improving job performance. In other words, PE is the degree to which a system will be beneficial to a user as he or she will be doing his or her duties (Shin, 2009). Rouibah and Abbas (2006) highlight that performance expectancy is the extent to which users are confident and sure that employing a new system will improve their productivity and effectiveness in their jobs. Compeau and Higgins (1995) state that in other models, the constructs that relate to performance expectancy are recognized as outcome expectations (SCT), relative advantage (IDT), job-fit (MPCU), extrinsic motivation (MM) and perceived usefulness (TAM and combined TAM-TPB). Alsharif (2013) notes that in each of these individual models, performance expectancy was the most powerful determinant of intention and remained statistically significant when measured in either mandatory or voluntary contexts. The UTAUT model posits that age and gender may influence the impact of performance expectancy on behavioral intention and this impact is hypothesized to be more significant for men and younger workers (Al-Qeisi, 2009).

Effort expectancy (EE)

Venkatesh, Thong and Xu (2012) defined EE as the ease with which a person can use technology or a system. Davis (1989) argues that if users think that the system will be easier to use then they are more likely to accept it. Kabir, Saidin and Ahmi (2017) further highlight that effort expectancy means that the user considers the system to be simple to use and if the system is easy to use then his behavioral intention to use the system will increase. In other models, the constructs that are able to capture the same concept are perceived ease of use (TAM) and complexity (DOI and MPCU). The UTAUT model posits that gender, age and experience may influence the impact of effort expectancy on behavioral intention and this impact is assumed to be more in young women and aged employees at early stages of experience (Al-Qeisi, 2009).

Social influence

Social influence (SI) is defined as the extent to which customers believe that important others, such as friends, colleagues and friends think they should utilize a specific technology or system (Venkatesh, Thong and Xu, 2012). In other words, SI is described as the degree to which an

individual thinks that influential people in his or her life believe that he or she should employ a particular technology.

Facilitating conditions

Facilitating conditions (FC) is the degree of belief in the fact that an individual's organizational and technical infrastructure system are available or ready to support the use of innovation (Mutlu and Der, 2017). Venkatesh et al. (2003) defines facilitating conditions as the extent to which a person believes the system or technology can be supported by organizational and technical infrastructure. Facilitating conditions have an influence on both behavioral intention and use.

Hedonic motivation

Hedonic motivation is the first variable or construct added to the UTAUT2. Venkatesh et al. (2012) define hedonic motivation (HM) as the enjoyment or pleasure obtained from employing a technology. In other words, hedonic motivation refers to the pleasure or fun resulting from using a certain technology. Brown and Venkatesh (2005) indicate that hedonic motivation is considered to have a significant influence on technology adoption and use; hence, it was added as a determinant of consumers' behavioral intention to use a technology. According to Lee (2009), people might receive satisfaction from a technology if it provides pleasure and amusement while they are using it, which then affects their behavioral intention to use the technology. Yang (2010) conducted research in the context of a mobile shopping service and found that hedonic factors are major determinants of m-commerce consumer usage, and that consumers develop hedonic performance expectancy by having fun with various features and functionalities in mobile technology.

Price Value

UTAUT was developed for organizational setting, so price value was not included, but UTAUT2 was then developed for consumer use setting hence price values becomes a factor to consider. The difference between the two environments is that in UTAUT2 consumers usually bear the monetary cost of such use, whereas in UTAUT employees do not bear the cost and as a result, the cost of using technology and its price structure have a big impact on how people use technology; hence price value is added as a predictor of behavioral intention to use a technology (Venkatesh et al.,

2012). Pagani (2004) and Sharples (2005) argue that cost is the third important factor considered by customers in choosing mobile services, following ease of use and perceived usefulness. Other researchers (Habbaoush, Nassuora & Hussein, 2011) highlight that cost of the service providers and of phone charges demonstrated the negative impact of using technology on behavioral intention. Price value in this study is defined as the farmers' cognitive trade-off between the perceived benefits of mobile agricultural platforms and the monetary cost of using them. Venkatesh et al. (2012) further indicate that price value can be positive or negative depending on whether the perceived benefits of using the technology outweigh the monetary costs of doing so. Chan et al. (2008) submit that the popularity of short messaging services (SMS) in China is due to the low pricing of SMS relative to other types of mobile internet applications.

Habit

Venkatesh et al. (2012) and Limayem, Hirt and Cheung (2007) define habit as the extent to which individuals tend to execute behaviors automatically because of learning. According to Kim and Malhotra (2005), habit can be equated with automaticity. In accordance with this definition, in this study habit is defined as the extent to which individuals tend to use mobile farming platforms automatically. Venkatesh et al. (2012) further highlight that as users gain more experience with a technology, they develop a habit of using it, and this habit influences their behavioral intention to use it. Literature indicates that habit influence behavioral intention (BI) towards consumer technology use contexts, such as e-commerce (Escobar-Rodriguez and Carvajal-Trujillo, 2013) and e-learning (Lewis et al., 2013). Ouellette and Wood (1998) postulate that habit can predict future behavior, and people are more likely to have a positive purpose to undertake behaviors they have done before. Aarts, Verplanken and Knippenberg (1998) indicate that when a behavior has been repeated numerous times in the past, it becomes automatic in the future. Therefore, in the context of this study, once farmers have been using mobile faming platforms, this they may begin to use them very often and then habit will influence the farmers to use mobile farming platforms.

In conclusion, the factors that have been explored in the existing literature that affect the acceptance and adoption of mobile farming platforms were identified through highlighting the most important studies, models and theories in this regard. From the literature that has been reviewed in this study, each of these models has its strengths and weaknesses as discussed

previously. Depending on the needs of the researcher, some of these models are suitable for application in some research areas more than others. However, the UTAUT is one of the most comprehensive models since it includes all the elements of the other models. This unified theory can be used in applications of information systems, as it contains many factors that the experiments proved its ability to predict and explain different phenomena under study.

Chapter 4: Culture and technology acceptance

4.0 Culture and technology acceptance

Chapter three provided a comprehensive assessment of the models and theories that are typically used to explain behaviors linked to information technology acceptance and adoption. In addition, Chapter Two discussed a variety of factors, both demographic and non-demographic, that could influence the use and acceptance of mobile farming platforms. Therefore, in this section of the chapter, the discussion focuses on the construction of the proposed conceptual model for this study by elaborating on the various factors. The proposed model's development demonstrates the impact of independent variables on the value of dependent variables, as well as assisting the researcher in hypothesizing and testing relationships between the identified constructs to ensure the validity of the theorized model (Sekaran and Bougies, 2011).

This section examines significant literature on culture and technology acceptance. A description of the underlying theory is presented first. This is followed by a discussion on culture and how it affects technology acceptance. The chapter then proceeds to a brief explanation on the cultural theory that was proposed by Hofstede and its dimensions and other related cultural models. The current study adopted the UTAUT 2 model, which was extended by Venkatesh, Thong & Xu (2012). The purpose of UTAUT 2 was to concentrate on the consumer use context rather than the employee use context found in UTAUT.This model incorporated eight well-known theories and models, including: TAM 1 & TAM 2 (Davis, 1989; Davis et al., 1989), TRA (Fishbein and Ajzen, 1975), MM (Davis et al., 1992 as cited in Venkatesh et al., 2003), TPB (Ajzen, 1991), combined TAM-TPB (Taylor and Todd, 1995), MPCU (Thompson, Higgins & Howell, 1991), IDT (Roger 1995) SCT (Bandura, 1986).

UTAUT 2 is a unified and comprehensive model for technology acceptance and use that is very good and detailed. The UTAUT model can explain for 70% of the difference in usage intentions, which is a significant improvement from the previous eight models and their extensions (Olushola & Abiola, 2017). This makes UTAUT the most appropriate model to adopt when studying individual technology acceptance. This is why in this study the researcher chose to adopt this model in studying the adoption of mobile farming platforms by smallholder farmers in Zimbabwe.

Despite the fact that the UTAUT model is a unified and comprehensive theory, it has a major flaw and limitation in that it ignores cultural factors, which are significant in the majority of countries around the world (Olushola and Abiola, 2017). Cultural variables have a substantial influence on technology adoption and utilization (Hofstede, 1980; Del Gado, 1996). Cultural variables should be included in acceptance models, according to several researchers (Park, Yang, & Lehto, 2007), because culture influences how individuals utilize information systems (Im, Hong, & Kang, 2011). Cultural values, according to Srite and Karahanna (2006), play a moderating role in technology acceptance. According to Okazaki (2005), there is an expectation of a constant increase in empirical study of culture and mobile technology, but very little of it has merged the two aspects. In other words, previous research on the acceptance of mobile technology in African countries and the examination of cultural variations is quite limited. Therefore, the goal of this research is to close this gap by constructing a complete model based on UTAUT2 that captures the cultural elements that influence user adoption and acceptance of mobile farming platforms, thus adding to the body of knowledge.

4.1 Effects of culture on technology acceptance

Culture is defined as the mental programming that distinguishes between individuals of one human group and those of another (Hofstede, 1980). Culture, according to Hofstede, is the program of the mind or the software of the human soul. The software dictates a computer's functions, therefore Hofstede used this computer imagery or comparison to underline the importance of culture in human life, implying that it is a human drive without which human beings may be without meaning. Culture, according to Scupin (2008), is a set of norms, ideas, and habits that are learned from the society into which one is born or in which one becomes rooted. According to Thomas, Haddon, Gilligan, Heinzmann, and de Gournay (2003), culture represents a shared set of values that define a community through family, education, and social organization. Culture, according to Samovar, Porter, and McDaniel (1998), is a collection of values, religion, attitudes, beliefs, philosophy of time, spatial relations, roles, understanding of the universe and material objects, experience, knowledge and belongings accumulated by a group and its members over generations. By describing culture as the rich complex of practices, beliefs, symbols, norms, meanings and values prevalent among people in a society, Schwartz (2006) adds a new dimension to the concept.

According to Fandy (2000), a number of studies have been completed on the transfer of information technology to developing nations, but little research has been done on how cultural values influence technology adoption and use. Furthermore, the limited research conducted to determine the impact of cultural values on technology acceptability was conducted at the national level rather than at the individual level (Sun, Lee, & Law, 2019). As a result, the influence of cultural values on individual technology acceptance has received little attention, particularly in the agricultural sector. According to Ooi and Tan (2016), studies on the influence of cultural values on individuals are scarce and frequently overlooked.

As a result, the current research aims to close this gap by analyzing and examining the impact of individual cultural values on technology acceptance.

If technology is to be embraced successfully in any society, culture must be taken into consideration. According to Akour (2006), ignoring cultural variations can stymie technology adoption and increase the chance of failure, which is why information technology researchers are now paying close attention to culture and its effects on technology adoption. Sriwindono and Yahya (2012) go on to say that cultural aspects have been overlooked in studies of technology acceptance, particularly in underdeveloped nations like Zimbabwe.

According to the literature, various studies have been undertaken over the last thirty years to demonstrate the relationship between cultural values and technology adoption (Hofstede, 1980; Tse and Kangaslahti, 2004; Barton, 2010). These studies clearly show that a person's cultural background has a substantial impact on how they adopt and use technology. Most technologies according to Al-Jumeily and Jaafar Hussain (2014), were developed in the Western world and are thus culturally biased in terms of those civilizations. They also claim that if culture is not taken into account when presenting technology to non-western nations, technologies may be provided in ways that are not necessarily relevant for non-western cultures.

The concept of exploring the relationship between culture and technology is particularly essential given that many businesses are attempting to extend outside their regional bounds by entering foreign markets (Ugur, 2017). To put it another way, as organizations become more global, advanced models for cultural awareness become necessary. To be successful in the global market,

organizations and companies must understand the challenges they face when introducing new technologies, not only in their own country but also in other countries, and thus understanding different cultures in different countries and places becomes very important (Ugur, 2017). According to Van Slyke, Belanger, and Comunale (2004), discrepancies in technology adoption in different countries can be explained by differences in national culture, demonstrating the close link between culture and technology acceptance.

Users in non-English speaking countries are hesitant to accept software products with English language only interfaces (Karahama, Evaristo, & Strite, 2005). According to Koch (2006), software developers are increasingly pushing their software products and innovation internationally, and this trend has necessitated changes in how software is constructed. Understanding the target culture where the software will be sold, as well as customizing the product's user interface and supporting papers to that culture, is necessary to improve the software's marketability and acceptance abroad (Carey, 1998).

After conducting a study on culture or cultural values, Hofstede (1980) produced a cultural framework, which is a model that consists of five cultural dimensions, namely (1) power distance dimension, which is an extent to which people accept injustice or inequality in the distribution of power; (2) individualism-collectivism dimension, which reflect the extent to which members of the society would rather act as individuals than as groups; (3) uncertainty avoidance dimension, which reflects the extent to which members of a community perceive themselves to be threatened by unknown situations or unstructured or ambiguous situations; (4) the masculine-feminine dimension, where masculinity is the dominant value of society that emphasizes assertiveness or rigor and earns money as well as other material goods while femininity reflects the degree to which the dominant values in society emphasize the relationship between human beings, and (5) long term orientation, which reflects the degree to which a culture has a pragmatic perspective of long-term or short term historical orientation. Hofstede (2001) identified uncertainty avoidance as the cultural factor that is more strongly linked to technology adoption and he revealed that high uncertainty avoidance cultures are more likely to put money into technology or they are more likely to embrace technology as compared to other cultures. However, in similar research, Sundqvist, Frank and Puumaliainen (2005) note that high uncertainty avoidance cultures actually

do not rush into adopting technology and instead rely on the experiences of those who adopt it early. This is also confirmed by Doktor, Bangert and Valde (2005) who also observes that high uncertainty avoidance cultures adopt technology later than other cultures.

Another assessment of the research on the relationship between culture and technology acceptance found that societies with high individualism, low power distance, and low uncertainty avoidance are more likely to swiftly adopt new technology (Ozbilen, 2017). Cultures with a high level of power distance, collectivism, and uncertainty avoidance, on the other hand, are more resistant to new technology acceptance (Kirsch, Chelliah, & Parry, 2012). Individualistic societies, according to Herbig and Palumbo (1994), are more likely to take the lead in technological progress and it takes them less time to adopt new technologies. Individuals in countries with a high masculinity score are more likely to value success, competition and achievement according to Ozbilen (2017), and are thus more likely to accept new technologies in order to be the leaders in the market. This therefore means Hofstede's cultural dimensions can be used to study different cultures in different places so as to understand the likely level of adoption of any technology because culture is linked to technology adoption.

According to Collins (1999), culture has a significant impact on how people accept and use technology, particularly the internet. According to Hansen, Postmes, Vinne, and Theil (2012), culture and technology are linked in a two-dimensional interaction; the first is that culture shapes the setting in which a particular technology is deployed, the second is that culture is shaped and influenced by new traits and opportunities introduced by technology, as well as new social behaviors that emerge in tandem with an innovation. Tedre (2006) points out that the cultural characteristics that are attributed to a certain technology come from two sources, namely the technology designer and users and their environment (which defines how the technology is accepted, used, adapted and perceived). As a result, the bidirectional link between culture and technology implies that these two factors are so intertwined that failing to comprehend the culture of users of a given technology means failing to comprehend the context in which that technology will be deployed. Failure of the technology acceptance process can also be attributed to a lack of understanding of the environment in which a particular technology will be applied.

According to Stogyte (2013), technology is influenced by the cultural contexts in which it develops, as well as the contexts in which it is adopted and employed. He goes on to say that the introduction and implementation of new technology has an impact on culture and society. In other words, societies are not immune to the consequences of any technology that is introduced or adopted in that culture. According to Stogyte (2013), technology alters the ways in which social units maintain their relationships and identities while also allowing for the emergence of new groupings, such as activist groups, with their own cultural characteristics. Tedre et al. (2006) indicates that technological systems are shaped by social forces and therefore, by virtue of them being socially produced, they are culturally informed.

Many factors have been proven to influence technology acceptance, according to Sriwindono and Yahya (2012), but cultural influences are thought to be particularly essential. Straub et al. (2003) back this up, stating that cultural variations can influence how users interact with technology. According to Loch, Straub, and Kamel (2003), any new technology bears the culture values of the procducer, which may or may not be compatible with the cultural values of the consumer. This is a compelling argument that represents the fact that anytime a new technology is produced, two cultures are involved: one for the inventor and one for the receiver.

Cultural characteristics are significant in explaining IT usage behavior, according to a number of researchers. According to England (1975), the adoption of any new technology is impacted by a group's shared views and values. Literature on technology adoption has also indicated that culture is a crucial influence in technology acceptance, according to Leidner and Kayworth (2006). According to Veiga, Floyd, and Dechant (2001), the interaction effects of a country's combination of cultural values are likely to affect technology acceptance in ways that are unique to that culture. Without a close model of cultural influence on the adoption of these technologies, successful mobile technology uptake and use will be impossible (Sharifi & Zarei, 2004).

According to Ali, Weerakkody, and El-Haddadeh (2009), culture has influenced numerous applied fields, including technology and information systems. Furthermore, according to the literature, a number of researchers have discovered a substantial link between cultural values and real technology use (Zhang & Maruping, 2008; Twati, 2008 & Min, Li & Ji, 2009). Many researchers

have pointed out that technology transmission occurs in a highly culture-specific manner across cultures (Erumban & de Jong, 2006; Al-Gahtani et al., 2007). The strong relationship between culture and technological adoption is ascribed to these disparities in technology diffusion (Straub, Loch, & Hill 2003). Straub et al. (2003) have revealed that the success of technology produced in one culture and subsequently transferred to another culture involves more than merely following technical instructions. As a result, users' cultural prejudices, beliefs, and values influence how technological systems are built and perceived, resulting in acceptance or rejection of technology. This means that when a new technology is developed, it is critical to research and comprehend the recipient culture in order for the technology to be transferred and accepted in that setting (Straub et al., 2003).

Al-Shehry, Rogerson, Fairweather, and Prior (2006) found that investigating the interaction between culture and technology, particularly e-government and culture, is important. In other words, it is impossible to truly comprehend the acceptance of any technology without first understanding the culture of the users of that technology. According to Leidner and Kayworth (2006), research on technology acceptance has found that culture is a crucial predictor in technology adoption. According to Kedia and Bhagat (1998), there is evidence in the literature that cultural values shape cognitive processes, influencing people's perceptions regarding information technology adoption. Previous research suggests that a country's national information infrastructure, technology transfer, and rate of technology adoption are all influenced by its culture (Thatcher, Strite, Stephia, & Liu, 2003).

Sun, Lee, and Law (2019) observed that cultural values, personal experience with technology, and employees' technical background all affect effective technology usage by employees in a study on factors that affect effective technology usage by employees. This indicates that until employees' or individuals' cultural values are identified, effective technology usage will not be realized, either at the organizational or individual level, because culture plays a crucial role in technology adoption. According to Meng et al. (2009), culture has a crucial part in shaping an individual's technology readiness, and so varied cultural backgrounds influence an individual's preparedness for and acceptance of technology. If it is in a work environment, it means this will have an impact on how employees deliver services, especially if ther are expected to accept and use technology in

their daily operations. Culture is a key factor that influences technology acceptance. Klein (2004) posits that the diverse cultures of individual users are important considerations in the discussion and studies on technology acceptance and usage. Kim et al. (2018) highlight that to date, much effort is still being exerted on the influence of cultural factors on the acceptance of technology and usage.

Different cultural values of individual users have been proven to be determinants in the successful acceptance of modern technologies in recent studies, and studies have revealed varying user experiences in relation to the successful acceptance of modern and emerging technologies while taking into account different cultural values (Yoo et al., 2011). According to Vance, Elie-dit-cosaque, and Straub (2008), culture, coupled with system quality, are the key elements that significantly affect trust in modern technologies, affecting their acceptance.

4.2 Cultural models

There are numerous cultural models that examine culture, each with its unique set of variables and capacity for identifying cultural features (Tarhini, 2013). These various cultural models are significant because they compare and contrast the similarities and contrasts of two or more cultures using cultural variables, which are organized into categories (Hoft, 1996). The following section discusses some of the most important cultural models.

4.2.1 Trompenaars' Cultural Model

Culture, according to Trompenaars (1993), is the way a group of people handles problems. Trompenaars believed that culture is like an onion, with layers that must be peeled away layer by layer in order to understand it. He propoased a three-layered model, with the outside layer being the first, the middle layer the second, and the core layer being the third. These layers, he claims, are different and are made up of various items and materials. The outer layer, which is made up of external, explicit and observable products and activities, contains all aspects of life. The middle layer, which reflects deeper levels of culture and concerns about a particular group's rules and values, is the second layer. Norms are described as a group's shared understanding of what is "right" and "wrong" (Trompenaars, 1993). Values give us the sense of "this is how I strive or desire to act". In other words, values define what is considered 'good and bad,' and they are intimately

linked to group beliefs. The core, which is the assumption of being, is the third layer. Trompenaars (1993) described the core as groups of people who organize themselves in such a way that their problem-solving processes become more effective and efficient.

The seven dimensions in Trompenaars' model are significant in understanding varied relationships between people from various country cultures. Some key variables in the model aid in understanding culture. In this model, the first major cultural variable is universalism vs. particularism. Universalism is the belief that ideas and practices can be applied universally without modification anywhere in the world, whereas particularism is the belief that circumstances can influence how ideas and practices should be applied, and that some things cannot be done the same way everywhere (Tarhini, 2013). Another important variable is neutral vs emotional culture, where neutral culture refers to a culture in which people try not to show their emotions to others, whereas emotional culture refers to a culture in which emotions are openly and naturally expressed, such as when people smile or show happiness or unhappiness. Another set of variables in Trompennar's model is achievement vs ascription. People are assigned status in achievement cultures based on how successfully they execute their jobs and what they have accomplished, whereas in ascription cultures, people are assigned status based on who or what they are; for example, status may be assigned based on age or gender. Sequential versus synchronic, internal versus external control, specific versus diffuse, and individualism versus collectivism are the other four variables in Trompennar's model.

4.2.2 Hall's Cultural Model

According to Hall (1973), culture is a complex phenomena that cannot be studied in isolation. He argues that culture is an important venue for social action and intervention since it is where power relations are established and possibly disrupted. Hall discovered a method for assessing culture, which included establishing the fundamental cultural units. *Context, Space and Time* are the units that Hall proposed. According to Hall, time can be divided into monochronic and polychronic time orientations. He revealed that people with monochronic time orientation deal with time in a sequential manner, while those with polychronic time orientation deal with time in a simultaneous manner.

Hall also added space as another variable and he argues that space indicates some significant cultural variations between nations. According to Hoft (1996), Latin countries such as Spain and Italy prefer a closer relationship and are close to half the bodily distance that would be considered inappropriate in the United Kingdom or the United States. The third variable is context, which refers to a person's ability to handle a certain quantity of information. Hall revealed that culture can be classified as either high context culture or low context culture, with high context culture requiring background information to be made explicit in an interaction, such as through the use of language, whereas low context culture requires background information to be made explicit through the use of language.

4.2.3 Schwartz's Cultural Model

Schwartz (1994) developed a cultural framework for comparing, calculating, and studying national cultural differences. The cultural variables in this model are drawn from both individual and culture values. Culture, according to Schwartz, can be classified into seven categories based on universal human value kinds. The following are the seven categories:

1. Conservatism: People in this area value tight relationships with other members of their group and generally avoid actions that disrupt society's traditional order.
2. Intellectual autonomy: Individuals are acknowledged as autonomous or independent creatures with the right to pursue their own intellectual interests, ambitions, and desires under this type of society.
3. Affective autonomy: People are acknowledged as autonomous entities in such cultures, with the right to pursue their stimulation and hedonistic interests and needs..
4. Hierarchy: People in such communities place a premium on the legitimacy of hierarchical roles and resource distribution.
5. Mastery: People or individuals in these societies can gain an advantage over others by stressing active control of the social environment.
6. Egalitarian Commitment: The transcendence of unselfish motives is emphasized in such cultures.
7. Harmony: This is a society that places a high value on environmental harmony.

Schwartz (1999) stated that the seven value categories effectively describe the relationships across national cultures after conducting a research among instructors and students with 35 000 respondents.

4.2.4 Hofstede's Cultural Dimensions

Hofstede's cultural dimensions are used to expand our understanding of individual and situational aspects in mobile farming platform adoption and use, as well as to shed new light on how culture affects individual behavior. Hofstede (1980) proposed a theory of cultural differentiation, which has been widely applied in a variety of cross-cultural research, primarily through comparing cultures in different nations (Reisinger, 2009). Hofstede's cultural framework is a complete model that has been widely utilized and referred to by a variety of studies in a variety of fields, and it is based on national culture samples (Soares, 2007). Hofstede's theory is the most important type of cultural theory, according to Soares et al. (2007), and its cultural dimensions encompass the entire and major conceptualizations of culture that have lasted the test of time. According to Reisinger (2009), Hofstede's cultural theory contains five dimensions, which allow academics to examine, compare, and observe shared values across diverse national cultures. In other words, because each dimension reflects a different continuum, each country may be graded from high to low and placed somewhere along each one (Podrug, Pavicic, & Bratic, 2017). The cultural theory of Hofstede consists of five dimensions: (1) individualism/collectivism, (2) masculinity/femininity, (3) uncertainty avoidance, (4) power distance, and (5) long-term orientation.

4.2.4.1 Power distance

This dimension measures how much less powerful members of a country's institutions and organizations anticipate and accept unequal power distribution (Hofstede, 2001). Power distance can also be defined as the amount to which the less powerful members of a society accept inequality in power as normal, and thus respect and avoid criticizing their superiors. In other terms, subordinates' attitude toward superiors' authority and power is referred to as power distance. High power distance is expressed in organizations when workers or employees execute their task in a certain manner because their boss wants it that way, and low power distance is reflected when employees believe it is the best way to do it. According to Wu (2006), organizational hierarchy is particularly visible in high power distance firms, and there is a distinct line between managers and

subordinates. In terms of individuals, Hofstede (2001) shows that people in countries with a larger power distance, such as Venezuela and Brazil, accept power inequality in their societies, whereas people in countries with a smaller power distance, such as the United States and Denmark, represent the opposite pole of the power distance dimension. It is permissible to challenge superiors in low power distance countries such as the United States and Denmark, but it is not acceptable in high power distance countries such as Venezuela, France, and Brazil.

4.2.4.2 Uncertainty Avoidance

This dimension assesses how threatened a culture's members are by unclear, unknown, and ambiguous events (Hofstede, 2001). Uncertainty avoidance also refers to how a society strives to avoid uncertain situations by enforcing strong codes of conduct, believing in absolute truth, enforcing formal laws, and not accepting deviant ideas and actions (Podrug, Pavicic, & Bratic, 2017). Lifetime employment is more common in high uncertainty avoidance cultures like Japan and Portugal, whereas significant job mobility is more common in low uncertainty avoidance countries like the United States and Ireland (Hofstede, 2001). People in high uncertainty avoidance societies are more concerned with life security and are less inclined to take chances, whereas individuals in low uncertainty avoidance societies are less concerned with life security and are more ready to take risks (Hofstede et al., 2001). In terms of organizational structure, high uncertainty avoidance firms have more written rules to reduce uncertainty, and low uncertainty avoidance organizations have less rules and rituals (Wu, 2006). As a result, power distance refers to how much ambiguity and uncertainty may be accepted (Tarhini, 2013).

4.2.4.3 Individualism-collectivism

Individualism/collectivism is the third dimension, which indicates how a society regards its members as individuals or as members of a group (Hofstede, 1984). Individualism, according to Hofstede, portrays a society in which individual relationships are loose and everyone is expected to look after himself and his immediate family solely, whereas collectivism refers to a society in which people are born into strong and cohesive groups that continue to protect them throughout their lives in exchange for unquestioned allegiance (Hofstede, 2001). Individuals in individualistic communities are more concerned with their personal interests and those of their immediate families, whereas individuals in strongly collectivistic societies are defined by the acts of the group

rather than their own. In other words, people in collectivist cultures have a deep relationship with society members, but those in individualistic cultures have a shaky relationship with one another (Bergiel, Bergiel, & Upson, 2016). Individualistic societies, such as Canada and Australia, think that democracy should be enjoyed by all, whereas collectivist countries, such as Chile and Indonesia, do not (Bergiel, Bergiel, & Upson, 2016). People with high individualistic values care more about self-actualization and professional advancement in companies, whereas people with low individualistic values, on the other hand, place a higher priority on organizational benefits than personal interests (Wu, 2006).

4.2.4.4 Masculinity/femininity

The fourth dimension is masculinity/femininity, which relates to the degree to which conventional gender roles are distinguished and defined, whether in organizations or in society as a whole. Masculinity depicts a community in which social gender roles are well defined; males are expected to be tough, bold, and focused on material achievement, whereas women are expected to be humble, kind, and concerned with the quality of life in a masculine community. Femininity, on the other hand, shows a community where social gender roles intersect and both men and women are expected to be delicate, humble, and concerned about the quality of life (Podrug, Pavicic, & Bratic, 2017). Individuals who are masculine and feminine have opposing and distinct qualities. Masculine individuals value achievement in terms of intimate human relationships, caring for the weak, and quality of life, whereas feminine folks prioritize close human relationships, caring for the weak, and quality of life. Women have a harder time getting higher-level and better-paying jobs in high-masculinity organizations, whereas women can acquire more equitable organizational standing in low-masculinity organizations (Wu, 2006). Mexico, Japan and Italy are all masculine countries; in fact, according to Hofstede's original sample, Japan is one of the most masculine countries on the planet (Hofstede, 2001). Scandinavian countries symbolize feminine society.

4.2.4.5 Long-term versus short-term orientation

Hofstede's study originally comprised four national culture dimensions, but they were later expanded to five. Long-term versus short-term orientation, also originally known as Confucian dynamism (Hofstede and Bond, 1984), is the fifth dimension that was added. Long-term and short-term orientations were distinguished by Hofstede and Hofstede (2005), who stated that long-term

orientation refers to the development of virtues that are oriented toward future benefits, such as perseverance, whereas the phrase "short-term" refers to the development of qualities relating to historical and contemporary, valuing tradition, maintaining one's appearance, and performing social obligations. Long-term oriented countries include China, Japan, and Brazil, whereas short-term oriented countries include Canada, the United Kingdom, and the United States (Hofstede, 2001).

After considering the five dimensions, which make up Hofstede's cultural framework, in the next section the researcher links the framework with the existing technology acceptance theories used within information systems. The link is important since literature has proved that technology adoption or acceptance is significantly affected by culture. Although there are numerous examples of Hofstede's framework in the literature on information systems, Ford et al. (2003) contend that there is comparatively little theory development effort in this field. Ford et al. (2003) recommends to researchers to develop a theoretical basis for the integration of culture and information systems, particularly integrating the five dimensions of Hofstede's cultural theory in any information systems study. Ford et al. (2003) propose that the dimensions play a moderating effect, particularly in respect to existing theories in information systems, such as the TAM and UTAUT. The research approach in this study adheres to these suggestions.

4.3 The UTAUT2 combined with Hofstede's cultural dimensions

Most of the work on cultural influences in information systems research is based on the national or corporate level, whereas end user acceptance of technology is an individual level phenomenon, according to Tarhini (2013). As a result, in order to bridge this gap, this study will look at the influence of culture on individuals by combining it with UTAUT2 in the setting of a developing country. UTAUT2 becomes the most relevant theory for this study because it is appropriate for usage by consumers.

Before the extension to UTAUT2, UTAUT was created to describe employee acceptance and utilization of technology. Since literature demonstrates that culture influences how people utilize technology, Hofstede's cultural dimensions are also used in this study. Furthermore, this is the first time, to the best of this researcher's knowledge, that Venkatesh et al.(2012) 's UTAUT2 and

Hofstede's cultural dimensions have been used in a mobile agricultural technology acceptance study, integrating the advantages of these two theories with Zimbabwean data. In this research, Hofstede's cultural values are used to expand our knowledge of individual and situational features in the adoption and acceptance and usage of mobile farming platforms, presenting new perspectives on how culture affects individual user's behavior.

This section provides further justification for including cultural dimensions of Hofstede's theory as independent variables within the model to study the adoption and acceptance of mobile farming platforms. Furthermore, research hypotheses are developed, and the proposed model is used to gather and analyze empirical data.

4.4 Research Model and Hypotheses

The current research adopted the Unified Theory of Acceptance and Use of Technology (UTAUT 2) model which was extended by Venkatesh, Thong and Xu (2012). Venkatesh, Thong and Xu (2012) introduced UTAUT 2, which was an extension of UTAUT developed by Venkatesh, Morris, Davis and Davis (2003). The objective of developing UTAUT 2 was to pay particular attention to the consumer use context and move away from employee use context in UTAUT. Therefore, UTAUT was extended to UTAUT 2 to suit consumer context. This model integrated eight prominent theories and models, namely the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), Technology Acceptance Model (TAM & TAM 2) (Davis, 1989; Davis et al., 1989), Motivational Model (MM) (Davis et al., 1992 as cited in Venkatesh et al., 2003), Theory of Planned Behavior (TPB) (Ajzen, 1991), combined TAM-TPB (Taylor and Todd, 1995), Model of Personnel Computer Utilization (MPCU) (Thompson, Higgins & Howell, 1991), Innovation Diffusion Theory (IDT) (Roger 1995) and Social Cognitive Theory (SCT) (Bandura, 1986).

A combination of UTAUT2 with Hofstede cultural dimensions was employed as the study's base line for theoretical support as shown in Figure 4.1 below. Considering that culture has been shown to influence how people use technology from previous studies, the cultural dimensions by Hofstede are also used in this study. UTAUT was thought to be the most comprehensive model for predicting information technology adoption until UTAUT2's appearance (Martins et al., 2014). UTAUT2 improves the variation explained in behavioral intention and technology use significantly,

outperforming any previous model in understanding the user's behavioral intention to accept information technology (Venkatesh et al., (2012). Therefore, the theory is used in this work. Figure 4.1 displays the proposed research model, followed by a full explanation of each category.

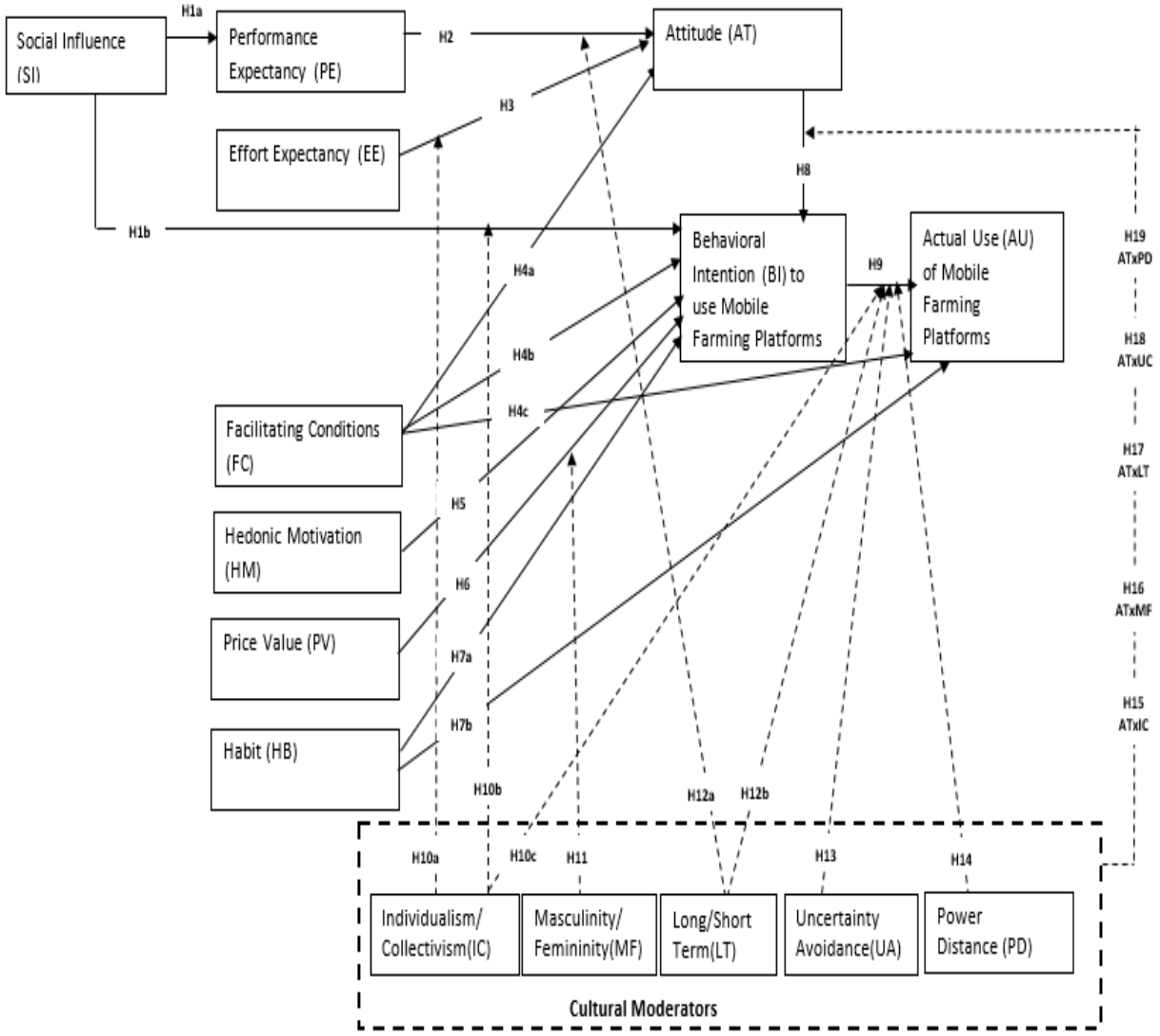

Figure 4.1 ***Theoretical Research Model; Extended UTAUT 2 (E-UTAUT 2)***

Notes: ——→ Direct effect

- - - - - - - - → Moderating effect

Social influence (SI)

Social influence is described as the extent to which farmers believe others, particularly colleagues, friends and family menbers, believe they should employ mobile farming platforms (Venkatesh et al., 2003). Lin et al. (2003) report that individuals tend to take significant referents' opinions into consideration when assessing a technology's usefulness; thus, perfomance expectancy is significantly influenced by social influence. Therefore, we hypothesize that:

H1a. SI of mobile farming platforms adoption in Zimbabwe has a positive influence on PE.

H1b. SI of mobile farming platforms adoption in Zimbabwe has a positive influence on BI.

Performance expectancy (PE)

The extent to which a farmer believes that employing a mobile farming platform would aid them in their farming activities is referred to as performance expectancy (Venkatesh et al., 2003). Individuals are more likely to adopt mobile technology if they think the technology will bring favorable outcomes (Compeau and Higgins, 1995). It shows the perception of improvement when using mobile farming platform measures such rapid information availability (Yang, 2009), immediacy and convenience (Zhou et al., 2010). Performance expectancy has also been shown to have a positive influence on attitude in several research (Jairak et al., 2009). This means that farmers will develop a positive attitude to mobile farming platform system if they believe that they will help them accomplish their farming activities efficiently.

Therefore, we hypothesize that:

H2. PE of mobile farming platforms in Zimbabwe has a positive influence on attitude (AT).

Effort expectancy (EE)

The degree of easiness connected with the use of mobile farming platforms is referred to as effort expectancy (Venkatesh et al., 2003). Some farmers have a better understanding of mobile phones than others, thus they should have fewer difficulty utilizing the platform and become accustomed to it rapidly (Koeng-Lewis et al., 2010). If farmers find mobile farming platforms easy to use, they may want to use them more in sending and receiving information about their farming activities (Lin, 2011). In other words, if the platform is easy to use then farmers would develop a positive attitude towards that platform. This is confirmed by Jairak et al. (2009) who highlights that effort expectancy has a positive effect on attitude.

Therefore, we hypothesize thus:

H3. EE of mobile farming platforms in Zimbabwe has a positive influence on attitude (AT).

Facilitating conditions (FC)

According to Venkatesh et al. (2003), facilitating conditions refers to how people feel that technical infrastructures exist to assist them in using the system or technologies whenever they are needed. Connecting to the internet and being able to browse from certain sites as well as understanding of mobile service carriers and security, are required when using a mobile phone to access agricultural information and services. Farmers who have access to a favorable set of facilitating conditions, such as demos or live support chat, are more likely to employ them. Attitude, intention, and use behavior will all be influenced by facilitating conditions. Nassuora (2012) argues that a person who has access to a favorable set of facilitating conditions towards a system tends to develop a positive attitude to it; therefore, facilitating conditions have a positive impact on attitude.

Therefore, we hypothesize that:

H4a. FC of mobile farming platforms in Zimbabwe have a positive influence on attitude (AT).

H4b. FC of mobile farming platforms in Zimbabwe have a positive influence on behavioral intention (BI).

H4c. FC of mobile farming platforms in Zimbabwe have a positive influence on actual usage (AU).

Hedonic motivation (HM)

Hedonic motivation describes the level of enjoyment or pleasure obtained from using mobile farming platforms (Venkatesh et al., 2012) and it is a significant factor in user acceptance of technology (Heijden, 2004); farmers will have a higher acceptance intention if the mobile farming platform provides more enjoyment value (Zhang et al., 2012).

Therefore, we hypothesize that:

H5. HM of mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).

Price value (PV)

Price value refers to farmers' mental trade-off between the perceived benefits of using mobile farming platform services and the monetary cost of doing so (Venkatesh et al., 2012), and it takes into account costs associated with data service providers, subscription fees and transaction fees as needed. The price value is positive when the perceived benefits of using the mobile farming platform outweigh the related monetary cost.

Therefore we hypothesize that:

H6. PV of mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).

Habit

Habit reflects a variety of previous experience's outcomes (Venkatesh et al., 2012) and one of the main drivers of current behavior is the frequency of previous behavior (Ajzen, 2002).

Therefore, we hypothesize that:

H7a. Habit (HB) of mobile farming platforms adoption in Zimbabwe has a positive influence on behavioral intention (BI).

H7b. Habit of mobile farming platforms in Zimbabwe has a positive influence on actual use (AU).

Attitude

Alsharif (2013) defines attitude as an individual's total emotional response to using a technology. The influence of attitude on behavioral intention to use technologies has been investigated through research. The effect of attitude on behavioral intention is spurious, according to Venkatesh et al. (2003), and it only appears after performance and effort expectancy are removed from the model. Nassuora (2012) and Jairak et al. (2009), on the other hand, found that attitude has a postive influence on behavioral intention, taking into account both effort and performance expectancy.

Therefore, we hypothesize that:

H8. Attitude towards using a mobile farming platform in Zimbabwe has a positive influence on behavioral intention (BI).

Behavioral intention

UTAUT2 backs up the idea that behavioral intention has a big influence on how people use technology (Venkatesh et al., 2003), and this is consistent with all other models which revealed that individual behavior is predictable and is impacted by individual intention (Yu, 2012).

Therefore, we hypothesize that:

H9. Behavioral intention (BI) of mobile farming platforms in Zimbabwe has a positive influence on actual usage (AU).

4.5 Espoused national cultural values as moderators

Individualism/collectivism (IC)

Individuals in individualistic communities are more concerned with their personal interests and those of their immediate families, whereas individuals in strongly collectivistic communities are defined by the acts of the group rather than their own. In other words, people in collectivist cultures have a close bond with society members, but people in individualistic cultures have a shaky bond with one another (Bergiel, Bergiel, & Upson, 2016). People who share collectivist beliefs, according to Zakour (2004), will be interested in other people's perspectives on technology. In collectivist countries like Zimbabwe, people are more inclined to adopt new technologies (Hofstede, 1980).

Therefore, we hypothesize that:

H10a. Individualism/collectivism (IC) moderates effort expectancy (EE) and attitude (AT).

H10b. Individualism/collectivism (IC) moderates social influence (SI) and behavioral intention (BI).

H10c. Individualism/collectivism (IC) moderates behavioral intention (BI) and actual usage (AU).

Masculinity/femininity

Individuals who are masculine and feminine have opposing and distinct qualities. Masculine individuals define achievement in terms of close human relationships, consensus, valuing equality, caring for the weak, solidarity, and incentives such as free time and flexibility and quality of life, whereas feminine individuals define achievement in terms of close human relationships, consensus, valuing equality, caring for the weak, solidarity, and incentives such as free time and

flexibility and quality of life (Hofstede, 2014). Users who are high in masculinity, according to Sivakumar (2018), want to maximize the value derived from using mobile farming platforms. Therefore, we hypothesize that:

H11. Masculinity/femininity (MF) moderates the relationship between price value (PV) and behavioral intention (BI).

Long-term versus short-term orientation

Hofstede and Hofstede (2005) highlighted the distinction between long-term and short-term orientation, they revelaled that long-term orientation fosters virtues oriented toward future rewards, such as perseverance, whereas short-term orientation fosters virtues related to the past and present, such as respect for tradition, maintaining one's face, and fulfilling social obligations. East Asian countries are considered long-term oriented because they score well in this dimension, particularly in terms of savings, persistence, and adapting to changing circumstances, whereas African countries like Zimbabwe and Mozambique score poorly, implying a short-term orientation (Hofstede & Bond, 1988). These African countries have a high regard for tradition, a low proclivity to save for the future, and a drive to get things done quickly (Hofstede, 2014). People with a high long-term orientation, according to Sivakumar (2018), demand improved performance, convenience, and speed in mobile farming platforms so that they may complete their work swiftly. Therefore, we hypothesize:

H12a. Long/short term (LT) orientation moderates performance expectancy (PE) and attitude (AT).

H12b. Long/short term (LT) moderates behavioral intention (BI) and actual use (AU).

Uncertainty avoidance (UA)

Cultures with high degrees of uncertainty avoidance are likely to have a low rate of mobile farming acceptance because mobile farming is not well suited to uncertainty reduction compared to face-to-face encounters or dialogue with agricultural extension personnel (Straub et al., 1997). Individuals that are uncomfortable with ambiguity and uncertainty will be less likely to use technology in high uncertainty avoidance societies (Zakour, 2004). People in low or weak uncertainty avoidance societies are relatively relaxed and risk averse (Hofstede, 2014).

Uncertainty-avoiding people are less inclined to try new things or adopt new technologies (Png & Tan, 2001).

Therefore, we hypothesize that:

H13: Uncertainty avoidance (UC) moderates behavioral intention (BI) and actual use (AU).

Power distance (PD)

People in hierarchical cultures with high power distance values are more concerned with following the beliefs of their superiors or communities and are afraid of disagreeing with them (Hofstede, 1980). Centralization is favored in these societies, hierarchy is perceived as reflecting underlying disparities, and subordinates expect orders (Hofstede, 2014). Mobile farming platforms are likely to be embraced by other farmers if the hierarchy or community supports them.

Therefore, we hypothesize that:

H14. Power distance (PD) moderates behavioral intention (BI) and actual use (AU).

H15. Individualism/collectivism (IC) moderates attitude (AT) and behavioral intention (BI).

H16. Masculinity/femininity (MF) moderates attitude (AT) and behavioral intention (BI).

H17. Long/short term (LT) orientation moderates attitude (AT) and behavioral intention (BI).

H18. Uncertainty avoidance (UC) moderates attitude (AT) and behavioral intention (BI).

H19. Power distance (PD) moderates attitude (AT) and behavioral intention (BI).

4.6 Summary and conclusion

In this chapter, current literature on technology acceptance and cultural models was given and addressed. These two essential concepts provide the theoretical background of this research. A review of the eleven most significant technology acceptance models that have been used to analyze human behavior was conducted to better understand technology adoption. The models were analyzed and compared in chapter three. From the literature reviewed, the researcher noted that some of the models, such as UTAUT2, have parsimony, but lack thorough coverage of some main factors, whereas other models include more complicated features but compromise on the model's parsimony.

In comparison to other models, however, UTAUT2 was determined to have adequate explanatory power and parsimony. UTAUT2 can explain for 70% of the variation in usage intention, which is

a significant improvement over the initial eight models and extensions (Olushola & Abiola, 2017). In this regard, UTAUT2 has gained a lot of empirical support in the domain of implementing information systems. Nonetheless, the UTAUT2 parameters left out other important predictors and factors that could influence technology acceptance, such as cultural influences. Olushola and Abiola (2017) agree, pointing out that the UTAUT model does not account for cultural influences. In light of the aforementioned shortcoming, this study expands the UTAUT2 model to include cultural factors in order to improve its predictive potential. We added stronger determinants to predict intention to utilize mobile farming platforms by including cultural components in the proposed research model, and hence providing greater predictive power to existing UTAUT2 models.

Secondly, this chapter discussed the various cultural models available in literature, with a focus on Hofstede's cultural theory. The majority of the literature on cultural influences in information systems study is based on the national level, despite the fact that end-user adoption of technology is an individual level phenomenon, according to the research. As a result, in order to close this gap, this study looked at the influence of culture on individuals in the setting of a developing country, specifically Zimbabwe. Finally, the researcher provided a theoretical framework in this chapter that could be useful in understanding the cultural values that are likely to influence smallholder farmers' adoption of mobile farming platforms in Zimbabwe.

The research model is based on UTAUT2 and it proposes and tests 9 direct hypotheses from H1 to H9. The conceptual frame work is tested empirically in Zimbabwe to meet the objectives of the study as highlighted and discussed in previous chapters. Therefore, the next chapter addresses the study's research design and methodology, as well as a full explanation of the data collection method, questionnaire preparation, and data analysis tools.

Chapter 5: Research design and methodology

5.1 Introduction

Chapter 3 reviewed the theories and models in technology acceptance extensively. In chapter 4, the relationship between technology acceptance and culture was explored and the conceptual model was developed to examine the influence of culture on the acceptance of technology with regards to mobile farming platforms by smallholder farmers in Zimbabwe. This chapter describes and justifies the philosophical approach, methods and techniques used in this study to achieve the main research objectives and to answer the research questions. An explanation of research paradigms, approaches and methodology is given, with the aim of providing convincing reasons on the choice of methodology for the current study.

This research employed a quantitative method in order to fully understand and validate the conceptual framework outlined. A survey research approach based on positivism was employed to guide the research and the questionnaire was used as a data collection technique. Structural Equation Modelling (SEM), which used AMOS, was employed as the data analysis technique.

5.2 Overview of research paradigms and research methodologies

Denzin and Lincoln (2005) define paradigm as a broad framework of perceptions, feelings and beliefs with which theories and practice operate. Guba (1990) highlights that a paradigm is a set of beliefs which provide guidance as to how the world is seen and acted upon. A paradigm can also be defined as a set of assumptions that serve as a conceptual framework for a world view, allowing for a systematic examination of the world around us (Deshpande, 1983). Alsharif (2013) defines paradigm as a "world view". This worldview is a set of assumptions and beliefs that guide a researcher's inquiry. A paradigm is a fundamental aspect in research because it is the one that establishes the philosophical basis upon which research is built and interpreted (Pereira, 2011). Therefore, for any researcher to successfully carry out a study, they must reveal and unpack their paradigm first.

The word paradigm is very broad and therefore it is defined on the basis of three major concepts, namely ontology, epistemology and methodology and from these concepts, a research philosophy is then formulated. In other words, ontology, epistemology and methodology are philosophical

concepts which bring to light the researcher's beliefs, feelings and assumptions of reality. Ontology is the assumed nature of reality (Sarantakos, 2005). Guba and Lincoln (1994) submit that ontology simply refers to the researcher's feelings about how the world works. Pereira (2011) highlights that ontology considers people's beliefs about reality and what is "real' for them, for example in religion, ontologically some believe that there is God but some do not believe in God. Epistemology in turn refers to how the world should be understood. Pereira (2011) states that epistemology is concerned with how people know what they know and what counts as legitimate knowledge to them. In the world of religion, epistemology will be the reasons for the belief or disbelief in God. In other words, epistemology seeks to establish the nature of the relationship between the researcher and the problem under investigation. Davidson and Tolich (2003) indicate that epistemology is related to the nature of knowledge, particularly the assessment of 'legitimate' knowledge. The ontological and epistemological assumptions and concepts are the ones that then guide the researchers' choice of methodology. Methodology therefore refers to the general principles which underline how we investigate the social world and how we demonstrate that the knowledge generated is valid (Blaikie, 2000; Mingers, 2003). Sarantakos (2005) indicates that the methodology therefore translates the ontological and epistemological principles into guidelines that define the way research should be conducted.

5.3 A comparison of the four major research paradigms

Different ontological and epistemological assumptions mean different ways of perceiving the world, which then gives rise to several research paradigms (Sarantakos, 2005). Lincoln, Lynham and Guba (2011) argue that positivism, post-positivism, critical theory and constructivism/interpretivism are the four schools of thoughts that underlie the major paradigms structuring the social science research. These paradigms differ on their philosophical assumptions with regards to ontology, epistemology and methodology. The following table shows the major differences amongst these four paradigms with regards to their methods and approaches.

Table 5.1 Basic Beliefs of Alternative Research Paradigms (Adapted from Guba and Lincoln, *1994)*.

Philosophical Assumptions	**Positivism**	**Post-positivism**	**Critical theory**	**Constructivism/Interpretivism**
Ontology	**Naïve Realism:** reality exists but apprehensible	**Critical Realism**: real reality exists but only imperfectly and probabilistically apprehensible	**Historical Realism**: virtual reality shaped by social, political, ethnic, cultural, economic and gender values crystallized over time.	**Relativism**: local and specific constructed realities. There are multiple realities where the mind plays an important role by determining categories and shaping realities. In this case, there is no separation of mind and objective as the two are linked together.
Epistemology	Dualist/Objectivist: Findings true, the investigator and the investigated 'object' do not affect each other and are supposed to be independent entities; enquiry takes place in the	Modified dualist/objectivist: Critical tradition and community; findings probably true but always subject to	Transactional/Subjectivist: the findings are value-mediated and its aim is a critique to the knowledge.	Transactional subjectivist: The observer and the object to be observed are supposed to be interactively linked so that the findings are created as the investigation proceeds

	cause to effect relationships, the observer does not influence or is influenced by the object. Replicable empirical results are true.	falsifications.		by the investigator's interpretation. The results are created findings.
Methodology	Experimental/Manipulative: Chiefly quantitative methods; Verification of hypothesis.	Modified Experimental /Manipulative; Critical multiplism; falsification of hypotheses; may include qualitative methods.	Dialogic/Dialectic: A change in practice and social relationship is a results based on the dialogue between the observer and the participants in order to extract more accurate knowledge from the ignorance	Hermeneutic/dialectical

The above table clearly demonstrates that these four major paradigms differ ontologically, epistemologically and methodologically, but previous studies have indicated that ontologically, major paradigms are oriented to 'reality' or to 'constructions of reality'. Patton (2002) argues that the positivist and post-positivist paradigms are 'reality oriented' which means both paradigms

assume that there is a 'real' world that can be understood, analyzed and measured. Both paradigms acknowledge that knowledge can be distinguished as either scientific knowledge (genuine knowledge) or belief that it is knowledge without empirical verification.

According to Orlikowski and Baroudi (1991), a study is positivist if it contains evidence of formal propositions, quantifiable variables, hypothesis testing, and inferences about a phenomenon drawn from a sample of a sated population. Lien, Pauleen, Kuo and Wang (2014) highlight that positivism is as an objective research approach, which directs its emphasis to the objectivity of factual components of life. Positivism calls for a scientific method to understand real life problems (Heppner, Wampold & Kivlighan, 2008:7). Byrman, Becker and Sempik (2008) note that positivism is a paradigm that professes the application of natural science methodologies to the study of social reality and beyond. According to Burell and Morgan (1979), epistemologically, positivism tries to describe and forecast what happens in the social world by searching for regularities and relationships between its constituent elements. Mingers (2003) states that the history of information systems research has been characterized by the domination of the positivism approach amongst the other 3 approaches, with more than 75% research employing this school of thought, 17% the interpretivist and only 5% employing the critical research. Hirschheim (1985) notes that positivism is so entrenched in our society to an extent that knowledge claims not based upon positivist thought have been simply dismissed as non-scientific and invalid. This research employs the positivist approach since it includes research hypotheses testing and quantifiable measures of variables towards the adoption of mobile farming platforms by smallholder farmers and provides evidence of propositions. A further discussion of what was involved in selecting this approach is provided below.

The post-positivism approach is positioned between positivism and interpretivism (Lincoln, Lynham & Guba, 2011). Post-positivism refers to a paradigm which focuses on determining and explaining the true meaning of a phenomenon or real-life occurrence in social contexts (Henderson, 2011). Post-positivism and positivism share some similarities, but one important similarity between the two approaches is that both approaches conduct empirical and quantitative research (Creswell, 2008). According to Ryan (2006), post-positivism incorporates both theories and practical data analysis of facts, designed for establishing social concerns. Lopez and Willis

(2004) note that one of the outstanding characteristics of this paradigm is to emphasize better comprehension of individuals' social life experiences. Creswell (2008) indicates that post-positivists recognize that, when studying the behavior and actions of humans, the researcher cannot be positive about their claims of knowledge.

Tarhini (2013) argues that the findings that the researchers obtain from the post-positivist studies are based on observation and measurement of the objective reality that usually exists 'out there' in the world. According to Patton (2002), the main difference between the positivist and post-positivist paradigms is that post-positivist admits knowledge about the 'real' world is limited and relative rather than absolute. Pereira (2011) further identifies another difference between positivism and post-positivism by indicating that post-positivism recognizes that judgment is unavoidable in science and all methods are imperfect, so the application of multi-methods over time is required to generate and test theories on how the world operates. This school of thought was not chosen since there is no lack of values and ethical questioning in our theoretical model and, in addition, the post-positivism approach fails to explain the unpredictable nature of humans (Onwuegbuzie, 2002). Furthermore, Tarhini (2013) notes that the post-positivism approach needs more effort and money, and in many cases a lot of time is wasted.

Interpretivism or constructivism is another research paradigm which is a naturalistic approach used to view a social phenomenon. According to Burrell and Morgan (1979), interpretivists view the social reality as a product of individuals' consciousness and access to reality will be achieved through social actors and constructions. Interpretivism research, according to Walsham (1993), aims to produce a knowledge of the information system's context, as well as the process by which the information system impacts and is influenced by the context. Blaikie (1993) submits that interpretivism assumes that people assign meanings to their activities in order to make sense of their world, encompassing natural events, social situations and other people's and their own behaviors. In interpretivism, people seek to understand and interpret the world they live and work in based on their experiences, but individuals have different and unique interpretations that need to be listened to, collected and then analyzed (Ashkanani, 2017). This therefore requires the researcher to be personally involved with the subjects of their studies and develop subjective meanings based on people's responses. Creswell (2003) highlights that the term constructivism

originated because of the personal involvement and the interactions performed by the researchers in gathering data.

Studies under constructivism or interpretivism depend on participants' views of specific situations being studied, taking into consideration the historical and cultural norms that hold the lives of individuals. Contrary to the positivist research, constructive or interpretive research does not pre-define dependent and independent variables (Kaplan and Maxwell, 2005). This approach employs qualitative data collection and therefore produces deep insights into social phenomena; however, it lacks the ability to generalize the findings to a larger population (Myers and Avison, 1997). The other limitation with this approach is that the researcher's background, culture and experience may influence his/her interpretation of the participants' responses and how their interpretation flows from their view to the participants' view (Ashkanani, 2017). Considering the above limitations, this approach was considered to be less appropriate to our research compared to the positivist approach.

The critical paradigm is another approach which is an alternative to interpretivism or positivism. Asharif (2013) indicates that the critical paradigm is characterized by the critical intention to change reality and the wish to emancipate disaffected individuals. Critical studies, according to Myers and Avison (1997), postulate that social reality is historically constructed and that it is produced and reproduced by people. They went on to say that, while people can actively attempt to improve their social and economic conditions, critical researchers understand that their ability to do so is limited by various types of social, ethnic, and political dominance (Myers and Avison, 1997). The two main data collection methods used in critical studies are interview and observation (Bryman & Bell, 2011). This approach was considered to be less appropriate for our research as compared to the positivist approach. The researcher did not consider this paradigm because previous studies indicate that this approach is still immature and unclear as a legitimate paradigm in the information system discipline since it lacks an agreed theoretical basis (Kvasny & Richardson, 2006; Falconer, 2008). Furthermore, according to Richardson and Robinson (2007), critical research is described as "a missing paradigm" in information systems research due to the little research that consider this approach.

5.4 Choosing the positivism paradigm for this study

In the previous section, an analysis of the four major paradigms was done and the positivist approach was then indicated as the selected most appropriate approach for this study. This selection was done after considering the differences amongst the other three approaches and the nature of the study being undertaken (Hall & Howard, 2008). This approach was chosen based on a number of strengths that it possesses. According to Winfield (1991), one of the major advantages of using the positivist approach is that findings from any research done using the positivist approach can be replicated in a different study or set up or even in a different context. This research posits a number of hypothesized relationships to be tested and quantitatively measured within the context of technology acceptance by smallholder farmers in Zimbabwe. Therefore, methodologically, this research is justified to use the positivist approach because this paradigm is mostly linked to quantitative methodology, which in turn uses a deductive approach (Bryman, 2008).

The current study used a well-defined conceptual framework where relationships amongst different constructs were clearly defined using the UTAUT2 model as presented in Chapter One. This therefore means that from an epistemological point of view, this research is justified. The current research aims to explore the effect of culture and its dimensions on mobile technology adoption by smallholder farmers in Zimbabwe. Therefore, from an ontological perspective, the positivist approach is relevant because the research is related to social subjects where farmers' behavior is measured and the researcher is isolated from the aim of the study (Saunders et al., 2009). Lastly, the positivist approach was chosen because previous studies indicate that it is the most dominant amongst the other three approaches, with more than 75% research employing this approach especially in technology acceptance research (Mingers, 2003). Having discussed the rationale behind choosing the positivist approach for this study, the following section describes the research method.

5.5 Research strategies: Quantitative vs. Qualitative.

Tarhini (2013) notes that the choice to employ a quantitative or qualitative methodology will influence how to collect data in the later stages of the research. Morgan and Smircich (1980) noted that the suitability of using qualitative or quantitative techniques depends on the underlying

assumptions of the researcher and the nature of the phenomena to be studied. There are several key differences between the two approaches.

According to Bryman (2008), the quantitative method is an objective statistical-based approach to research which encompasses the adoption of deductive reasoning, to ground the research with an appropriate theory. Bryman (2008) further highlights that in a quantitative research, numerical data is collected and the relationships between measurable variables are verified in a universal cause-effect way. Muijs (2010) highlights that the quantitative method is most appropriate when assessing beliefs and attitudes of respondents towards particular research patterns or phenomena. David and Sutton (2004) note that quantitative methods use a deductive approach that is connected with hypothesis testing in order to modify or support the existing theory. Creswell (2008) indicates that the quantitative method is usually associated with positivist epistemology, which uses scientific procedures, statistical methods and usually presents data numerically.

Qualitative research approaches, on the other hand, prefer to investigate and discover meanings and patterns rather than numbers (Creswell, 2008). Qualitative research methodology refers to the subjective analysis and interpretation of wording and meaning over the quantification of objective analysis and data collection of social components (Zou, Sunindijo & Dainty, 2014). The qualitative research approach is an effective method to represent participants' real-time views and perceptions of a certain social fact (Ponteretto, 2005). Flick (2014) notes that qualitative research has been found to be most prominent in sociology, psychology, anthropology, engineering, nursing and cultural fields in which participants' views are required. Creswell (2008) highlights that qualitative research employs an inductive approach to derive the theories through the process of collecting and analyzing the data. In qualitative methodology, data is collected and analyzed to give descriptions which are then used to build and test a theory (Maanen, 1979).

The following Table (**Table 5.2**) illustrates and summarizes the differences between quantitative and qualitative methodologies.

Table 5:2 Quantitative versus Qualitative Research (Source: Johnson and Christensen, 2010)

Criteria	**Quantitative Research**	**Qualitative Research**
Purpose	To test hypotheses, look at cause and effect, and generalize results. Prediction and explanations.	To understand and interpret social interactions in order to provide a complete description. Contextualization.
Group studied	Larger and randomly selected.	Smaller and not randomly selected.
Type of data collected	Numbers and statistics (Numerical data). Identify statistical relationships.	Words, pictures and objects. Identify patterns, features and themes.
Approach	Begins with hypotheses and theories. Deductive. Uses formal instruments. Experimentation. Component analysis. Abstract language in write-up.	Ends with hypotheses and grounded theory. Inductive. Researcher as instrument. Naturalistic. Searches for patterns. Descriptive write-up.
Role of researcher	Researcher cannot influence the participants, there is detachment and impartiality. Objective portrayal.	Researcher may influence the participants; there is personal involvement and partiality. Empathic understanding.
Nature of reality & assumptions	Single reality; objectivity is critical. Primacy of method.	Multiple realities; subjectivity is expected. Primacy of subject matter.

	Variables can be identified and relationships measured. Etic (outside's point of view).	Variables are complex, interwoven, and difficult to measure. Emic (insider's point of view).
Research objectives	Describe, explain and predict.	Explore, discover and construct.
Scientific method	Confirmatory or top-down.	Exploratory or bottom-up.
Results	The findings are more generalizable and can be applied to different contexts and other populations.	The results are less generalizable and the findings are particular and specialized to a certain subject.

Alsharif (2013) highlights that the design of quantitative methodology is based on an objective view of the world and it follows the positivist model of controlling variables and testing pre-specified hypotheses. This is supported by other previous researchers in the field of information systems (Yin, 2009; Straub et al., 2004) who indicate that the use of a quantitative research method is rooted in the positivist ontology. The goal of this study was to analyze and test known hypotheses in the context of technology acceptance, particularly among smallholder farmers, in an objective manner in which the researcher was removed from the study's goal. The data survey method was employed to collect data from a large number of participants in order to analyze the data using the SEM technique, and this data is presented in numbers and thus belong to the quantitative method rather than the qualitative (Creswell, 2008; Bryman, 2008).

5.6 Types of reasoning in research

Goel and Dolan (2004) define reasoning as an intellectual process that involves the derivation of conclusions from information exchanged. They further highlight that cognitive argumentative standpoints offer a basis for reaching some level of consensus. Reasoning research arguments can thus be divided into inductive and deductive. Below is an explanation of inductive and deductive reasoning.

5.6.1 Inductive versus deductive easoning.

Alsharif (2013) defines induction as the process of deriving general principles from particular facts. Inductive reasoning, according to AL-Qeisi (2009), is a style of reasoning in which the premises of an argument are assumed to support the conclusion but do not guarantee it. According to the same source, when researchers use inductive reasoning, they examine certain facts and draw inferences based on them; they logically build a general premise based on observed phenomena. Hayes *et al.* (2010) argue that inductive reasoning emphasizes elements of a more subjective approach to argumentation, which is characterized by little or no basis of validity, but which is rather perceived as plausible, if anything. The same authors further highlight that inductive reasoning is more suitable for qualitative research.

Deduction is then the process of reasoning by which a conclusion follows necessarily from the stated premises (Alsharif, 2013). The same author further highlights that deduction involves inference by reasoning from the general to the specific by which a conclusion follows necessarily from the premises. Deductive reasoning, according to AL-Qeisi (2009), is a set of procedures for evaluating the validity of testable theories in the real world. Researchers use deductive reasoning to reach a reasoned conclusion based on logical generalizations of existing facts (Alsharif, 2013). Goel and Dolan (2004) argue that deduction is viewed as a valid and more objective line of cognitive reasoning about a valid premise. In this study, a deductive theory was chosen as a more appropriate theory because it provides support to and follows quantitative research approaches. This is because the study seeks to test through hypothesis, the causal direct and indirect relationships between different constructs outlined in the conceptual framework. Ordinarily, hypothesis testing questions are posed as deductive while qualitative approaches are primarily inductive, drawing from the meaning attached to them by participants (Alsharif, 2013).

5.7 Research strategy

There are a number of different research strategies that have been used in literature when conducting any research. These include surveys, observations, correlations, field experiments, lab experiment, field study, phonological research, narrative research, opinion research, ethnography, grounded theory (Creswell, 2008; Guba and Lincoln, 1994; Nueman, 2006). For the current research, the researcher employed the survey approach in order to collect data from smallholder

farmers in different districts in three provinces, namely Mashonaland West, Mashonaland East and Harare Metropolitan Province. The **table 5.3** below shows the provinces and districts from which the farmers were drawn from.

Table 5.3: Sample areas

Province	**Districts**
Mashonaland East	Goromomzi, Marondera and Chikomba.
Mashonaland West	Chegutu, Hurungwe and Zvimba
Harare Metropolitan	Chitungwiza, Epworth and Norton

The above provinces and districts were chosen because they practice intensive farming due to their geographic profiles, good and favorable climatic conditions. In the chosen districts there is intensive farming of a variety of crops which include tobacco, sugar beans, horticulture, maize, soy beans, potatoes and small grains like rapoko, millet and sorghum (Njaya, 2010). These farmers cultivated a wide variety of crops, including staple and cash crops, and perishables and non-perishables. The districts were also chosen because of their proximity and closeness to Harare, which is the capital city of Zimbabwe and the center and hub of business operations. Most of these farmers take advantage of their closeness to the capital city to practice intensive farming and hence contribute positively to the agricultural sector in Zimbabwe which is the backbone of the country's economy.

5.8 Survey research approach

The survey approach was chosen because of so many reasons. First, Choudrie and Dwivedi (2005) note that the survey research approach is the most dominant approach used in information systems journals, with at least 50% of the total number of articles. Secondly, according to Mingers (2003), the survey method is the most extensively used in technology adoption study. Mingers (2013) adds that 74% of the articles in journals like European Journal of Information systems, MIS Quarterly and Journal of Information systems that are related to technology adoption employed survey research, while the case study approach was employed by the remaining 26% only.

Thirdly, the aim of this research was to examine smallholder farmers' technology acceptance behavior in Zimbabwe, and this involved collecting data from a large number of participants,

especially when using the Structural Equation Modelling (SEM) technique in data analysis. This therefore means that employing another research approach will be very expensive and time-consuming (Hair et al., 2010). This research employed positivist and quantitative methodologies and the survey approach is associated with the research using positivist-quantitative methodologies (Saunders et al., 2009). The conceptual framework for this study (see Chapter 1) includes a number of hypotheses which need to be empirically tested and this is only appropriate using the survey research approach (Tarhini, 2013). The survey approach allowed large amounts of data to be collected; therefore, the findings can be generalized to the entire population. The survey approach again is more feasible and appropriate for this study as compared to case studies because this research is related to social subjects where farmers' technology adoption behavior is measured and the researcher is cut off from the study's main objective. This is very important because the extent to which a researcher is involved within the context being studied is one of the major factors that affect the research approach (Saunders et al., 2009).Within the survey research strategy, data is collected using a number of methods. Some of the methods that can be used include mail, telephone, email, interview and self-administrated questionnaire (Zikmund, 2009). This research employed the self-administrated questionnaire as a data collection method.

5.9 Self-administrated questionnaire

The self-administered questionnaire was employed for data collection because of a number of reasons. A questionnaire is a quick, easy, efficient and economical way of collecting data from a large number of participants simultaneously as compared to other methods such as telephone and interviews (Bougie, 2011; Zikmund, 2009). Issues such as anonymity and confidentiality are dealt with when using a questionnaire; hence, there is higher privacy of respondents. The questionnaire is easily designed and administrated as compared to interviews, which usually require much administrative skills (Sekaran and Bougie, 2011). Questionnaires can also be collected immediately after being completed and this will assure a higher response rate (Sekaran and Bougie, 2011). A questionnaire as a data collection method has been widely used in studies similar to the context of this study. For example, Srite and Karahanna (2006) and Venkatesh and Bala (2008).

In previous sections, the researcher reviewed the various philosophical schools that dealt with the research paradigms and methodologies. The aim was to identify the path of the current study in terms of the paradigm, purpose and the methodologies that are used in this study. As highlighted

is the previous section, the current study is deductive rather than inductive, which means it tests the theory rather than generate one. In other words, the current study started with formulation of a theory and hypotheses that was investigated and is validated in order to confirm the results so that they can be generalised to the context of the study. Figure 5.1 below illustrates the proposed framework of the research methodology for this study.

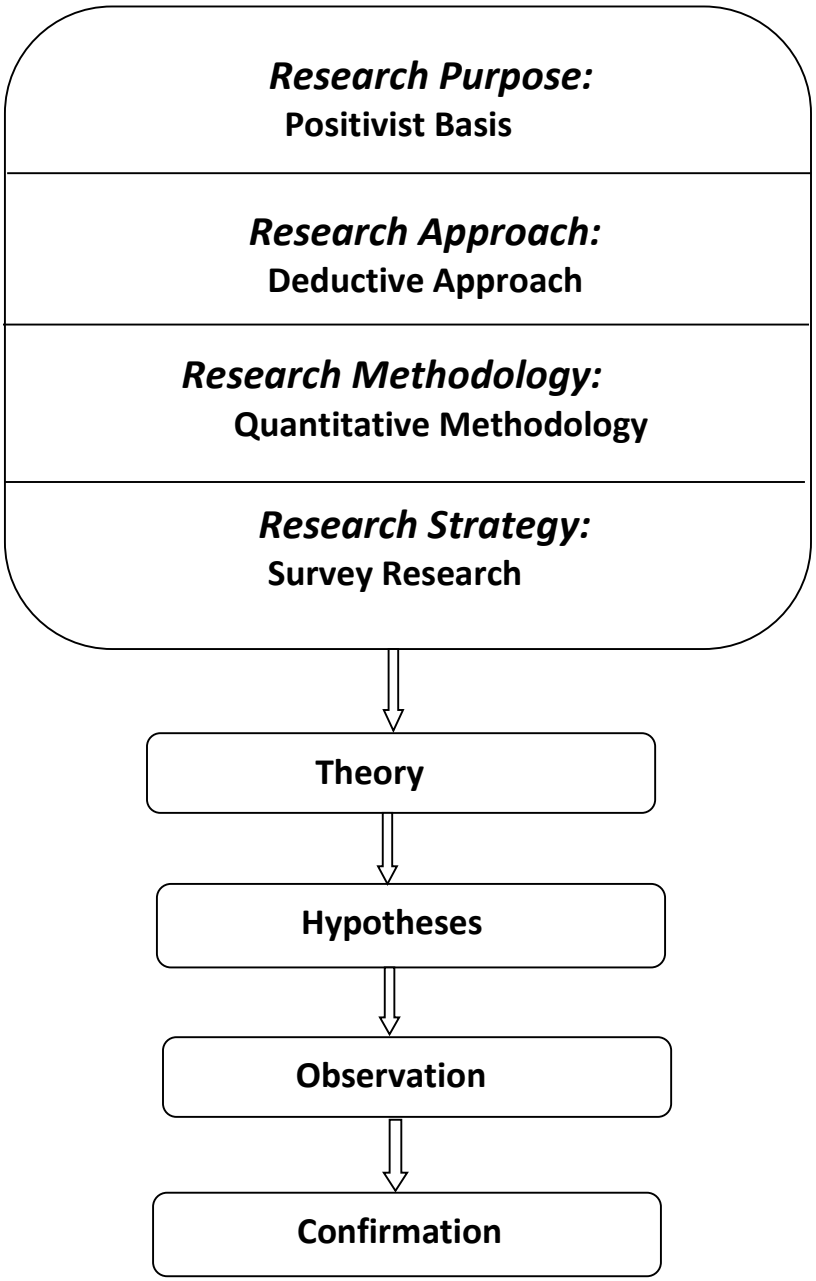

Figure 5.1: Research Methodology Framework. **Source:** Alsharif (2013)

The above diagram summarizes the proposed framework of the research methodology which was discussed in the previous section. The next section explains the research design and summarizes the overall research framework

5.10 Research design

An overall guidance and framework for the data collection and analysis of the study is very important when carrying out research. According to Bryman and Bell (2011), a research design provides this overall guidance and framework needed when carrying out the research. Nachmias and Nachmias (2008) observe that research design is very important in linking the theory and the empirical data collected in order to answer the research questions. Hair et al. (2010) highlight that the research design chosen by a researcher will also affect the use and type of data collection, sampling techniques and the budget. The purpose of the current study was to test hypotheses generated from the conceptual framework in Chapter one. Hypothesis testing is useful for determining the links between variables in a model. Hypothesis-testing studies also explain the nature of specific interactions between variables and establish distinctions between groups.

Sarantakos (1993) indicates that a research design should be based on a sequence of an interrelated step by step process. The literature review (Chapter 2, Chapter 3 and Chapter 4) was critical in the first stage to gain a deep understanding about the research problem. A conceptual framework with constructs was developed in order to test the hypotheses (Chapter 1). The process of how to go about finding the solution to the research problem is through methodology (Chapter 5), for example collecting data using quantitative methods, development of survey, sampling technique and data collection process. A descriptive analysis of the collected data is essential (Chapter 6) to test the proposed model and the results of testing the research model are provided. The final stage (Chapter 7) is the discussion of the results, conclusion and recommendations on future work.

5.11 Population and sampling

The sampling technique is considered a very important part of research since it produces a sample which is then used to represent the targeted population and then generalize results (Bryman and Bell, 2011). In addition, in order to eliminate bias in the data collection methods, the sampling technique must be considered as a critical factor before proceeding to the data collection process.

When designing a sample, there are four major elements that should be considered, namely (1) the choice of probability or non-probability sample technique, (2) the sample frame, (3) the size of sample, and (4) the response rate (Fowler, 2009). According to Feldmann (2014), sampling design encompasses the target population, sampling frame, sample size and sampling method.

5.12 Sampling choice and approach

Time and financial constraints are some of the common constraints that the researcher will face when carrying out a research; hence, there is need to recognize the importance of coming up with a sample of respondents that represents the entire population so as to save time and money. Blumberg et al. (2008) indicates that there are several factors that have to be considered when coming up with a sample, some of which are the nature of the research problem, research questions and research objectives as well as time and budget. According to Berndt and Petzer (2013:349), sampling is viewed as the process of choosing a sample with the view of concluding on the population selected. Sampling can be implemented by applying two distinct techniques, known as probability and non-probability sampling (Bryman and Bell, 2011). **Table 5.4** below provides a description about each sampling method under each sampling technique.

Table 5.4: A Classification of Sampling Techniques (Groves et al., 2009)

Probability Sampling Techniques	Non-Probability Sampling Techniques
1. Simple Random Sampling 2. Systematic Sampling 3. Stratified Sampling 4. Cluster Sampling	1. Convenience Sampling 2. Judgmental Sampling 3. Quota Sampling 4. Snowball Sampling

5.13 Probability sampling

Nugent (2010) defines probability sampling as a technique used to identify a specific sample from a targeted population, from which a survey needs to be conducted. Probability sampling methods consist of simple random, stratified, systematic, and cluster sampling techniques (Zikmund *et al.*, 2010). Below is the description of the above mentioned techniques. Simple random sampling is a technique in which every respondent of a targeted population is viewed to have the same opportunity and probability to be selected for a survey, which denotes that each sample is selected

individually (Malhotra & Birks, 2007). In stratified sampling techniques, a targeted population is divided into different groups known as strata, and each stratum is then subdivided into distinct subgroups, also called strata. The basis of stratification rides on that the repartition must be mutually exclusive so that every element of a selected population needs to be allocated to one specific stratum (Hansen, Hurwitz & Madow, 1953). Systematic sampling refers to the selection of a sample by randomly starting from any given point. Afterwards, elements of a sample are consecutively from that starting point (Levy & Lemeshow, 2013). Lastly, cluster sampling is where a targeted population is partitioned into different groups known as clusters. Then, a group is chosen using the simple random technique (Ott & Gerow, 2011).

5.14 Non-probability sampling

Non-probability sampling is defined as a judgment-based approach of selecting a sample from a convenient basis (Wretman, 2010). Non-probability sampling approaches include convenience, judgmental, snowballing, and quota sampling techniques. Below is the description of each of them. Convenience sampling is a technique in which respondents of a study are conveniently selected by their accessibility and proximity to the researcher (Robinson 2014). Judgemental sampling is regarded as closely related to convenience sampling in that the sample is chosen based on the researcher's expert knowledge and understanding of the population (Robinson, 2014).

In the snowballing sampling technique, a random sample of respondents is selected and interviewed. After that, subsequent groups are chosen depending on their identification by the interviewed group (Malhotra & Briks, 2007). Quota sampling is regarded as a two-phase judgement technique in which a population is subdivided into specific groups or quota. Then, sample elements are judgementally or conveniently selected by the researcher (Robinson, 2014). Both sampling approaches have merits and demerits related to their implementation. Both probability sampling and non-probability methods consist of four distinct techniques each, all with a different set of strengths and weaknesses. **Table 5.5** below describes the strengths and weaknesses of each of the sampling methods.

Table 5.5: Pros and Cons of the sampling methods. ***Source: (Blumberg et al., 2008)***

Technique	Advantages	Disadvantages
Probability sampling		
Simple random sampling (SRS)	It is easy to implement, interpret and analyze. The results are projectable.	This technique requires a complete list of population. It is expensive, time consuming and it produces a high error rate.
Systematic	Compared to simple random sampling, systematic sampling is simpler, quicker and cheaper. Sampling distribution of mean is easy to be determined.	It has lower representativeness than SRS. It is costly and the sample may be skewed due to the periodicity within the population.
Stratified random	The researcher is able to control the sample size. It decreases sampling error because it includes all important subgroups.	The sample size in strata must be carefully defined. It is more complex and expensive and the researcher should put greater effort in it.
Cluster	It is good for large population, easy, cost-effective and quick.	It's imprecise and not easy to compute results. Clusters are homogenous rather than heterogeneous and this leads to lower statistical efficiency.
Non-probability sampling		
Convenience	It is not time-consuming and it is very cost-effective. It is very common and one of the most convenient amongst other methods.	The sample is not representative of the whole population because there is selection bias; therefore, the researcher has to be cautious

		when generalizing results or findings.
Judgemental or purposive	It is not time-consuming and it is very cost-effective. It ensures balance of group sizes.	Reliability and generalizability of the results may be questionable because the subjectivity of the researcher may lead to bias.
Quota	Low cost and not time-consuming. The researcher can select subgroups with controlled characteristics.	It is not easy to defend the results as a representative of the targeted population because the results depend on the characteristics of the respondents.
Snowball	It is very efficient where individuals are very rare. It is also possible to include participants even if there is no known list in advance.	It is questionable to agree whether the sample is representative of the entire population and it is time-consuming.

This study employed convenience sampling. The reasons behind employing the convenience sampling technique in this study are highlighted in the section below.

5.15 Justification of using convenience sampling

Stangor (2010) submits that the convenience sampling method is the most commonly used method in social sciences and behavioral studies. Convenience sampling allows the researcher to select the sample or the respondents from the targeted population based on who is willing and easily accessible to be recruited in the research. In this study, due to the Covid-19 pandemic and lockdown restrictions which were imposed on people and restricted their movement, it was not feasible to access data to allow random sampling to take place, hence convenience sampling. Non-probability sampling technique was used in the selection of respondents used in this study due to the nature of the research, which requires firsthand information drawn from the experiences of

farmers that subscribe to mobile farming platforms. Only farmers who subscribe to at least one of the mobile farming platforms and who were willing to be recruited in the study were given the questionnaires to complete. Time and budget constraints also led to the decision to select the non-random sampling approach with the potential to greatly collect data from the sample for the analysis. This technique is also the least expensive and least time-consuming among all other techniques, hence the decision to employ it. Although this research used the convenience sampling technique in collecting data, which assumes homogeneous population and thus generalization of results to the entire population should be done with caution, based on the characteristics of the respondents in this study, it could be argued that a random sampling was partially used in this study. In addition, in an attempt not to limit collecting data from one geographical area and to increase the reliability of the findings of this study, participants from 3 different provinces in Zimbabwe and 3 districts from each province were used. Lastly, since the target population for this study was large, this research employed convenience sampling techniques based on factors already discussed and due to time and budgetary constraints.

5.16 Population

Zikmund (2009) defines target population as the entire group of subjects in which the researcher is interested to investigate in order to answer the research questions. A target population is viewed as the universe of units from which the sample is selected (Berndt & Petzer, 2013). As such, the target population for this study consisted of all smallholder farmers in three major provinces of Zimbabwe, which are Mashonaland West, Mashonaland East and Harare Metropolitan province.

5.16.1 Sample size

The specification of the sample size within the targeted population is a critical aspect in research. Bryman (2011) notes that using a very large sample when carrying out a research cannot guarantee accurate results and in many cases it will result in wastage of money and time. In addition, using a small size especially when statistical data such as SEM is required, may result in inaccurate results (Hair et al., 2010). In this study, the sample size was determined based on the agreed rules of thumb for using SEM within AMOS. Roscoe (1975) suggests that the following rules of thumb should be used when coming up with the sample size:

a) A sample size that is > 30 and <500 is appropriate for most research.

b) In Structural Equation Modelling (SEM), the required sample size should be preferably 10 times the number of variables within the proposed framework of the study. This research has 14 variables in the proposed conceptual framework, which gives the minimum sample size of 140 i.e. (10 * 14 = 140).

Kline (2010) suggests that for a complicated path model, a sample size of 200 or larger is appropriate. Hair et al. (2010) suggests that a sample size can be calculated based on the number of constructs within the model under study. He further highlights that, for example, a sample size of 400 or more is required for a model with 6 or more constructs. In line with the above discussion and suggestions, and taking into consideration the constructs and variables in the proposed conceptual framework, the sample size for this study was pegged at n=500 respondents.

5.16.2 Execution of the sampling process

For the present study, the selection of farmers from the 3 provinces were based on farmers' availability and the researcher self-selection. As previously discussed, this method of selection might affect the generalizability of the results to the entire population as there is no equal chance for other farmers to participate in the study. However, farmers share many similarities and thus produce similar results (King and He, 2006). Therefore, the effect of this method on generalizability of the results is decreased to minimum.

5.17 Questionnaire as measurement instrument

This study used a structured research questionnaire to collect data from the targeted sample. A questionnaire was developed to collect the data required to answer the research questions and thus achieve the main objectives of the study (Saunders et al., 2009). The questionnaire was made up of four sections, described as sections A to D. Section A included the demographic variables such as gender, age, educational level and province. Section B covered the direct determinants within the proposed conceptual framework, and Section C covered the actual usage of the mobile farming platforms while Section D covered the five cultural variables. The conceptualization and operationalization of the constructs and their variables used in the questionnaire are measured as follows:

Section A: this section includes the demographic characteristics of the respondents

- **Demographic characteristics:** these refer to gender, age, educational level and province of origin. The variables are comprised in four questions (G, A, EL and P). These questions were considered very important and were therefore included in the first part of the questionnaire.

Section B: this section included the main determinants of UTAUT 2

- **Performance expectancy (PE):** This is the extent to which users are confident and sure that employing mobile farming platforms will improve their productivity and effectiveness in their farming activities (Rouibah and Abbas, 2006). This construct consisted of four questions (PE1 – PE4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Effort expectancy (EE):** This is the degree of easiness connected with the use of mobile farming platforms (Davis, 1989). This construct consisted of five questions (EE1 – EE5) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Social influence (SI):** This is the extent to which farmers believe others, particularly colleagues, friends and family menbers, believe they should employ mobile farming platforms (Engotoit, Moya & Kutiyi, 2016). This construct consisted of four questions (SI1 – SI4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Facilitating conditions (FC):** This is the degree to which farmers feel that environmental and technical infrastructure exist to assist them in using the mobile farming platforms whenever they are needed (Venkatesh, Morris, Davis & Davis, 2003). This construct consisted of four questions (FC1 – FC4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Hedonic motivation (HM):** This the enjoyment or pleasure obtained from employing mobile farming platforms (Venkatesh et al., 2012; Brown & Venkatesh, 2005). This construct consisted of three questions (HM1 – HM3) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Price value (PV):** This is the consumers' cognitive trade-off between the perceived benefits of the technology and the monetary costs of using them (Venkatesh et al., 2012; Dodds, Monroe & Grewal, 1991). This construct consisted of four questions (PV1 – PV4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Habit (HB):** This the extent to which farmers tend to use mobile farming platforms automatically because of learning (Venkatesh et al., 2012; Limayem, Hirt & Cheung, 2007). This construct consisted of four questions (HB1 – HB4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Attitude (AT):** Attitude has been defined as the overall affective reaction to using a system (Alsharif, 2013). The attitude construct is the first new construct that was added by the researcher to the UTAUT 2 model. This construct consisted of four questions (AT1 – AT4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

- **Behavioral intention (BI):** refers to the degree to which an individual has formulated conscious plans to engage in a given behavior (Davis, 1989). This construct consisted of four questions (BI1 – BI4) measured using a five-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

Section C: This section measured the actual usage of the mobile farming platforms and served as the profile description about what the farmers use the platform for.

- **Actual usage:** refers to individual's actual use of mobile farming platform system (Davis, 1989) and was based on two questions (AU1 – AU2). The first question (AU1) measured

how frequently the farmers used the system platform and this was done using a 5-point Likert scale where 1= Have not used, 2= Everyday, 3= Once in 2- 3 days, 4= Once a week, and 5= Once a month. The second question (AU2) measured the farmers' average daily use of the system and was done using a 5-point Likert scale where 1= Almost never, 2= Less than 30mins, 3= From 30mins to 1hr, 4= From 1hr to 2hr, and 5= 3hrs and above.

This section also includes a subsection about questions related to what the farmers used the mobile farming platform for. The section gathered information about the extent to which farmers used the mobile farming platform to perform the following tasks: a) Daily weather (AUDW), b) Weekly crop information(AUWCI), c) Farming and market tips (AUFMT), d) Daily rainfall advice(AUDRA), e) Adverts and marketing links (AML), f) Market price information (MPI), g) Weekly best farming practices (WBFP), and h) Financial linkages (FL). These questions were measured using a 5-Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Section D: This section measured the five cultural dimensions suggested by Hofstede (1980). Cultural factor is the second new construct that was added by the researcher to the UTAUT 2 model. These cultural factors were discussed and outlined in Chapter 4.

- **Power distance (PD):** The power distance dimension gauges how much less powerful members of a country's institutions and organizations expect and accept unequal power distribution (Hofstede, 2001). This construct was based on five questions (PD1-PD5) adapted from the work of Tarhini, Hone, Liu and Tarhini (2017) and were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).
- **Uncertainty avoidance (UA):** This dimension measures the degree to which members of a society perceive themselves as being threatened by unclear, unknown, and ambiguous situations (Hofstede, 2001). This construct was based on four questions (UA1-UA4) adapted from the work of Tarhini, Hone, Liu and Tarhini (2017) and were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).
- **Masculinity/femininity (MF):** refers to the degree to which established gender roles are differentiated among individuals (Hofstede, 1980). This construct was based on five questions (MF1-MF5) adapted from the work of Tarhini, Hone, Liu and Tarhini (2017) and

were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

- **Individualism/collectivism (IC):** refers to how a society regards its people as individuals or as members of a group (Hofstede, 1984)**.** This construct was based on six questions (IC1-IC6) adapted from the work of Tarhini, Hone, Liu and Tarhini (2017) and were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).
- **Long/Short term (LT) orientation:** refers to the development of virtues that are focused on future benefits as opposed to virtues that are focused on the past and now (Hofstede, 2005). This construct was based on three questions (LT1-LT3) adapted from the work of Hassan et al. (2011) and were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The actual adaptation of the questions was essentially made on the adjustment of the sentences. The process of shortening and rephrasing some of the words and phrases was done to fit the context of the study best. As suggested by Reichenheim and Moraes (2007), it is necessary that the essence and meaning of the questions in adjusting the sentences remain the same to ensure adequate understanding by the targeted respondents. As such, very few changes were made to complicate the wording of the sentences. This was because the original sentences were straightforward and had very little or no ambiguity, the latter which might have confused the respondents.

5.18 Data collection procedure

As discussed in the previous section, a structured questionnaire was chosen for gathering data for this study. The questionnaires were self-administered by the researcher with the help of agriculture extension workers in different districts using a drop-and-collect method, in which farmers who were willing and accessible were approached to participate in the survey. Those questionnaires were subsequently retrieved once duly completed. One of the main advantages of using the drop-and-collect method as pointed out by some authors (for example, Fowler 2013; De Vaus, 2013) is its ability to provide a better response rate from the participants of the survey.

The collection of data was conducted between May and September 2020. The extended period of five months was attributed to the large number (500) of questionnaires that were to be distributed. The Covid-19 lockdown restrictions made it even more challenging to physically reach the people within a short period of time, hence the five months. The 500 questionnaires were printed through the resources made available by a research directorate at a South African university of technology. Respondents who could not complete the questionnaires on sight were given two weeks, depending on the flexibility of their schedules. Additional resources provided by the Higher Degrees Research Department of the university of technology in the form of financial support were used to cover the travelling expenses. However, some respondents also completed their questionnaires online.

Table 5.6 below shows the response rate of the survey, which ascertains the actual number of responses to the survey. According to Fan and Yan (2010), a response rate is the number of properly completed survey units over the total determined sample size.

Table 5.6 Response rate

Total number of questionnaires administered	500
Total number of questionnaires returned	411
Unusable responses	59
Valid questionnaires retained	352
Usable response rate (percentage)	**70.4%**

Table 5.6 above highlights the allotment of the questionnaires distributed during the survey. A total of 500 questionnaires were issued to the smallholder farmers in three provinces. From that initial 500 questionnaires, 411 were returned, 59 of which were found to be improperly completed. These questionnaires had errors ranging from the double selection of entries on constructs such as gender (selection of both male and female), to Likert-type scale errors (1 and 4 simultaneously). The final number of valid questionnaires available for analysis was 352, which represented a response rate of 70.4%. This response rate is considered acceptable by (McGuirk and O'Neill, 2016).

5.19 Data analysis and statistical approach

The analysis of the collected data was conducted in two ways. The first step was to ascertain the descriptive statistics, which was followed by the assessment of study model fit as well as confirmatory factor analysis (CFA) and path modelling. The first phase of the analysis commenced with capturing the collected data into an excel spreadsheet where the data was cleaned to identify and correct missing data entries. Afterwards, the cleaned data was imported from excel to the Statistical Package for Social Sciences (SPSS version 24.0), after which descriptive statistical analysis was conducted. A model fit analysis, confirmatory factor analysis (CFA) and path modelling (for testing hypotheses) through the use of the Analysis of Moment Structures (AMOS version 24.0) statistical software were conducted.

5.20 Descriptive statistics properties

Descriptive statistics refer to the assessment of primary data through properties such as mean, mode, variance, median and standard deviation (Zikmund et al., 2010). In this study, descriptive statistics used include frequencies, mean scores and standard deviations. The descriptive analysis of this study is centered on determining the profile of smallholder farmers as well as the demographic elements of respondents.

5.21 Confirmatory factor analysis

According to Joreskog and Sorbom (1979), confirmatory factor analysis (CFA) refers to the systematic analysis of measurement variances and it facilitates the assessment of associations, which consist of latent constructs estimated after correction for measurement errors. Marsh, Morin, Parker and Kaur (2014) view reliability tests, assessment of validity and model fit assessment as critical component phases of CFA. Based on these views, this research followed the same phases of psychometric testing of the measurement scales.

5.22 Reliability

Reliability is defined as the degree to which measures are free from errors and yield consistent results (Ang, 2014). This study ascertained reliability by using three indices, namely Cronbach's alpha value, the composite reliability value and item-to-total correlation.

5.23 Cronbach's alpha

The Cronbach alpha (α) coefficient was originally developed by Lee Cronbach in 1951 and it refers to the assessment of the internal consistency of construct items or scales; it is usually stated in values confined between 0 and 1 (Tavakol & Dennick, 2011:53). One of the main advantages of using the Cronbach alpha as a reliability psychometric test is on its level of objectivity, especially in providing statistical references that are subjected to very few questions (Yang & Dennick, 2011:377). As such, as suggested by Fornell and Larcker (1981:39) and Nunnally (1978:1), Cronbach alpha thresholds should be equal to or greater than 0.7 for a measurement instrument to be regarded as meeting the internal consistency level and, therefore, be concluded as reliable. The results emanating from the Cronbach alpha (α) coefficient are presented in Chapter Six.

5.24 Composite reliability

Composite reliability has been found to be an alternative tool aimed at examining internal consistency of research constructs (Peterson & Kim, 2013:6). It can be ascertained through the following formula as recommended by Fornel and Lacker (1981):

(CR): $CR\eta = (\Sigma\lambda yi)\ 2 / [(\Sigma\lambda yi)\ 2 + (\Sigma\varepsilon i)]$

Composite Reliability = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (summation of error variances)}.

As highlighted by Chinomona (2011), in his study on non-mediated channel powers and relationship quality, CR values vary from 0.5 to 0.7 depending on the type of research. This view is supported by Nunnally (1967), who confirms that the acceptable threshold index for a basic research study is 0.5, while 0.6 was found for exploratory research (Nunnally, 1967). The latter index was further adjusted to 0.7 by Nunnally (1978) and recommended by Hair, Anderson, Tatham and Black (2006:55). The results of the CR analysis are provided in Chapter Six of this study.

5.25 Item-to-total correlations

Item-to-total correlations are a psychometric measure used to judge the reliability and consistency of measurement scales (Churchill, 1979). According to Nunnally (1978), item-to-total correlations scores should be equal or greater than a threshold value of 0.5 for the constructs to meet the cut-off level of reliability. Examples of other psychometric assessments of reliability of scales include

the split-half reliability coefficient, the Kuder-Richardson Formula 20 (K-R 20) (Huck 2004). The results of the item to total correlations are discussed in Chapter Six.

5.26 Validity

Scholtes *et al.* (2011) indicate that validity is the degree to which the instrument measures the construct it purports to measure. There are two measurement properties of validity known as construct and content validity, with the former categorized into convergent validity and discriminant validity (Moutinho & Hutcheson, 2011:327).

5.27 Construct validity

Construct validity has been defined by Peter (1981:134) as the level at which a specific measure measures what it is intended to measure. As indicated by Moutinho and Hutcheson (2011), construct validity is divided into convergent validity and discriminant validity. Convergent validity denotes the correlation that exists between different measurement instruments and the constructs they need to measure (Peter, 1981). In this study, convergent validity was ascertained through the use of item-to-total correlation values and item loading values (standardized regression weights) as supported by Chinomona (2011), whereas discriminant validity calls for the distinction of measures. This implies that each item scale must offer various loadings to different constructs (Malhotra, 1996). Thus, discriminant validity is ascertained through the correlation matrix as confirmed by Anderson and Gerbing (1988) who further mentions that the acceptable threshold between constructs should be no greater than 0.7. Discriminant validity was further determined by confirming whether the average variance extracted (AVE) value is larger than the highest shared variance (SV) (Anderson & Gerbing, 1988). Furthermore, Bagozzi and Yi (1988) suggest that discriminant validity can be ascertained through the use of the Pearson correlation matrix. This study employed both approaches to determine discriminant validity.

5.28 Content validity

Content validity is defined as the level at which a specific measurement item offers a precise definition of a construct (Polit & Beck, 2006). A prominent study by Lawshe (1975) concludes that one of the chief verification methods of content validity is expert judgement. This view finds supportive evidence from Cooper and Schindler (2008), who stress that in-depth scrutiny of

research measurement items by a panel of experts in that field of study is paramount to determine the relevance of the instruments. This study, therefore, conforms to the highlighted prerequisites, in that a review of the questionnaire led by a panel of academics who are experts in the supply chain management field assessed and reviewed the validity of the questionnaire. Their input was used to improve the questionnaire through suitable modifications to the wording, length and structure of the questions.

5.29 Research model fit assessment

A research model fit is regarded as the determination of the interaction that exists between latent constructs of a research model and the analysis of the relevant hypothesized relationships and covariance with the identified latent constructs (Schreiber, Stage, King, Nora & Barlow, 2006). The assessment of a study model fit is dependent on several indices (Hooper, Coughlan & Mullen, 2008). These include, among other indices, Chi-square value, Comparative fit index (CFI), Goodness of fit index (GFI), Incremental fit index (IFI), Normed fit index (NFI), and a Random measure of standard error approximation (RMSEA), as prescribed by Bagozzi and Yi (1988).

Chi-square value ($\chi 2$) is aimed at evaluating the inconsistency between the sample and covariance matrices (Hu & Bentler, 1998). There have been conflicting reports regarding the acceptability of a research model Chi-square ratio (Hooper *et al.,* 2008). However, prominent recommendations by Wheaton, Muthen, Alwin and Summers (1977) and Tabachnick and Fidell (2007) indicate an acceptable ratio range between 2 and not more than 5. Schreiber *et al.* (2006) provide a more precise determination of the Chi-square value ($\chi 2$), of equal to 2 or no higher than 3. RMSEA analyzes the fitness of the model about selected parameters and covariance matrices (Bryne, 1998). It was reported that the cut-off value of RMSEA should be equal to or no greater than 0.08 (Browne & Cudeck, 1993). CFI differentiates the covariance matrix anticipated by the model to the observed covariance matrix and further compares the null model with the observed covariance matrix. GFI is the ratio derived from observed covariance explained by the model. IFI addresses components related to parsimony and sample size (Bollen, 1990). NFI analyzes the model through the evaluation of the Chi-square values of both model and null and alternative model (Bentler & Bonnet, 1980). The acceptable threshold values of these respective indices are estimated at

between 0.9 and 1 (Bollen, 1990; Hu & Bentler, 1998). The results of the analysis of the study model fit assessment are presented in Chapter Six.

5.30 Path modelling

Path modelling is defined as a statistical approach, which is designed for examining the direct or indirect relationships that exist between distinct constructs through the assessment of their respective correlation ratios (Mitchell, 1992). As advocated by Schreiber *et al.* (2006), this process is applicable to the adoption of structural equation modelling (SEM). For this study, the analysis of path modelling and hypotheses testing, which derived from the implementation of SEM, was done using the Analysis of Moment Structures (AMOS version 24) software. The results of this analysis are presented in Chapter Six.

5.31 Pilot study results

A pilot study was conducted in three provinces, namely Mashonaland East, Mashonaland West and Harare Metropolitan**.** Participants included 45 individuals, comprising 15 individuals from each of the three provinces. The pilot study was done to assess the questionnaire in terms of clarity, time and understanding. All the participants completed an initial version of the questionnaire and their assessments and comments on the questionnaire helped to refine the questionnaire. The comments from the participants were positive; thus, the data from the pilot study fed into the data of the main study.

5.32 Ethical considerations

The process of completion of this study as well as the distribution of the questionnaires to the target population were done ethically. The process of gathering data and other relevant information from smallholder farmers was done concerning privacy and anonymity as indicated by Mason (1986), which emphasizes compliance with the criteria of confidentiality. This was achieved through ensuring that the names of the farmers who participated in the study and the respondents are kept anonymous. Moreover, voluntary participation in the survey by the selected respondents was achieved primarily by providing them with full information about the merits and purpose of the study, which subsequently enabled the various respondents to understand the value of the investigation. Respondents were able to make informed decisions regarding their participation and

contribution to the study. As suggested by Myers and Venable (2014), the respondents' rights to non-participation and protection from victimization were followed. Furthermore, compliance with rules related to plagiarism was enforced through acknowledging the respective in-text sources that were used in the study in the reference list. The entire thesis was subjected to a plagiarism test using Turn-it-in software, which assessed the degree of similarity of all in-text and reference list sources as a way to ensure the originality of the research undertaken. Ethical clearance was sought and received from the university ethics committee.

5.33 Conclusion

The major objective of this chapter was to present and justify the methods, philosophical approaches and statistical techniques used in this study to achieve the main research objectives and answer the research questions of the study. This study employed a quantitative method in order to understand and validate the conceptual framework. A positivism based survey approach was employed to guide the research, and this was found to be the most suitable approach for this study. A questionnaire was used as a data collection technique and a pilot study was done. A detailed explanation of sampling size and sampling techniques was provided as well as the justification for the selection of convenience sampling technique. Structural Equation Modelling (SEM), using Analysis of Moment Structures (AMOS), was the main data analysis technique used in this research. The chapter then discussed the ethical issues considered in the study. The next chapter (Chapter 6) focuses on data analysis.

Chapter 6: Data analysis and discussion

6.1 Introduction

Chapter 4 described the proposed conceptual model that was used to explore and examine the effect of attitude and culture on the adoption and acceptance of mobile farming platforms in Zimbabwe. In chapter 5, the research method that guided the study was discussed and the choice of the survey research approach to test the hypotheses, which resulted in the research questions being answered, was justified. This chapter presents the analysis of the data obtained from the respondents. The data analysis and screening were done using the Statistical Package for the Social Science (SPSS). The next section describes the results of the pilot study which was done to ensure reliability and validity of the measuring instruments which were used to test the hypotheses.

6.2 Pilot study

Creswell (2008) indicates that it is very important to pilot test the questionnaire before its use in the study so that it can be examined for validity and reliability. The validity and reliability of the instrument were examined in order to improve the questions, format and scales. The pilot study was conducted in three provinces, namely Mashonaland East, Mashonaland West and Harare Metropolitan prior to the distribution of the actual questionnaires. The major objective of the pilot study was to ensure the clarity and readability of the questionnaire items as well as to check if the data collected answered the research questions and provided face validity (Sekaran and Bougie, 2011). The items (questions) utilized in this study were taken from the literature and were shown to be reliable and valid for measuring variables of the phenomena they were meant to represent. The items used were very applicable to this study because they were developed for and tested within similar contexts to the current study. The researcher looked for help from academic experts from South Africa and Zimbabwe in order to obtain content validity. The researcher managed to get feedback and suggestions from the potential participants (farmers) and several changes were made to the wording of the questions and the questionnaire layout and thus face validity was established. Data from the participants was also analyzed by the researcher to discover any potential threats or drawbacks within the questionnaire items so as to decide on which items to delete, keep or even add. The questionnaires were distributed to a convenient sample of 45 farmers (N=45), comprising 15 farmers from each of three provinces within a duration of three weeks. Nargundkar (2003) shows that the sample size for the pilot study should not exceed 100 people

but at the same time it must be representative of the total population. Of the 45 questionnaires distributed, 40 were returned, which indicates a high response rate (88.8%). Table 6.1 below shows the sample distribution of the pilot study by sex and age. There were 29 male and 11 female respondents (**see Table 6.1.)**

Table 6.1: Sample Distribution of the Pilot Study by Sex and Age

Age	Number	Sex	Total
34 years or less	3	Male	15
35-50 years	9		
51yrs and above	3		
35 years or less	4	Female	25
35 – 50 years	18		
51 years and above	3		

6.2.1 Reliability of the parameters used in the study

After content validity, the researcher then moved to reliability check. Sekaran and Bougie (2011) defines reliability as the consistency of a measure used within the research. Furthermore, Last and Abramson (2001) highlight that for a test to be considered reliable, it must produce the same results when we repeat the same study with different samples, assuming we provide the same initial conditions for the test. The reliability of the constructs in this research was checked using Cronbach's Alpha. It was computed with SPSS (v20) programme and described as alpha coefficient in the output. Cronbach's Alpha is considered to be the most popular method of measuring reliability (Hinton and Brownlow, 2004). The Cronbach's alpha is calculated using the number of questions on a questionnaire and the average inter-item correlation. When using Cronbach's Alpha, the range stretches from 0 - 1 where (0) signifies a completely unreliable test and (1) signifies a completely reliable test. Several researchers have agreed on reliability values which are considered to be satisfactory, for instance Cronbach's alpha coefficient of less than 0.6 is considered to be poor, one equal to 0.7 is considered to be acceptable and over 0.8 is considered to be good (Mak, 2001; Sekaran, 2000). SPSS was used to analyze the reliability tests of the pilot study which are presented in **Table 6.2** below.

Table 6.2: Cronbach's alpha, Inter-item correlation for the pilot study

Factor	Number of Items	Cronbach Alfa	Inter-Item Correlation	Item-to-total Correlation
PE	4	.978	.906 -.956	.932 - .965
EE	5	.994	.949 - .988	.970 - .991
SI	4	.980	.890 - .953	.936 - .970
FC	4	.984	.906 - .954	.944 - .977
HM	3	.972	.912 -.948	.929 - .957
PV	4	.932	.824 - .961	.902 - .922
HB	4	.773	.385 -.933	.535 - .636
AT	4	.940	.736 - .862	.801 - .912
BI	4	.716	.336 -.962	.514 -.843
PD	5	.946	.690 - .929	.755 - .942
UA	4	.982	.905 - .977	.930 - .971
MF	5	.906	.365 - .977	.591 - .909
IC	6	.957	.703 - .960	.782 - .940
LT	3	.964	.879 - .947	.907 - .961

The results in Table 6.2 suggest that the constructs had adequate reliability, with a score ranging from 0.716 for BI to 0.994 for EE. This means that the items related to each construct used in the proposed model were positively correlated to one another. In other words, each topic and the group of topics are reliable. In addition, Table 6.2 also presents the results of inter-item correlation and item-to-total correlation which are two other internal consistency reliability indicators. The value for the item-to-total correlation should exceed 0.5 whereas the value for inter-item correlation should exceed 0.3 (Hair et al., 2010). The results of the pilot study exceeded the cut-off values for all the constructs used in the questionnaire, which means that there was high internal consistency of scales used for measuring items under each construct. The findings and outcomes of the main study are presented and discussed in the next section.

6.3 Descriptive statistics

6.3.1 Profile of respondents

The target sample for this survey were smallholder farmers who used mobile farming platforms. These farmers were taken from three provinces, namely Mashonaland West, Mashonaland East and Harare Metropolitan. A total of 500 questionnaires were issued to the smallholder farmers in the three provinces. From that initial 500 questionnaires, 411 were returned, 59 of which were unusable. After screening for missing data and duplicated responses, we retained 352 questionnaires for data analysis. The demographic characteristics are provided in **Table 6.3** below.

Table 6.3: Descriptive statistics

Gender	Count	Percent
Male	153	43.5%
Female	199	56.5%
Total	352	100%
Age	Count	Percent
34 years or less	54	15.3%
35-50 years	201	57.1%
51yrs and above	97	27.6%
Total	352	100
Level of Education	Count	Percent
Diploma and below	297	84.4
Degree	39	11.1
Masters and above	16	4.5
Total	352	100
Province	Count	Percent
Mashonaland East	107	30.4
Mashonaland Central	117	33.2
Harare Metropolitan	128	36.4
Total	352	100

More than half of the respondents were female (56.5%). The majority of the respondents were middle aged people (35-50 years) who constituted (57.1%). These are people who are believed to be economically active and therefore constitute a greater percentage of the farmers. There were a few younger (34 years or less) respondents (15.3%). More than three-fourths of the respondents (84.4%) had a diploma and below, and 4.5% had masters and above. Harare Metropolitan province had the highest number of respondents (36.4%) and Mashonaland east had the least number of respondents (30.4%), but generally all the three provinces had almost the same number of respondents.

6.3.2 Mean and standard deviation of constructs in mobile farming platforms

Respondents were asked to rate themselves on a Likert scale of 1 – 5 about their use and adoption of mobile farming platforms, with 1 being the lowest score and 5 being the highest score. The scale was defined as 1 "Strongly Agree", 2 "Disagree", 3 "Neutral", 4 "Agree", and 5 "Strongly Disagree". The descriptive statistics of construct items including the means and standard deviation for each independent and dependent variable used in the proposed research model are presented in the following subsections. Overall, all means indicate that the majority of participants express generally positive responses to the constructs that are measured in this study. The descriptive statistics for both samples is discussed next.

Table 6.4 below illustrates the mean (M) and standard deviation for the research factors:

Table 6.4 The Mean (M) and Standard Deviation for the Research Factors

Questions	Mean (M)	Std. Dev
Section B: Assesses farmers' beliefs about using mobile farming platforms using a rating scale of 1 to 5 from strongly disagree to 5 strongly agree		
Items	Mean (M)	Std. Dev.
Performance expectancy (PE).	3.78	1.009
Effort expectancy (EE).	3.43	1.167

Social influence (SI)	2.82	1.175
Facilitating conditions (FC)	2.83	1.053
Hedonic motivation (HM)	3.31	1.123
Price value (PV)	3.01	1.167
Habit (HB)	3.12	1.051
Attitude (AT)	3.54	1.113
Behavioral intention (BI)	3.96	1.293
Section C: Actual usage of mobile farming platforms		
Actual usage (AU)	3.58	1.245
Mobile farming platform usage		
To what extent do you use the mobile farming platform to perform the following services?		
Daily weather	3.78	1.093
Weekly crop information	2.87	1.148
Farming & market tips	3.32	1.254
Daily rainfall advice	3.45	0.787
Adverts & marketing links	2.93	1.311
Market price information	3.65	1.282
Weekly best farming practices	3.35	1.284
Financial linkages	2.89	1.345
Section D: Assess moderating effect of cultural values using a rating scale of 1 to 5 from strongly disagree to 5 strongly agree.		
Power distance (PD)	4.21	1.568

Uncertainty avoidance (UA)	2.06	1.597
Masculinity/femininity (MF)	1.53	1.569
Individualism/collectivism(IC)	4.04	1.269
Long/short term (LT)	3.66	1.654
Average of means	3.29	1.301
Total respondents	352	

1. Performance expectancy (PE)

The PE construct is conceptualized in this study to extract information about the farmers' belief that using mobile farming platforms will improve their performance and productivity. Four items were adopted from the work related to UTAUT2 (Venkatesh, Thong & Xu, 2012) and were measured using a 5 point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). As can be shown in Table 6.4, the mean for PE was 3.78 (±1.009), which indicates that the majority of the farmers agreed that mobile farming platforms were useful in their farming processes.

2. Effort expectancy (EE)

The EE construct is conceptualized, in this thesis, to extract the information about farmers' belief that mobile farming platforms are easy to use and understand. This variable measured by four items adopted from the work related to UATAUT2 (Venkatesh, Thong & Xu, 2012) and was measured using a 5 point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The results in Table 6.4 show that the mean for EE was 3.43(±1.167). The results indicate that the farmers found the system easy to use and understand.

3. Social influence (SI)

The SI variable is conceptualized in this thesis to extract information related to farmers' perceptions about mobile farming platform use, which is usually influenced by others'

opinions, such as other fellow farmers and agriculture extension officers. Four items were adopted from the work of Venkatesh, Thong and Xu (2012) and were measured using a 5-point Likert scale. The results of the descriptive statistics in Table 6.4 show that the mean for the SI was 2.82(±1.175). The results indicated that the farmers were being influenced by other farmers and agricultural extension officers.

4. Facilitating conditions (FC)

In this study, the FC variable extracted information about farmers' perceptions on whether they were able to access the required resources together with the necessary support to use mobile farming platforms. This construct also extracted information on the perception of farmers on whether the technical infrastructure exists to support their use of the mobile farming platforms. This factor was measured by four items adopted from the work of Venkatesh, Thong and Xu (2012) using a 5 point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). As shown in Table 6.4, the mean was 2.83 (±1.053) indicating agreement on the importance of the availability of the technological resources.

5. Hedonic motivation (HM)

The HM construct is conceptualized in this study to extract information about farmers' perception on whether there is fun or enjoyment resulting from using mobile farming platforms. This factor was measured by three items adopted from the work of Venkatesh, Thong and Xu (2012) using a 5 point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). As shown in Table 6.4, the results indicate that the mean was 3.31 (±1.123), implying that there was fun or enjoyment for farmers resulting from using mobile farming platforms.

6. Price value (PV)

The PV construct is conceptualized in this study to extract information about farmers' perception on the cognitive trade-off between the perceived benefits of mobile farming platforms and the monetary costs of using them. This factor was measured by four items adopted from the work of Venkatesh, Thong and Xu (2012) using a 5 point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). As shown in Table 6.4, the results indicate that

the mean was 3.01 (±1.167), implying that the benefits of using mobile farming platforms are perceived to be greater than the cost of using them.

7. Habit (HB)

The HB construct was used to extract information about the extent to which farmers were using mobile farming platforms automatically or habitually. This factor was measured by four items adopted from the work of Venkatesh, Thong and Xu (2012) using a 5 point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). As shown in Table 6.4, the results showed that the mean was 3.12 (±1.051), indicating that farmers are now using mobile farming platforms automatically or habitually.

8. Attitude (AT)

The AT construct is conceptualized in this study to extract information about farmers' perception on whether the use of mobile farming platforms is a good idea. This factor was measured by four items adopted from the work of Davis (1989) using a 5 point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). As shown in Table 6.4, the results showed that the mean was 3.54 (±1.113), indicating that farmers' perceptions are that using mobile farming platforms is a good idea, and that they like to work with the platforms.

9. Behavioral intention (BI)

The BI construct is conceptualized as a dependent variable in this thesis. It was meant to extract information related to farmers' behavioral intention to use mobile farming platforms in the future. Four items adopted from the work of Venkatesh, Thong and Xu (2012) were measured using a 5 point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The results of the descriptive analysis in Table 6.4 show that the mean was 3.96 (±1.293). The results revealed that the farmers intend to use mobile farming platforms in future.

10. Actual usage of mobile farming platforms (AU)

The AU variable is conceptualized as a dependent variable in this study to extract information about farmers' actual use of the mobile farming platforms. This variable is measured by two items adopted from the work of Venkatesh et al. (2000). Usage behavior construct uses scales

from 1 to 5 (1=have not used and 5= once a month) to assess the frequency of using mobile farming platforms and (1= almost never and 5 = 3hrs and above) to measure the average of daily usage per hour. As can be seen in Table 6.4, the mean was 3.58 (±1.245), indicating that there were high levels of usage of mobile farming platforms in general.

6.4 Cultural values as moderators

This section presents the results of the five individual cultural values for the farmers. Power distance (PD) was measured by five items, uncertainty avoidance (UA) by four items, masculinity /femininity (MF) by five items, individualism/collectivism (IC) by six items and long/short term (LT) orientation by three items. Items were measured using a 5 point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The constructs, adopted from the work of Tarhini, Hone, Liu and Tarhini (2017) who in turn developed their measures based on the work of Hofstede (2005), were modified to fit the context of the study. The following subsections provide a detailed analysis of the five cultural dimensions used in the study as moderators.

1. Power distance (PD)

This construct was conceptualized to measure the farmers' perception about the acceptance of power from their instructors like extension officers and government officers. The results in Table 6.4 revealed that the farmers were high on power distance, with a mean of 4.21 (±1.568). These results are consistent with Hofstede's (1980) findings, which revealed that African countries are hierarchical societies with high power distance values where people fear disagreeing with their superiors.

2. Uncertainty avoidance (UA)

This variable is conceptualized in this study to measure the extent to which the members of a culture feel threatened by uncertain, unknown and ambiguous situations. It also measures the extent to which a society tries to avoid uncertain situations by adopting strict codes of behavior, a belief in the absolute truths, establishing formal rules and not tolerating deviant ideas and actions. In other words, individuals with high UA cultural values will establish formal rules and not tolerate deviant ideas and actions for security reasons. On the other hand, individuals

with low UA cultural values might have a greater interest to take risks. As shown in Table 6.4, the average mean for the farmers was 2.06 (±1.597). The results indicate that the farmers were found to have low uncertainty avoidance. This result is consistent with Geert Hofstede's (2014) findings that classify most African countries as having low uncertainty avoidance.

3. Masculinity / femininity (MF)

This construct is conceptualized in this study to observe the masculine/feminine nature of farmers. Farmers who score high on masculinity values will emphasize on achievement or success, heroism, money and material success whilst those who score low on this construct will emphasize on close human relationships, caring for the weak, quality of life and usually follow more traditional roles. As can be seen in Table 6.4, the results indicate that the farmers were rated low on masculinity, which means they had feminine values. The mean was between 1.53 (±1.569) for the farmers. These results are consistent with previous studies, which indicate that most people in Africa reveal feminine cultural values, valuing close human relationships and quality of life (Geert Hofstede, 2014).

4. Individualism/collectivism (IC)

This construct is conceptualized in this study to reflect the degree to which farmers view their members as individuals or group members. Individualism reflects a society in which the ties between individuals are loose, where everybody is expected to look after him/herself and his or her immediate family only, whereas collectivism refers to a society in which people from birth onwards are integrated into strong and cohesive groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty. Table 6.4 presents the descriptive statistics of the IC cultural values. The mean average for the farmers was 4.04 (±1.269). The results revealed that farmers had collectivist values. The results are consistent with Hofstede' (1980) findings for most African countries at national level.

5. Long/short term (LT) orientation

This construct is conceptualized in this study to assess the extent to which farmers reflect long-term orientation versus short term orientation. Long-term orientation stands for the fostering of virtues oriented towards future rewards, such as perseverance, whereas short-term stands

for the fostering of virtues related to the past and present, in particular respect for tradition, preservation of face and fulfilling social obligations. Table 6.4 presents the descriptive statistics for the LT cultural values where the mean was 3.66 (±1.654). The score in this dimension suggested a short-term orientation. The results are consistent with (Hofstede and Bond, 1988) who revealed that African countries score low on this dimension suggesting a short-term orientation where they exhibit great respect for traditions and focusing more on achieving quick results.

6.5 The tasks the farmers performed using mobile farming platforms

This section assessed the current usage of mobile farming platforms at the time of the study. Regarding the actual tasks that the farmers performed using mobile farming platforms, the participants were asked to circle each question based on the following measurement scales; 1 = *almost never; 2 = less than 30 mins; 3 = from 30mins to 1hr; 4 = from 1hr to 2hrs, and 5 = 3hrs and above.* Overall, the majority of farmers used mobile farming platforms to perform specific tasks. Table 6.5 below explains the percentage and frequencies for the statistics.

Table 6.5: Farmers' actual usage of mobile farming platforms

Item	Not at all	To a small extent	To some extent	To a moderate extent	To a greater extent
Daily weather	6.5% (23)	5.7% (20)	25.3% (89)	23.0 (81)	39.5% (139)
Weekly crop information	5.4% (19)	6.5% (23)	24.4% (86)	24.7% (87)	38.9% (137)
Farming & market tips	5.9% (21)	4.8% (17)	23.0% (81)	25.9 (91)	40.3% (142)
Daily rainfall advice	6.8% (24)	4.3% (15)	25.9% (91)	26.1% (92)	36.9% (130)
Adverts & marketing links	4.5% (16)	7.7% (27)	22.4% (79)	37.8% (133)	27.6% (97)
Market price information	9.4% (33)	6.5% (23)	19.6% (69)	26.4% (93)	38.1% (134)
Weekly best farming practices	6.3% (22)	5.9% (21)	18.5% (65)	28.1% (99)	41.2% (145)
Financial linkages	34.4% (121)	9.7% (34)	28.7% (101)	24.4% (86)	2.8% (10)

Discussion on farmers' actual usage of mobile farming platforms

On the daily weather service, 93.5% of the farmers indicated that they were aware of the service and they were really utilizing it. Only 6.5% of the farmers were not using it at all. This could mean that the service was well advertised or it was considered to be of importance and useful by the majority of farmers. On weekly crop information service, 94.5% of the farmers revealed that they were utilizing the service, signifying its importance to them. Furthermore, only a small percentage of farmers indicated that they had not used it at all. The majority of farmers (94%) revealed that they were aware of farming and marketing tips availed through the mobile farming platforms whilst only 6% indicated that they had never utilized the service before. The results also showed that a high number of farmers (95.5%) were receiving adverts and marketing links through the platform and most of the farmers were aware of that service, the same with market price information where 90.6% revealed that they were aware of the service and were making use of it on the platform. Weekly best farming practices was another service where a majority of the farmers (93.7%) indicated that they were making use of the service. Only 6.3% revealed that they had never used it before. Of all the services offered through the platform, financial linkages were the only service where a high number of farmers (34.4%) indicated that they had never used it before compared to 65.6% who revealed that they were aware of it. This could be attributed to the probability that the service was not well advertised and quite a number of farmers were not aware of it or were not perceiving it to be of importance or useful. Generally, the results in Table 6.5 show that the majority of the farmers responded "to greater extent" on all other tasks except for "Adverts & marketing links", which was scored "to a moderate extent", and "Financial linkages", where participants responded "not at all".

6.5.1 Analysis tool selection

Simple linear regression was used in order to test hypotheses. Regression is defined as the relationship between the mean value of a random dependent variable and the corresponding values of one or more independent variables. The core purpose of regression is that it measures the relationship between the dependent variable and the independent variables, and it determines the shape of that relationship. Sometimes there will be a relationship between one independent variable and one dependent variable and this is called simple regression analysis. In instances where there is a relationship between the dependent variable and a number of

independent variables, then it is called multiple regression analysis. Regression is very important because it can be used for the purposes of planning, predicting, forecasting and assessment. The main aim of regression is to predict the value of a dependent variable for a given known value of an independent variable. If there is need to describe the relationship between two variables where one can explain the other, then regression becomes useful.

Assumptions

For linear regression analysis results to be valid and trustworthy, there is need to assess the model and check if it does not violate any of the fundamental assumptions of linear regression (Almquist, Ashir and Brannstrom, 2019). The following checklist should be considered when checking for violations of the fundamental assumptions of linear regression.

Table 6.6: Checklist for fundamental assumptions of Linear Regression

Item	Description
No outliers	Outliers are items which do not follow the overall pattern of the other data
Homoscedasticity	The variance around the regression line should be constant across all values of the x_ variable
Normality	The residuals for our x_ variables should be normally distributed.
Linearity	The effect of x on y should be linear
No multicollinearity	This occurs when 2 or more x_ variables included simultaneously in the model are strongly correlated with each other.

Source: Almquist, Ashir and Brannstrom (2019)

Outliers, normality, homogeneity and multicollinearity

Detecting and treating outliers is a fundamental stage in regression since this may affect the normality of the data, thus distorting the statistical tests (Tabachnick and Fidell, 2007). In this study, SPSS and AMOS were used to check for presence of univariate and multivariate outliers but no outliers were found. This means that all individuals followed the overall pattern of the data. Testing for normality is another critical step in regression because validity and reliability of the results will be impaired if the data is not normally distributed.

In the current study, the data was checked for normality and all the items in the data set were found to be normally distributed. Therefore, there were no issues of non-normality of the data. For homogeneity, a test was carried out to test for it and results confirmed that there was homogeneity of the variance in the data. Multicollinearity occurs when two or more variables are highly correlated to each other (Almquist, Ashir and Brannstrom, 2019). In this study, all the independent constructs had acceptable variance inflation factor (VIP) values and tolerance values suggesting the absence of multicollinearity in the sample.

6.6 Hypotheses test

6.6.1 Social influence (SI)

H_{1a}	
SI of mobile farming platforms adoption in Zimbabwe has a positive influence on PE.	
H_0	**H_A**
There is no statistically positive influence of SI on PE regarding the use of mobile farming platforms.	There is a statistically positive influence of SI on PE regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in Table 6.6.1 and Table 6.6.2 were obtained.

Model summary Table 6.6.1: H1a

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.763[a]	.582	.581	.1815221	.582	443.609	1

a. Predictors: (Constant), SI

Coefficients[a] Table 6.6.2 H1a Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.505	.207		2.433	.016
	SI	.895	.043	.763	21.062	.000

Dependent variable: PE

From tables 6.6.1 and 6.6.2 above, it can be concluded that there is a positive influence of social influence (SI) on performance expectancy (PE) (β =0.763, 0.000), supporting H1a. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (PE) is explained by the independent variable(s) (SI), and in this case R^2 is 58%. The results are consistent with what was reported in earlier studies that individuals tend to take significant referents' opinions into consideration when assessing a technology's usefulness (performance expectancy) (Lin et al., 2003).

6.6.2 Social influence (SI)

H_{1b}	
SI of mobile farming platforms adoption in Zimbabwe has a positive influence on BI.	
H_0	**H_A**
There is no statistically positive influence of SI on BI regarding the use of mobile farming platforms.	There is a statistically positive influence of SI on BI regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.3 and 6.6.4 were obtained.

Model summary Table 6.6.3: H1b Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.710[a]	.503	.502	.1950242	.503	322.352	1

a. Predictors: (Constant), SI

Coefficients[a] Table 6.6.4: H1b Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.875	.223		3.926	.000
	FC	.820	.046	.710	17.954	.000

a. Dependent variable: BI

From tables 6.6.3 and 6.6.4 above, it can be concluded that there is a positive influence of social influence (SI) on behavioral intention (BI) (β =0.710, 0.000), supporting H1b. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (SI), and in this case R^2 is 50%. Zimbabwe being a collectivist country, the results on social influence are consistent with some earlier studies (Putit & Arnott, 2007) that highlighted that in collectivist societies, individuals are usually influenced by other people's opinions when making decisions.

6.6.3 Performance expectancy (PE)

H_2	
PE of mobile farming platforms in Zimbabwe has a positive influence on attitude (AT).	
H_0	**H_A**
There is no statistically positive influence of PE on AT regarding the use of mobile farming platforms.	There is a statistically positive influence of PE on AT regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.5 and 6.6.6 were obtained.

Model summary: Table 6.6.5 : H2 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.960[a]	.921	.921	.0766286	.921	370.703	1

a. Predictors: (Constant), PE

Coefficients[a]: Table 6.6.6: H2 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.343	.075		4.601	.000
	PE	.931	.015	.960	60.850	.000

a. Dependent variable: AT

From tables 6.6.5 and 6.6.6 above, the researcher concludes that there is a positive influence of performance expectancy (PE) on attitude (AT) (β =0.960, 0.000), supporting H2. Under

the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (AT) is explained by the independent variable(s) (PE), and in this case R^2 is 92%. These results are consistent with previous studies like Jairak et al. (2009) who revealed that performance expectancy has a positive influence on attitude.

6.6.4 Effort expectancy (EE)

H_3	
EE of mobile farming platforms in Zimbabwe has a positive influence on attitude (AT).	
H_0	**H_A**
There is no statistically positive influence of EE on AT regarding the use of mobile farming platforms.	There is a statistically positive influence of EE on AT regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.7 and 6.6.8 were obtained.

Model summary: Table 6.6.7 : H3 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.617[a]	.380	.378	.2145288	.380	194.994	1

a. Predictors: (Constant), EE

Coefficients[a]: Table 6.6.8 : H3 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.923	.140		20.837	.000
	EE	.406	.029	.617	13.964	.000

a. Dependent variable: AT

From tables 6.6.7 and 6.6.8 above, it can be concluded that there is a positive influence of effort expectancy (EE) on attitude (AT) (β =0.617, 0.000), supporting H3. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (AT) is explained by the independent variable(s) (EE), and in this case R^2 is 38%. These results are consistent with previous studies, such as that Jairak et al. (2009) who revealed that effort expectancy has a positive influence on attitude.

6.6.5 Facilitating conditions (FC)

H_{4a}	
FC of mobile farming platforms in Zimbabwe have a positive influence on attitude (AT).	
H_0	**H_A**
There is no statistically positive influence of FC on AT regarding the use of mobile farming platforms.	There is statistically positive influence of FC on AT regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.9 and 6.6.10 were obtained.

Model summary: Table 6.6.9 : H4a Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.727[a]	.528	.527	.1871759	.528	355.882	1

a. Predictors: (Constant), FC

Coefficients[a]: Table 6:6.10 : H4a Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.844	.214		3.948	.000
	FC	.827	.044	.727	18.865	.000

a. Dependent variable: AT

From tables 6.6.9 and 6.6.10 above, the researcher concludes that there is a positive influence of facilitating conditions (FC) on attitude (AT) (β =0.727, 0.000), supporting H4a. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (AT) is explained by the independent variable(s) (FC), and in this case R^2 is 52%. The results are consistent with previous studies such as that of Nassuora (2012) that argues that a person who has access to a favorable set of facilitating conditions towards a system tends to develop a positive attitude towards such system.

6.6.6 Facilitating conditions (FC)

H_{4b}	
FC of mobile farming platforms in Zimbabwe have a positive influence on Behavioral Intention (BI).	
H_0	**H_A**
There is no statistically positive influence of FC on BI regarding the use of mobile farming platforms.	There is a statistically positive influence of FC on BI regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the following results were obtained.

Model summary: Table 6.6.11 : H4b Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.710[a]	.503	.502	.1950242	.503	322.352	1

a. Predictors: (Constant), FC

Coefficients[a]: Table 6:6.12 H4b Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.875	.223		3.926	.000
	FC	.820	.046	.710	17.954	.000

a. Dependent variable: BI

From tables 6.6.11 and 6.6.12 above, the researcher concludes that there is a positive influence of facilitating conditions (FC) on behavioral intention (BI) (β =0.710, 0.000), supporting H4b. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (FC), and in this case R^2 is 50%. The results are consistent with what was reported in previous studies (Miltgen et al., 2013) but contradicts others (Im et al., 2011).

6.6.7 Facilitating conditions (FC)

H_{4c}	
FC of mobile farming platforms in Zimbabwe have a positive influence on actual usage (AU).	
H_0	**H_A**
There is no statistically positive influence of FC on AU regarding the use of mobile farming platforms.	There is a statistically positive influence of FC on AU regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.13 and 6.6.14 were obtained.

Model Summary: Table 6:6.13 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.987[a]	.974	.974	.0421235	.974	12101.902	1

a. Predictors: (Constant), FC

Coefficients[a]: Table 6:6.14 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.422	.048		-8.773	.000
	FC	1.085	.010	.987	110.009	.000

a. Dependent variable: AU

From tables 6.6.13 and 6.6.14 above, the study concludes that there is a positive influence of facilitating conditions (FC) on Actual Usage (AU) (β =0.987, 0.000), supporting H4c. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (FC), and in this case R^2 is 97%.

6.6.8 Hedonic motivation (HM)

H_5	
HM of mobile farming platforms in Zimbabwe have a positive influence on behavioral intention (BI).	
H_0	**H_A**
There is no statistically positive influence of HM on BI regarding the use of mobile farming platforms.	There is a statistically positive influence of HM on BI regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the following results were obtained.

Model summary: Table 6:6.15 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.254[a]	.065	.062	.2676618	.065	21.956	1

a. Predictors: (Constant), HM

Coefficients[a]: Table 6:6.16 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.168	.151		27.628	.000
	HM	.301	.064	.254	4.686	.000

a. Dependent variable: BI

From tables 6.6.15 and 6.6.16 above, several conclusions are made. There is a positive influence of hedonic motivation (HM) on behavioral intention (BI) (β =0.254, 0.000), supporting H5. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (HM), and in this case R^2 is 06%. The results are consistent with what was reported in earlier studies, such as by Zhang et al. (2012) and Lee (2009).

6.6.9 Price value (PV)

H_6	
PV of mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).	
H_0	**H_A**
There is no statistically positive influence of PV on BI regarding the use of mobile farming platforms.	There is a statistically positive influence of PV on BI regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.17 and 6.6.18 were obtained.

Model summary: Table 6:6.17 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.210[a]	.044	.041	.2706027	.044	14.607	1

a. Predictors: (Constant), PV

Coefficients[a]: Table 6:6.18 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.121	.197		20.928	.000
	PV	.185	.048	.210	3.822	.000

a. Dependent variable: BI

From tables 6.6.17 and 6.6.18 above, several conclusions are made. There is a positive influence of price value (PV) on behavioral intention (BI) (β =0.210, 0.000), supporting H6. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (PV), and in this case R^2 is 04%. The results are in line with earlier studies (Habbaoush, Nassuora & Hussein, 2011).

6.6.10 Habit (HB)

H_{7a}	
Habit (HB) of mobile farming platforms adoption in Zimbabwe has a positive influence on behavioral intention (BI).	
H_0	**H_A**
There is no statistically positive influence of HB on BI regarding the use of mobile farming platforms.	There is a statistically positive influence of HB on BI regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis, and the results shown in tables 6.6.19 and 6.6.20 were obtained.

Model summary: Table 6:6.19

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.935[a]	.875	.874	.0980405	.875	221.869	1

a. Predictors: (Constant), HB

Coefficients[a]: Table 6:6.20

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.167	.100		1.667	.097
	HB	.965	.020	.935	47.073	.000

a. Dependent variable: BI

From tables 6.6.19 and 6.6.20 above, the study concludes that there is a positive influence of habit (HB) on behavioral intention (BI) (β =0.935, 0.000), supporting H7a. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (HB), and in this case R^2 is 87%. The results are consistent with what has been reported in earlier studies, such as Ajzen (2002).

6.6.11 Habit (HB)

H_{7b}	
Habit of mobile farming platforms in Zimbabwe has a positive influence on actual use (AU).	
H_0	**H_A**
There is no statistically positive influence of HB on AU regarding the use of mobile farming platforms.	There is a statistically positive influence of HB on AU regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results shown in tables 6.6.21 and 6.6.22 were obtained.

Model summary: Table 6:6.21

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.748[a]	.560	.559	.1746319	.560	404.637	1

a. Predictors: (Constant), HB

Coefficients[a] Table 6:16.22 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.286	.178		7.212	.000
	HB	.734	.037	.748	20.116	.000

a. Dependent variable: AU

From tables 6.6.21 and 6.6.22 above, several conclusions are made. There is a positive influence of habit (HB) on actual usage (AU) (β =0.748, 0.000), supporting H7b. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (HB), and in this case R^2 is 56%. The results are in line with literature, including Aarts, Verplanken and Knippenberg (1998).

6.6.12 Attitude (AT) towards using mobile farming platforms

H_8	
Attitude towards using mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).	
H_0	**H_A**
There is no statistically positive influence of AT on BI regarding the use of mobile farming platforms.	There is a statistically positive influence of AT on BI regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis, and the following results were obtained.

Model summary: Table 6:6.23

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.938[a]	.879	.879	.0962050	.879	231.478	1

a. Predictors: (Constant), AT

Coefficients[a] Table 6:6.24

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.229	.097		2.371	.018
	AT	.952	.020	.938	48.099	.000

a. Dependent variable: BI

Tables 6.6.23 and 6.6.24 above show that there is a positive influence of attitude (AT) on behavioral intention (BI) (β =0.938, 0.000), supporting H8. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (AT), and in this case R^2 is 87%. The results are in line with earlier studies which reported that attitude influences positively on behavioral intention with both effort expectancy and performance expectancy included (Nassuora, 2012; Jairak, 2009).

6.6.13 Behavioral intention (BI)

H_9	
Behavioral intention (BI) of mobile farming platforms in Zimbabwe have a positive influence on actual use (AU).	
H_0	**H_A**
There is no statistically positive influence of BI on AU regarding the use of mobile farming platforms.	There is a statistically positive influence of BI on AU regarding the use of mobile farming platforms.

A simple regression was used to test this hypothesis and the results presented in tables 6.6.25 and 6.6.26 were obtained.

Model summary: Table 6:6.25

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.733[a]	.538	.536	.1790006	.538	369.795	1

a. Predictors: (Constant), BI

Coefficients[a] Table 6:6.26

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.469	.177		8.300	.000
	BI	.697	.036	.733	19.230	.000

a. Dependent variable: AU

Tables 6.6.25 and 6.6.26 above indicate that there is a positive influence of behavioral intention (BI) on actual use (AU) (β =0.733, 0.000), supporting H9. Under the statistical theory, the decision is to reject the null hypothesis H_0. There is enough evidence to support the alternative hypothesis. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (BI), and in this case R^2 is 53%. The results are in line with earlier research (Venkatesh et al., 2003; Yu, 2012).

Combined influence of FC, PE and EE on AT

There is a statistically combined positive influence of FC, PE and EE on AT regarding the use of mobile farming platforms. A simple regression was used to test this hypothesis, and the results obtained are shown in tables 6.6.27 and 6.6.28 below.

Model summary: Table 6:6.27

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.965[a]	.931	.930	.0720185	.931	1411.975	3

a. Predictors: (Constant), FC, PE, EE

Coefficients[a] Table 6:6.28

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.585	.089		6.557	.000
	PE	.952	.022	.982	42.678	.000
	EE	.110	.017	.167	6.608	.000
	FC	.180	.036	.158	4.990	.000

a. Dependent variable: AT

From tables 6.6.27 and 6.6.28 above, it can be concluded that there is a combined positive influence of PE (β =0.982, 0.000), EE (β =0.167, 0.000) and FC (β =0.158, 0.000) on attitude (AT). The results indicate that PE, EE and FC account for 93% ($R^2 = 0.93$) of the variance of AT, with PE contributing the most to attitude compared to other constructs.

Combined influence of HB, PV, HM, FC and SI on BI

The combined effect of HB, PV, HM, FC and SI to BI was also investigated. There is a statistically combined positive influence of HB, PV, HM, FC and SI on BI regarding the use of mobile farming platforms. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.29 and 6.6.30 below.

Model summary: Table 6:6.29

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.942[a]	.888	.886	.0932850	.888	496.960	5

a. Predictors: (Constant), HB, PV, HM, FC, SI

Coefficients[a] Table 6:6.30

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.153	.131		-1.173	.242
	SI	.968	.214	.863	4.513	.000
	FC	.855	.214	.740	3.996	.000
	HM	.081	.028	.068	2.893	.004
	PV	.045	.017	.051	2.560	.011
	HB	.842	.033	.816	25.811	.000

a. Dependent variable: BI

From tables 6.6.29 and 6.6.30 above, the indication is that there is a combined positive influence of HB (β =0.816, 0.000), PV (β =0.051, 0.011), HM (β =0.068, 0.004), SI (β =0.863, 0.000) and FC (β =0.740, 0.000) on behavioral intention (BI). The results indicate that HB, PV, HM, SI and FC account for 88% ($R^2 = 0.88$) of the variance of BI, with SI contributing the most to behavioral intention compared to other constructs.

Combined influence of FC and HB on AU

Finally, the combined influence of FC and HB on AU was investigated. It was established that there is a statistically combined positive influence of FC and HB on AU regarding the use of mobile farming platforms. A simple regression was used to test this hypothesis and the results shown in tables 6.6.31 and 6.6.32 were obtained.

Model summary: Table 6:6.31

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.988[a]	.977	.976	.0403481	.977	6609.976	2

a. Predictors: (Constant), HB, FC

Coefficients[a] **Table 6:6.32**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.483	.047		-10.186	.000
	FC	1.031	.014	.938	75.100	.000
	HB	.067	.012	.068	5.441	.000

a. Dependent variable: AU

From tables 6.6.31 and 6.6.32 above, it can be concluded that there is a combined positive influence of HB (β =0.068, 0.000) and FC (β =0.938, 0.000) on actual use (AU). The results indicate that HB and FC account for 97% (R^2 = 0.97) of the variance of AU with, FC contributing the most to actual use compared to HB.

6.7 Moderating effects of cultural values

This section discusses the moderating effect of Hofstede's five cultural dimensions (individualism/collectivism(IC), masculinity/femininity (MF), long/short term (LT), uncertainty avoidance (UA) and power distance (PD) at the individual level on the relationships between PE and AT, EE and AT, SI and BI, PV and BI, AT and BI, and between BI and AU. The hypotheses related to the moderating effects of cultural values that were identified in Chapter 4 during the model development stage are as follows:

Cultural variables

H10a. *Individualism/collectivism (IC) moderates effort expectancy (EE) and attitude (AT).*

H10b. *Individualism/collectivism (IC) moderates social influence (SI) and behavioral intention (BI).*

H10c. *Individualism/collectivism (IC) moderates behavioral intention (BI) and actual use (AU).*

H11. *Masculinity/femininity (MF) moderates the relationship between price value (PV) and behavioral intention (BI).*

H12a*. Long/short term (LT) moderates performance expectancy (PE) and attitude (AT).*

H12b*. Long/short term (LT) moderates behavioral intention (BI) and actual use (AU).*

H13: *Uncertainty avoidance (UC) moderates behavioral intention (BI) and actual use (AU).*

H14. *Power distance (PD) moderates behavioral intention (BI) and actual use (AU).*

H15. *Individualism/collectivism (IC) moderates attitude (AT) and behavioral intention (BI).*

H16. *Masculinity/femininity (MF) moderates attitude (AT) and behavioral intention (BI).*

H17. *Long/short term (LT) moderates attitude (AT) and behavioral intention (BI).*

H18. *Uncertainty avoidance (UC) moderates attitude (AT) and behavioral intention (BI).*

H19*. Power distance (PD) moderates attitude (AT) and behavioral intention (BI).*

6.7.1 Hofstede's Cultural Dimensions

This section reports the results on the moderating effect of Hofstede's five cultural dimensions, namely individualism/collectivism (IC), masculinity/femininity (MF), long/short (LT) orientation, uncertainty avoidance (UA) and power distance(PD) on the relationships within the model.

6.7.1.1 Individualism/collectivism (IC)

The construct IC was measured in the survey questionnaire using six items through a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The overall mean was 4.04, indicating a high collectivist culture.

Moderating effect of IC on the relationship between EE and AT

The moderating effect of individualism/collectivism (IC) on the relationship between effort expectancy (EE) and attitude (AT) was investigated. A simple regression was used to test this hypothesis and the following results were obtained.

Model summary: Table 6:6.33

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.959[a]	.920	.920	.0769350	.920	3670.744	1

a. Predictors: (Constant), EExIC

Coefficients[a] Table 6: 6.34

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.346	.075		4.620	.000
	EExIC	.930	.015	.959	60.587	.000

a. Dependent variable: AT

The results presented in Table 6.6.33 and Table 6.6.34 above show that the cultural variable individualism/collectivism (IC) was found to moderate positively the relationship between EE_AT (β =0.959, 0.000), supporting H10a. R^2 represents how much of the variation in the dependent variable (AT) is explained by the independent variable(s) (EExIC), and in this case R^2 is 92%.

Moderating effect of IC on the relationship between SI and BI

The moderating effect of individualism/collectivism (IC) on the relationship between social influence (SI) and behavioral intention (BI) was investigated. A simple regression was used to test this hypothesis and the results shown in tables 6.6.35 and 6.6.36 were obtained.

Model summary: Table 6:6.35

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.899[a]	.808	.807	.1213468	.808	1336.012	1

a. Predictors: (Constant), SIxIC

Coefficients[a] Table 6:6.36

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.562	.118		4.761	.000
	SIxIC	.885	.024	.899	36.551	.000

a. Dependent variable: BI

The results presented in tables 6.6.35 and 6.6.36 above show that the cultural variable individualism/collectivism (IC) was found to moderate positively the relationship between SI_BI (β =0.899, 0.000), supporting H10b. R^2 represents how much of the variation in the dependent

variable (BI) is explained by the independent variable(s) (SIxIC), and in this case R^2 is 80%.

Moderating effect of IC on the relationship between BI and AU

The moderating effect of individualism/collectivism (IC) on the relationship between behavioral intention (BI) and actual use (AU) was investigated. A simple regression was used to test this hypothesis and the results shown in tables 6.6.37 and 6.6.38 were obtained.

Model summary: Table 6:6.37

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.749[a]	.561	.560	.1744440	.561	406.195	1

a. Predictors: (Constant), BIxIC

Coefficients[a]: Table 6:6.38

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.298	.177		7.317	.000
	BIxIC	.732	.036	.749	20.154	.000

a. Dependent variable: AU

The results presented in tables 6.6.37 and 6.6.38 above show that the cultural variable individualism/collectivism (IC) was found to moderate positively the relationship between BI_AU (β =0.749, 0.000), supporting H10c. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (BIxIC) and in this case R^2 is 56%.

Moderating effect of IC on the relationship between AT and BI

The moderating effect of individualism/collectivism (IC) on the relationship between attitude (AT) and behavioral intention (BI) was investigated. A simple regression was used to test this hypothesis and the results shown in tables 6.6.39 and 6.6.40 were obtained.

Model summary: Table 6:6.39

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.936[a]	.876	.876	.0973800	.876	2250.359	1

a. Predictors: (Constant), ATxIC

Coefficients[a]: Table 6:6.40

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.187	.099		1.889	.060
	ATxIC	.961	.020	.936	47.438	.000

a. Dependent variable: BI

The results presented in tables 6.6.39 and 6.6.40 above show that the cultural variable individualism /collectivism (IC) was found to moderate the relationship between AT_BI (β =0.936, 0.000), supporting H15. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (ATxIC), and in this case R^2 is 87%.

6.7.1.2 Masculinity/femininity (MF)

Five items were used to measure the moderating variable MF. The construct was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The overall mean was 1.914, indicating a feminine culture.

Moderating effect of MF on the relationship between PV and BI

The moderating effect of masculinity/femininity (MF) on the relationship between price value (PV) and behavioral intention (BI) was investigated. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.41 and 6.6.42 below.

Model summary: Table 6.6.41

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.517[a]	.267	.265	.2369134	.267	115.926	1

a. Predictors: (Constant), PVxMF

Coefficients[a] Table 6.6.42

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.402	.051		105.798	.000
	PVxMF	.047	.004	.517	10.767	.000

a. Dependent variable: BI

The results presented in tables 6.6.41 and 6.6.42 show that the cultural variable masculinity/femininity (MF) was found to moderate the relationship between PV_BI (β =0.517, 0.000), supporting H11. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (PVxMF), and in this case R^2 is 26%.

Moderating effect of MF on the relationship between AT and BI

The moderating effect of masculinity/femininity (MF) on the relationship between attitude (AT) and behavioral intention (BI) was investigated. A simple regression has been used to test this hypothesis and the results obtained are shown in tables 6.6.43 and 6.6.44.

Model Summary Table 6.6.43

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.320[a]	.102	.099	.2622332	.102	36.177	1

a. Predictors: (Constant), ATxMF

Coefficients[a] Table 6.6.44

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.186	.054		95.612	.000
	ATxMF	.023	.004	.320	6.015	.000

a. Dependent variable: BI

The results presented in the two tables above show that the cultural variable masculinity/femininity (MF) was found to moderate the relationship between AT_BI (β =0.320, 0.000), supporting H16. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (ATxMF), and in this case R^2 is 10%.

6.7.1.3 Uncertainty avoidance (UA)

Four items were used to measure the moderating effect of construct UA. The construct was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The overall mean was 2.207, indicating a low uncertainty avoidance culture.

Moderating effect of UA on the relationship between BI and AU

The moderating effect of uncertainty avoidance (UA) on the relationship between behavioral intention (BI) and actual use (AU) was investigated. A simple regression has been used to test this hypothesis and the results shown in tables 6.6.45 and 6.6.46 were obtained.

Model summary Table 6.6.45

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.780[a]	.609	.607	.1646685	.609	494.731	1

a. Predictors: (Constant), BIxUA

Coefficients[a] Table 6.6.46

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.308	.160		8.164	.000
	BIxUA	.731	.033	.780	22.243	.000

a. Dependent variable: AU

The results presented in tables 6.6.45 and 6.6.46 above show that the cultural variable uncertainty avoidance (UA) was found to moderate the relationship between BI_AU (β =0.780, 0.000), supporting H13. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (BIxUA), and in this case R^2 is 60%.

Moderating effect of UA on the relationship between AT and BI

The moderating effect of uncertainty avoidance (UA) on the relationship between attitude (AT) and behavioral intention (BI) was investigated. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.47 and 6.6.48 below.

Model summary Table 6.6.47

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.933[a]	.871	.870	.0994399	.871	2145.055	1

a. Predictors: (Constant), ATxUA

Coefficients[a] Table 6.6.48

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.156	.102		1.533	.126
	ATxUA	.967	.021	.933	46.315	.000

a. Dependent variable: BI

The results presented in Table 6.6.47 and Table 6.6.48 show that the cultural variable uncertainty avoidance (UA) was found to moderate the relationship between AT_BI (β =0.933, 0.000), supporting H18. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (ATxUA), and in this case R^2 is 87%.

6.7.1.4 Power distance (PD)

The construct PD was measured in the survey questionnaire using five items and through a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The overall mean was 3.612 indicating a high power distance culture.

Moderating effect of PD on the relationship between BI and AU

The moderating effect of power distance (PD) on the relationship between behavioral intention (BI) and actual use (AU) was investigated. A simple regression was used to test this hypothesis and the results shown in tables 6.6.49 and 6.6.50 were obtained.

Model summary Table 6.6.49

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.787[a]	.620	.619	.1622574	.620	519.064	1

a. Predictors: (Constant), BIxPD

Coefficients[a] Table 6.6.50

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.345	.155		8.689	.000
	BIxPD	.724	.032	.787	22.783	.000

a. Dependent variable: AU

The results presented in tables 6.6.49 and 6.6.50 show that the cultural variable power distance (PD) was found to moderate the relationship between BI_AU (β =0.787, 0.000), supporting H14. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (BIxUA), and in this case R^2 is 62%.

Moderating effect of PD on the relationship between AT and BI

The moderating effect of power distance (PD) on the relationship between attitude (AT) and behavioral intention (BI) was investigated. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.51 and 6.6.52 below.

Model summary Table 6.6.51

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.937[a]	.878	.877	.0967695	.878	2282.869	1

a. Predictors: (Constant), ATxPD

Coefficients[a] Table 6.6.52

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.208	.098		2.124	.034
	ATxPD	.957	.020	.937	47.779	.000

a. Dependent variable: BI

The results presented in the two tables above show that the cultural variable power distance (PD) was found to moderate the relationship between AT_BI (β =0.937, 0.000), supporting H19. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (ATxPD), and in this case R^2 is 87%.

6.7.1.5 Long/short term (LT) orientation

The construct LT was measured in the survey questionnaire using four items and through a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The overall mean was 3.840, indicating a short term orientation.

Moderating effect of LT on the relationship between PE and AT

The moderating effect of long/short term (LT) orientation on the relationship between performance expectancy (PE) and attitude (AT) was investigated. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.53 and 6.6.54.

Model summary Table 6.6.53

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.883[a]	.779	.778	.1281119	.779	1120.484	1

a. Predictors: (Constant), PExLT

Coefficients[a] Table 6.6.54

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.042	.055		55.104	.000
	PExLT	.079	.002	.883	33.474	.000

a. Dependent variable: AT

The results presented in Table 6.6.53 and Table 6.6.54 show that the cultural variable long/short Term (LT) was found to moderate the relationship between PE_AT (β =0.883, 0.000), supporting H12a. R^2 represents how much of the variation in the dependent variable (AT) is explained by the independent variable(s) (PExLT), and in this case R^2 is 77%.

Moderating effect of LT on the relationship between BI and AU

The moderating effect of long/short term (LT) orientation on the relationship between behavioral intention (BI) and actual use (AU) was investigated. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.55 and 6.6.56 below.

Model summary Table 6.6.55

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.848[a]	.719	.718	.1395218	.719	814.097	1

a. Predictors: (Constant), BIxLT

Coefficients[a] Table 6.6.56

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.145	.061		51.677	.000
	BIxLT	.074	.003	.848	28.532	.000

a. Dependent variable: AU

The results presented in Table 6.6.55 and Table 6.6.56 show that the cultural variable long/short Term (LT) was found to moderate the relationship between BI_AU (β =0.848, 0.000), supporting H12b. R^2 represents how much of the variation in the dependent variable (AU) is explained by the independent variable(s) (BIxLT), and in this case R^2 is 71%.

Moderating effect of LT on the relationship between AT and BI

The moderating effect of long/short term (LT) orientation on the relationship between attitude (AT) and behavioral intention (BI) was investigated. A simple regression was used to test this hypothesis and the results obtained are shown in tables 6.6.57 and 6.6.58 below.

Model summary Table 6.6.57

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.840[a]	.705	.705	.1501867	.705	761.773	1

a. Predictors: (Constant), ATxLT

Coefficients[a] Table 6.6.58

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.085	.065		47.262	.000
	ATxLT	.077	.003	.840	27.600	.000

a. Dependent variable: BI

The results presented in Table 6.6.57 and Table 6.6.58 above show that the cultural variable long/short term (LT) orientation was found to moderate the relationship between AT_BI (β =0.840, 0.000), supporting H17. R^2 represents how much of the variation in the dependent variable (BI) is explained by the independent variable(s) (ATxLT), and in this case R^2 is 70%.

Table 6.7: Moderation effects of cultural values on independent variables and dependent variables

Independent ⟶ Dependent variable	Independent x Moderator ⟶ Dependent variable
EE ⟶ AT = 0.617	EE x IC ⟶ AT = 0.959 (moderating positively)
SI ⟶ BI = 0.710	SI x IC ⟶ BI = 0.899 (moderating positively)
PV ⟶ BI = 0.210	PV x MF ⟶ BI = 0.517 (moderating positively)
PE ⟶ AT = 0.960	PE x LT ⟶ AT = 0.883 (negligible moderation)
AT ⟶ BI = 0.938	AT x IC ⟶ BI = 0.936 (negligible moderation)
	AT x MF ⟶ BI = 0.320 (moderating negatively)
	AT x LT ⟶ BI = 0.840 (moderating negatively)
	AT x UA ⟶ BI = 0.933 (negligible moderation)
	AT x PD ⟶ BI = 0.937 (negligible moderation)
BI ⟶ AU = 0.733	BI x IC ⟶ AU = 0.749 (moderating positively)
	BI x LT ⟶ AU = 0.848 (moderating positively)
	BI x UA ⟶ AU = 0.780 (moderating positively)
	BI x PD ⟶ AU = 0.787 (moderating positively)

6.8 Analysis of cultural values as moderators

The research model investigated and validated the influence of Hofstede's cultural moderators on relationships among different variables in the model, including behavioral intention and actual use. As shown in table 6.7 above, individualism/collectivism had a strong and positive moderating effect on the relationships between effort expectancy and attitude, social influence and behavioral intention and between behavioral intention and actual use. The effect was found to be stronger for

farmers with higher collectivism than for those with individualism, and this is in line with earlier research findings, such as Baptista (2015). On the positive moderating effect of individualism/collectivism on effort expectancy (ease of use) and attitude as well as behavioral intention and actual use, the findings confirmed that respondents with higher collectivism encourage each other to use mobile farming platforms which are easy to use, convenient and efficient, which then leads to a higher intention to use mobile farming platforms. These findings show that the ease of use of the system or platform plays a greater role in the decision to adopt technology for collectivist users. On the relationship between social influence and behavioral intention, the findings confirmed that farmers who are high on collectivism exert a stronger social influence on behavioral intention. In a collectivist society like Zimbabwe, social influence plays a pivotal role over intention because people in collectivist societies are normally more concerned about the opinions of others (Putit & Arnott, 2007). This is also in line with previous studies, including Tarhini (2013) who highlights that the opinions of significant others like peers play a greater role in the decision to adopt a technology for collectivist users. Individualism/collectivism however, had a negative moderating effect on the relationship between attitude and behavioral intention. While the negative moderating effect of individualism/collectivism on the relationship between attitude and behavioral intention was unexpected, it is however in line with other earlier studies, such as Zhou et al. (2007) who contend that collectivist cultures act as a barrier to mobile technology adoption.

Power distance moderated negatively the relationship between attitude and behavioral intention. Zimbabwe being a high power distance country, the findings confirm that individuals or farmers who are high on power distance display a significantly less favorable view towards adoption of new technology. This is consistent with previous research (Leng & Botelho, 2020; Tong, 2010). Individuals high on power distance are characterized by lower rates of innovation and acceptance of technology (Tarhini, 2013; Zmud, 1982). On the other hand, power distance moderated positively the relationship between behavioral intention and actual use and, again, this is in line with previous research (Baptista, 2015; Sriwindono & Yahya, 2012). The reason for the positive moderation could be that the opinions of others, such as agritex officers and peers, play greater roles in the decision to adopt technology for users with higher power distance cultural values. It could be that farmers with higher levels of power distance were intending to use the technology to comply with their superiors and please them.

Uncertainty avoidance had a positive moderating effect on the relationship between behavioral intention and actual use. This show a low uncertainty avoidance cultural characteristic. Baptisa (2015) has indicated that people with this cultural characteristic are not averse to taking risks and have a greater acceptance of new innovations, products and services. This could be the reason it moderated positively the relationship between behavioral intention and actual use. This is in line with previous findings, for example Chopdar, Korfiatis and Lytras (2018) who highlight that low uncertainty avoidance causes low perceived risk in the context of mobile technology adoption.

Long/short term orientation had a negative moderating effect on the relationship between performance expectancy and attitude as well as the relationship between attitude and behavioral intention, in harmony with previous research (Hassan et al., 2011). This suggests that people with short-term orientation like those in Zimbabwe, focus more on achieving quick results from a system more than the performance of that system. This then means that it is important for technology start-up companies to develop mobile farming platforms that give farmers quick results with regards to their farming activities since they have a relatively small propensity to save for the future.

Masculinity moderated positively the relationship between price value and behavioral intention. This advocates that farmers high on femininity seek to have equality and solidarity with regards to prices of mobile farming platforms.

In conclusion, the results for cultural values are aligned with Hofstede's cultural classification for most African countries as collectivist, feminine, low uncertainty avoidance, high power distance and short term regions though the study produced mixed results with regards to the moderating influences of Hofstede's cultural values on the model variables. One reason for mixed results could be that some cultural values might be affecting other relationships via some other variables which are not included in our model, an area that can be explored in future research.

6.9 Constraints of the usage of mobile farming platforms

The moderating effects of the cultural values analyzed in Table 6.7 above revealed that some cultural values are constraining the relationships of certain variables by moderating them in a negative way. However, there are some cultural values which moderated positively the independent and dependent variables in the model. The cultural values moderating positively have to be encouraged and supported since they enhance the acceptance and adoption of technology by users. Similarly, those cultural values moderating negatively have to be addressed so that their effects can be minimized.

6.10 Underlying factors that influence behavior towards successful adoption of mobile farming platforms.

The results of the study have revealed that attitude and Hofstede's cultural values as moderators, together with the original UTAUT 2 variables are the underlying factors that influence behavior towards successful adoption of mobile farming platforms. The positive effect of attitude on behavioral intention is consistent with previous studies, such as by Nassuora (2012) and Jairak et al. (2009) who argue that attitude positively influences behavioral intention with both effort expectancy and performance expectancy included. However, the results contradict those of Venkatesh et al. (2003) who argues that the effect of attitude on behavioral intention is spurious and it emerges only when performance expectancy and effort expectancy are omitted from the model. The results have revealed that the attitude of users has to be considered as a fundamental factor for the adoption or acceptance of any technology. Furthermore, the moderating effect of cultural values of users have to be considered as another underlying factor that influences behavior towards successful adoption of technology, particularly mobile farming platforms. Failure to consider these fundamental factors will result in unsuccessful acceptance of technology by users.

6.11 Summary of the model results

A summary of the results in terms of supported /not supported hypotheses that are related to social influence, performance expectancy, attitude, effort expectancy, facilitating conditions, hedonic motivation, price value, habit, behavioral intention, actual use and cultural dimensions is given in Table 6.8 below. The results show that all the hypothesized relationships for the direct variable and moderators were all supported.

Table 6.8 Summary of the hypotheses tests

Hypothesis No	Variable	Hypothesis	Study Results
H1a	Social influence	SI of mobile farming platforms adoption in Zimbabwe has a positive influence on PE.	**Supported**
H1b	Social influence	SI of mobile farming platforms adoption in Zimbabwe has a positive influence on BI.	**Supported**
H2	Performance expectancy (PE)	PE of mobile farming platforms in Zimbabwe has a positive influence on attitude (AT).	**Supported**
H3	Effort expectancy	EE of mobile farming platforms in Zimbabwe has a positive influence on attitude (AT).	**Supported**
H4a	Facilitating conditions	FC of mobile farming platforms in Zimbabwe have a positive influence on attitude (AT).	**Supported**
H4b	Facilitating conditions	FC of mobile farming platforms in Zimbabwe have a positive influence on behavioral intention (BI).	**Supported**

H4c	Facilitating conditions	FC of mobile farming platforms in Zimbabwe have a positive influence on actual usage (AU).	**Supported**
H5	Hedonic motivation	HM of mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).	**Supported**
H6	Price value	PV of mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).	**Supported**
H7a	Habit	Habit (HB) of mobile farming platforms adoption in Zimbabwe has a positive influence on behavioral intention (BI).	**Supported**
H7b	Habit	Habit of mobile farming platforms in Zimbabwe has a positive influence on Actual Use (AU).	**Supported**
H8	Attitude	Attitude towards using mobile farming platforms in Zimbabwe has a positive influence on behavioral intention (BI).	**Supported**
H9	Behavioral intention	Behavioral intention (BI) of mobile farming platforms in Zimbabwe	**Supported**

		has a positive influence on actual use (AU).	
Cultural Moderators: Cultural values have a moderating effect on the independent variables and dependent variables.			
H10a	Individualism/collectivism (IC	Individualism/collectivism (IC) moderates the relationship of effort expectancy (EE) and attitude (AT).	**Supported**
H10b	Individualism/collectivism (IC	Individualism/collectivism (IC) moderates the relationship of social influence (SI) and behavioral intention (BI).	**Supported**
H10c	Individualism/collectivism (IC	Individualism/collectivism (IC) moderates the relationship of behavioral intention (BI) and actual use (AU).	**Supported**
H11	Masculinity/femininity (MF	Masculinity/femininity (MF) moderates the relationship of price value (PV) and behavioral intention (BI)	**Supported**
H12a	Long/short term (LT)	Long/short term (LT) moderates the relationship of performance expectancy (PE) and attitude (AT).	**Supported**
H12b	Long/short term (LT)	Long/short term (LT) moderates the relationship	**Supported**

		of behavioral intention (BI) and actual use (AU).	
H13	Uncertainty avoidance (UC	Uncertainty avoidance (UC) moderates the relationship of behavioral intention (BI) and actual use (AU)	**Supported**
H14	Power distance (PD	Power distance (PD) moderates the relationship of behavioral intention (BI) and actual use (AU).	**Supported**
H15	Individualism/collectivism (IC	Individualism/collectivism (IC) moderates the relationship of attitude (AT) and behavioral intention (BI).	**Supported**
H16	Masculinity/femininity (MF)	Masculinity/femininity (MF) moderates the relationship of attitude (AT) and behavioral intention (BI).	**Supported**
H17	Long/short term (LT	Long/short term (LT) orientation moderates the relationship of attitude (AT) and behavioral intention (BI).	**Supported**
H18	Uncertainty avoidance (UC)	Uncertainty avoidance (UC) moderates the relationship of attitude (AT) and behavioral intention (BI).	**Supported**

H19	Power distance (PD)	Power distance (PD) moderates the relationship of attitude (AT) and behavioral intention (BI).	**Supported**

Table 6.8: Summary of Results related to Hypotheses Summary

6.12 Conclusion

This chapter presented the results of the main study and the next chapter presents the discussion of those results. The results of the study have shown that attitude positively influences behavioral intention in the adoption of technology, particularly mobile technology. This is consistent with earlier research findings by Nassuora (2012) and Jairak et al. (2009). On the moderating effect of Hofstede's cultural values, the study produced mixed results with regards to the moderating influences. As was shown in Table 6.7, some cultural values moderated positively, others had negligible moderating effect and others moderated negatively. The findings from these results have revealed that it cannot be specifically concluded that certain cultural values have a positive or negative moderating effect on the factors affecting adoption of technology. However, as a conclusion, it can be generalized that culture as a whole moderates, positively or negatively, the adoption of mobile technology. The results of the study have demonstrated the consistency of the variables in the model of adoption. In conclusion, it can be generalized that the variables in the model all influence positively the adoption of mobile technology as shown by the results. The results of the study help in understanding the factors that affect the adoption of mobile faming platforms/technology for smallholder farmers in Zimbabwe.

Chapter 7: Discussion

7.1 Introduction

Chapter 6 presented the results of the proposed research model to examine the potential factors that affect the adoption and usage of mobile farming platforms in Zimbabwe. A two-step approach was used during the data analysis process. Confirmatory Factor Analysis (CFA) was used in the first step to assess the constructs' validity and to test the model fit. The second step used Structural Equation Modeling (SEM) techniques to test the hypothesized relationships among the independent and dependent variables as well as to examine the moderating effect of cultural values. This chapter focuses on discussion and interpretation of the results presented in chapter 6. The findings are then connected to the research objectives of this study. This chapter is centered around 2 main parts. The first part provides a detailed discussion of the direct relationship in the model. The core objective of the first part is to understand the roles that social influence, performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, price value, habit and attitude play in affecting farmers' beliefs towards adoption and acceptance of mobile farming platforms in Zimbabwe. The second section of this chapter is dedicated to the understanding of the moderating effects of cultural dimensions on the relationships between the dependent and independent variables in the research model.

7.2 Impact of direct determinants

This section is dedicated to the discussion of the direct relationships between social influence, performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, price value, habit, attitude and behavioral intentions and actual usage. Figure 7.1 below shows the results of the direct hypothesized relationships in the proposed research model. The results revealed that all the paths were supported. The empirical results have shown that social influence, performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, price value, habit and attitude affect the farmers' perceptions towards using mobile farming platforms in Zimbabwe. This section provides a brief discussion about the direct hypotheses testing in the model.

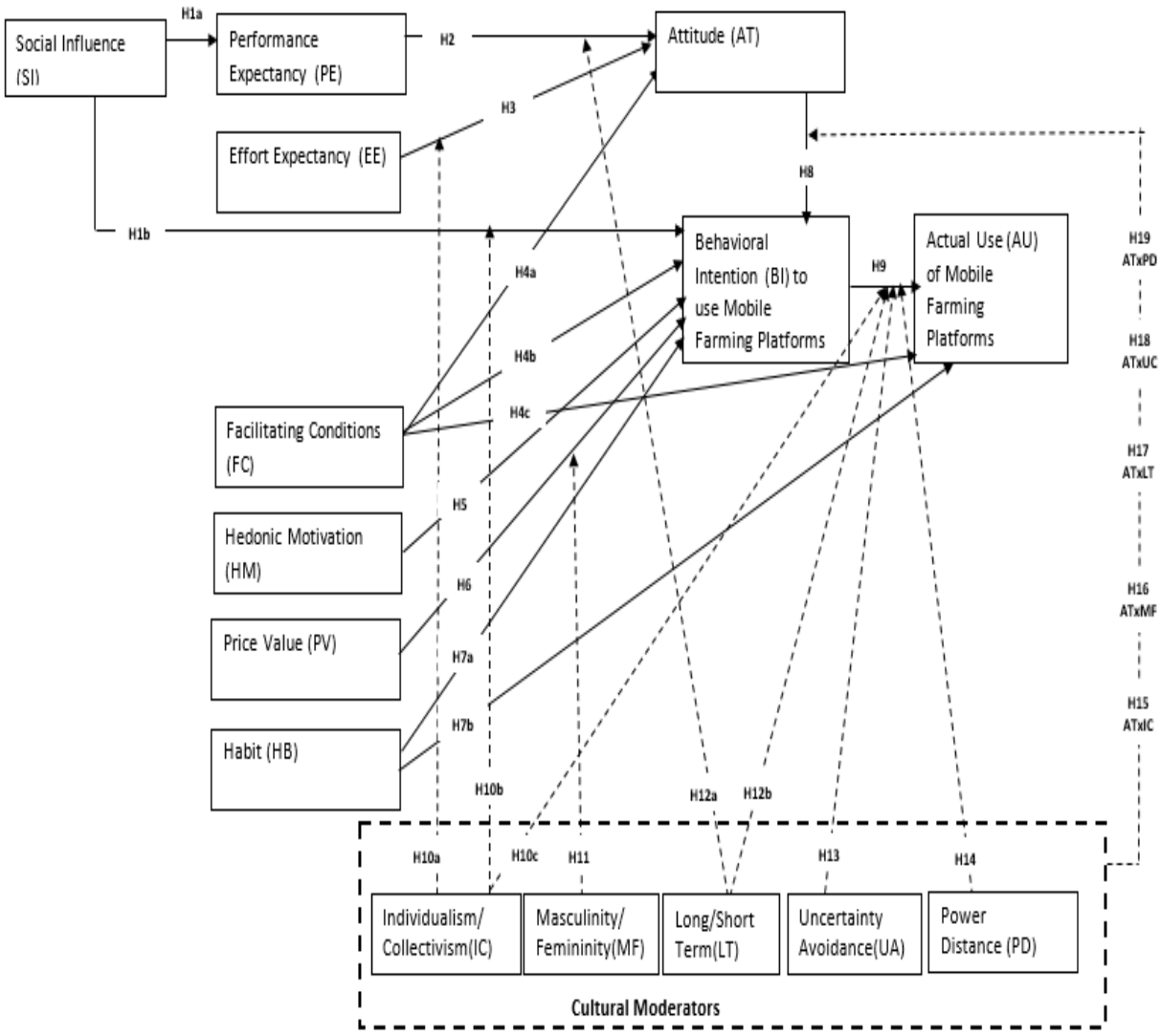

Figure 7.1: Results of hypothesized direct relationship in the model

- **Social influence (SI)**

Venkatesh et al. (2003) defines SI as an individual's perception of how important others, such as family and friends, believe he or she should adopt new technology. In the context of this study, social influence is the amount to which farmers believe others, particularly friends and family, believe they should use mobile farming platform services (Venkatesh et al., 2003). Lin et al. (2003) reports that individuals tend to take significant referents' opinions into consideration when assessing a technology's usefulness; thus, social influence has a significant positive effect on performance expectancy. The result from the current study showed that this variable has a significant influence on behavioral intention. This is consistent

with the original UTAUT model. The results also showed that this construct has a significant effect on performance expectancy.

- **Performance expectancy (PE)**

Venkatesh, Morris, Davis and Davis (2003) define performance expectancy (PE) as a user's belief that using a certain system will help him or her in improving job performance. In other words, it is the extent to which users of a system are optimistic that their productivity and effectiveness in their work could be improved through the use of the technology or application (Rouibah & Abbas, 2006). In the context of the current study, performance expectancy refers to a farmer's belief that adopting a mobile farming platform will improve his or her ability to accomplish farming tasks (Venkatesh et al., 2003). It implies that people will use computing/mobile technology if they believe it will help them achieve their goals (Compeau and Higgins, 1995). PE reflects the perception of improvement by using mobile farming platform measures such as speedy availability of information (Yang, 2009), convenience and immediacy (Zhou et al., 2010). Several studies have also revealed that performance expectancy has a positive effect on attitude (Jairak et al., 2009). According to the results in this study, performance expectancy has a positive effect on attitude. This result is consistent with findings from Jairak et al., (2009). Therefore, farmers will develop a positive attitude if they believe that using a mobile farming platform system will provide benefits in performing their farming activities.

- **Effort expectancy (EE)**

Venkatesh, Thong and Xu (2012) defined EE as the ease with which a person can use technology or a system. In other words, effort expectancy means that the user perceives that the system is very simple to use and that users' behavioral intention increases when system is not difficult to use (Kabir, Saidin & Ahmi, 2017). According to the results of this study, there is a statistically significant relation between effort expectancy and attitude in the case of using mobile farming platforms. This is consistent with Jairak et al. (2009) who highlight that effort expectancy has a positive effect on attitude.

- **Facilitating conditions (FC)**

Facilitating condition (FC) is described as the extent to which a user thinks that the system's organizational and technological infrastructure are in place to facilitate its use (Al-Qeisi, 2009). In other words, facilitating condition is the extent to which all the necessary facilities, tools, equipment and assistance are provided to an individual to support the use of a system (Kabir, Saidin & Ahmi, 2017). The result from this study revealed that facilitating conditions have a significant influence in predicting behavioral intention. The results also proved the existence of a relationship between actual use and facilitating conditions. These results are consistent with Alsharif (2013) who also proved the same. According to the same results, there is a statistically significant relation between facilitating conditions and attitude in the case of using mobile farming platforms. This is consistent with Nassuora (2012) who argues that a person who has access to a favorable set of facilitating conditions towards a system tends to develop a positive attitude to it.

- **Hedonic motivation (HM)**

Venkatesh et al. (2012) define hedonic motivation (HM) as the enjoyment or pleasure obtained from employing a technology. It can also be referred to as perceived enjoyment in information systems. Literature indicates that hedonic motivation directly influences technology acceptance and use (van der Heijden, 2004; Thong et al., 2006). The results of the current study indicate that hedonic motivation has an influence on behavioral intention. This is consistent with Venkatesh, Thong and Xu's (2012) arguments in the original UTAUT 2 model where they highlight that HM has a direct effect on BI.

- **Price value (PV)**

Price value is defined as the farmers' cognitive trade-off between the perceived benefits of mobile farming platforms and the monetary cost of using them (Venkatesh et al., 2012; Dodds, Monroe & Grewal, 1991). According to Moon and Chang (2014), cost affects a user's attitude towards adoption of certain technology. Wagner (2005) argues that cost is the foremost hindrance to the implementation and adoption of mobile systems. The findings of this study proved that there is a

relationship between price value and behavioral intention. This is consistent with the propositions in Venkatesh, Thong and Xu's (2012) UTAUT 2 model, which highlights that PV affects BI.

- **Habit (HB)**

Habit has been defined as the degree to which people tend to perform behaviors automatically as a result of their learning (Venkatesh et al., 2012; Limayem, Hirt & Cheung, 2007). When users or customers get more familiarity with a technology, they begin to use it on a regular basis. When a behavior has been repeated numerous times before, it becomes automatic in the future (Aarts, Verplanken & Knippenberg, 1998). Results in the current study indicate that habit has a significant influence on both BI and AU. This finding is consistent with Venkatesh, Thong and Xu's (2012) submissions in their UTAUT 2 model.

- **Attitude (AT)**

Attitude is defined as the overall affective reaction to using a system. Research has been carried out to investigate the influence of attitude towards the use of the technologies on behavioral intention. According to Venkatesh et al. (2003), the effect of attitude on behavioral intention is spurious and it emerges only when performance expectancy and effort expectancy are omitted from the model. However, Nassuora (2012) and Jairak et al. (2009) indicate that attitude impacts positively on behavioral intention with both effort expectancy and performance expectancy included. Results from this study found that attitude has a significant influence on BI. The strong relationship between attitude and behavioral intention in this model revealed that attitude towards mobile farming platforms positively influenced farmers' decision to adopt mobile farming platforms. Attitude was one of the new constructs that were added to this model and results proved that it is an important construct that should be included in the comprehensive UTAUT 2 model.

- **Behavioral intention (BI)**

For this study, BI has been defined as the adoption or use of mobile farming platforms that is expected to have a direct effect on actual usage as suggested by Venkatesh, Thong and Xu (2012). This study proved that there is a relationship between BI and AU. This is consistent with the underlying theory of Venkatesh, Thong and Xu (2012).

7.3 Discussion of results related to the cultural values as moderators

This section is devoted to discussing the moderating effect of the five cultural dimensions (individualism/collectivism, masculinity/femininity, long/short term, uncertainty avoidance, and power distance) on the relationships between social influence, performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, price value, habit, attitude and behavioral intentions and actual usage.

7.3.1 Individualism/collectivism (IC).

The results of the moderating effect of IC cultural variable are presented in Section 6.7.1.1 of Chapter 6. The overall mean for IC construct was 4.04, indicating high collectivist culture. The results reveal that farmers in the sample had collectivist values. The results are consistent with Hofstede' (1980) findings for African countries at national level. This means that since Zimbabwe is indicated as a collectivist country, it means that the views or opinions of fellow farmers with regards to the perceived usefulness of mobile farming platforms had positive influence on the decisions of other farmers to adopt mobile farming platforms. This variable had a positive moderating effect on the relationship between EE and AT as well the relationship between SI and BI.

7.3.2 Masculinity/femininity (MF)

The results of the moderating effect of MF cultural variable are presented in Section 6.7.1.2 of Chapter 6. The overall mean for IC construct was 1.91, indicating a feminine culture. These results are consistent with previous studies which indicate that most people in Africa reveal feminine cultural values, valuing close human relationships and quality of life (Geert Hofstede, 2014). This variable had a positive moderating effect on price value (PV) and BI.

7.3.3 Uncertainty avoidance (UA)

The results of the moderating effect of UA cultural variable are presented in Section 6.7.1.3 of Chapter 6. The overall mean for IC construct was 2.20, indicating a low uncertainty avoidance culture. This result is consistent with Geert Hofstede's (2014) classification of most African countries as having low uncertainty avoidance. Baptista (2015) highlights that people who have

this cultural characteristic are not averse to taking risks and they have a greater acceptance of new ideas, innovations and services. This variable had a positive moderating effect on BI and AU.

7.3.4 Power distance (PD)

The results of the moderating effect of PD cultural variable are presented in Section 6.7.1.4 of Chapter 6. The overall mean for IC construct was 3.61, indicating a high power distance culture. Our results are consistent with Hofstede's (1980) findings who revealed that African countries are hierarchical societies with high power distance values where people fear disagreeing with their superiors. This variable had a positive moderating effect on the relationship between BI and AU.

7.3.5 Long/short term (LT) orientation

The results of the moderating effect of LT cultural variable are presented in Section 6.7.1.5 below. The overall mean for LT construct was 3.84, indicating a short term orientation. The results are consistent with findings by Hofstede and Bond (1988), who revealed that African countries score low on this dimension, suggesting a short-term orientation where they exhibit great respect for traditions and they focus more on achieving quick results. This variable had a negative moderating effect on the relationship between PE and AT.

7.4 Conclusion

This chapter presented an in-depth interpretation of the major findings of the study. The hypotheses developed in the study were discussed in detail in chapter six and the results were based on the 2 major parts stated earlier on. The first section provided a detailed discussion of hypotheses related to the direct relationships in the research model. This section was very important because it helped the researcher to explain the overall relationships amongst social influence, performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, price value, habit, attitude and behavioral intentions and actual usage. This section gave a clear picture of the role that these factors play in affecting the farmers' beliefs towards adoption and acceptance of mobile farming platforms in Zimbabwe. The other section of this chapter was devoted to discussing the results related to the moderating effects on cultural values on the independent variables. In the next chapter, conclusions are made directions for future research are discussed.

Chapter 8: Conclusion and further research

The previous chapter discussed the findings of the study. This final chapter provides the conclusion and recommendations for future research.

8.1 The research questions and objectives

This study was conducted specifically to answer the following research questions.

1. What are the constraints in the usage of farming mobile platforms in Zimbabwe?
2. What are the key underlying factors that influence behavior towards successful adoption of mobile farming platforms?
3. How can a comprehensive mobile farming platform adoption model be developed?
4. How can the effectiveness of the proposed model be measured and evaluated?

In order to answer these questions, the following objectives were carried out:

1. Develop a comprehensive adoption model through extending UTAUT 2 model to explore the factors affecting the adoption of mobile farming platforms.
2. Explore the constraints facing the usage of mobile farming platforms.
3. Select the field work research methodology and preparation of instruments.

8.2 Research methodology

In chapter 5, the researcher reviewed the philosophical schools underlying different research methods. This review was done in order to thoroughly understand the most suitable methodology for the current study. The positivist school of philosophy was found to be the most appropriate for this study because it is mostly linked to quantitative methodology, which in turn uses a deductive approach.

This study used the quantitative methodology in answering the research questions as well as exploring the relationships amongst the many variables in the study. The survey method was used as the data collection method. Numerical data was generated from this method and this data was analyzed using statistical analysis techniques. Hypotheses had to be tested and checked for validity. Therefore, this study is confirmatory.

Through hypothesis, the study tested causal direct and indirect relationships between different constructs outlined in the conceptual framework. Therefore, a deductive approach was chosen. Deductive reasoning is a set of procedures for evaluating the validity of testable theories in the real world. When using deduction, researchers arrive at a reasoned conclusion by logical generalizations of the known facts.

This study adopted the UTAUT 2 model and extended it by adding two major constructs, namely attitude and culture as was shown in Figure 4.1. The study explored the factors that affect adoption of mobile farming platforms among the smallholder farmers in Zimbabwe. Therefore, there was a need for a larger questionnaire to collect data. The questionnaire was chosen as the most appropriate data collection tool considering that data was being collected from a larger geographical area consisting of three provinces of Zimbabwe.

8.3 Summary of the research findings

Chapter seven consists of a thorough discussion of the results. The study concludes that attitude positively influences behavioral intention in the adoption of technology, particularly mobile technology, and this is consistent with earlier studies, such as Nassuora (2012) and Jairak et al. (2009). On the moderating effect of Hofstede's cultural values, the study produced mixed results with regards to the moderating influences. As shown in Table 6.7 in the previous chapter, some cultural values were moderating positively, others had negligible moderating effect and other cultural values were moderating negatively. These findings show that it cannot be specifically concluded that certain cultural values have a positive or negative moderating effect on the factors affecting adoption of technology. However, as a conclusion, it can be generalized that culture as a whole moderates, be it positively or negatively, in the adoption of mobile technology. The results of the study have demonstrated consistency of the variables in the model of adoption. In conclusion, it can be generalized that the variables in the model all influence positively in the adoption of mobile technology, as shown by the results. The results of this study help in understanding the factors that affect the adoption of mobile faming platforms/technology for smallholder farmers in Zimbabwe.

8.4 Recommendations

Based on the research findings, the researcher proposes a set of recommendations to farmers, extension workers, the government and technology start-up companies. These are highlighted below:

1. The results showed the importance of the identified factors in influencing behavioral intention. Since all the factors are important in technology acceptance, there is need for technology start-up companies to consider all the factors and take them into cognizance when developing mobile farming platforms. Since previous studies indicated that only 16% of mobile agriculture solutions implemented in developing nations make it to widespread use , there is need now to consider all these factors so that there is full adoption of these platforms by farmers.

2. Results have also shown the importance and effect of attitude in influencing behavioral intention. The current UTAUT 2 model had ignored the attitude factor as an important construct, claiming that the effect of attitude on behavioral intention is spurious and it emerges only when performance expectancy and effort expectancy are omitted from the model. However, results from this study indicate that attitude is one of the key factors that influence behavioral intention to adopt a technology. The researcher therefore recommends that developers, companies, extension officers and all parties involved should grow a positive attitude to the users of the technology so that it could be fully accepted and adopted.

3. Lastly, the study showed the importance of culture as a moderating variable between different relationships of the independent variables in the model. In light of this, the researcher therefore recommends that all parties who participate in the deployment of the mobile farming platforms to farmers for adoption, have to study and understand the cultural diversities of the users. This is important because culture has an influence on acceptance and adoption of technology as revealed by the results of this study.

8.5 Research limitations

The first limitation of this study has to do with the size of the sample chosen. The sample did not include all the provinces in Zimbabwe, as the study collected data from three provinces. Therefore, care should be exercised when generalizing these findings to a larger population. The second limitation was that this research was mainly interested in studying the adoption of mobile farming platforms by individual farmers only and it did not include the opinions and views of other parties like the government, technology start-up companies and agriculture extension officers. This means that the study did not adopt a helicopter view in terms of exploring and analyzing the larger problem surrounding adoption and acceptance of mobile farming platforms.

8.6 Recommendations for further research

Considering the limitations of this study, some suggestions can be made for future research. Future researches could improve on this study by expanding the size of sample from three provinces to all the provinces in the country. In this study it was not possible to use triangulation (interviews and surveys) due to time constraints. Therefore, future researchers could strengthen the findings of the questionnaire by supporting it with observation and interviews so that reliability of data can be further improved.

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Appendix A: Survey Questionnaire

SECTION A: ABOUT YOURSELF (Please tick √ only one option)

Gender (G)	Male ☐	Female ☐	
Age (A)	Below 35 ☐	From 35 –50 ☐	51 and above ☐
Educational Level (EL)	Diploma & below ☐	Degree ☐	Masters and above ☐
Province (P)	Mash East ☐	Mash Central ☐	Harare Metropolitan ☐

SECTION B: PERFOMANCE EXPECTANCY, EFFORT EXPECTANCY, SOCIAL INFLUENCE, FACILITATING CONDITIONS, HEDONIC MOTIVATION, PRICE VALUE, HABIT AND BEHAVIORAL INTENTION ABOUT MOBILE FARMING PLATFORMS USAGE.

Please rate the extent to which you agree with each statement below. (Please tick √ the most appropriate option for each statement below)

1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree						
PE. *Performance Expectancy (PE) about using Mobile Farming Platforms*						
Using Mobile Farming Platforms (**EcoFarmer, eHurudza, eMkambo & Esoko**) will						
1	… enhance my effectiveness in farming	1	2	3	4	5
2	… make it easier to access and disseminate my agricultural product prices	1	2	3	4	5
3	… increase my farming productivity	1	2	3	4	5
4	… enable me to get accurate and reliable agricultural information	1	2	3	4	5
EE. *Effort Expectancy (EE) about using Mobile Farming Platforms*						
1	Learning to use Mobile Farming Platforms is easy for me	1	2	3	4	5
2	My interaction with mobile farming platforms is clear & understandable	1	2	3	4	5
3	It is easy for me to become skilful at using mobile farming platforms	1	2	3	4	5
4	I find it easy to get the mobile farming platform do what I want it to do	1	2	3	4	5
5	I find mobile farming platforms easy to use.	1	2	3	4	5
SI. *Social Influence (SI) about using Mobile Farming Platforms*						
1	My friends & relatives encourage me to use mobile farming platforms	1	2	3	4	5
2	Extension workers think that I should use mobile farming platforms	1	2	3	4	5
3	Other farmers think that I should use mobile farming platforms	1	2	3	4	5
4	Generally speaking, I would do what extension workers think I should do	1	2	3	4	5
FC. *Facilitating Conditions (FC) about using Mobile Farming Platforms*						
1	I have the knowledge necessary to use mobile farming platforms	1	2	3	4	5
2	I have the resources necessary to use mobile farming platforms	1	2	3	4	5
3	I can get help from others when I have difficulties using mobile farming platforms	1	2	3	4	5

4	I believe the government provides training services for using mobile farming platforms	1	2	3	4	5

***Please rate the extent to which you agree with each statement below*. (Please tick √ the most appropriate option for each statement below)**

1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree						
HM. *Hedonic Motivation (HM) about using Mobile Farming Platforms*						
1	Using mobile farming platforms to access agricultural market information is fun	1	2	3	4	5
2	Using mobile farming platforms is enjoyable	1	2	3	4	5
3	Using mobile farming platforms is entertaining	1	2	3	4	5
PV. *Price Value (PV) about using Mobile Farming Platforms*						
1	It is less costly to use mobile farming platforms to access agricultural marketing information	1	2	3	4	5
2	Mobile farming platforms are reasonably priced comparing with other channels	1	2	3	4	5
3	At the current price, mobile farming platforms provide a good value for smallholder farmers to access agricultural information	1	2	3	4	5
4	I think it is cheaper to acquire a mobile communication device.	1	2	3	4	5
HB. *Habit (HB) about using Mobile Farming Platforms*						
1	The use of mobile farming platforms to access agricultural information has become a habit for me	1	2	3	4	5
2	I am addicted to using mobile farming platforms	1	2	3	4	5
3	I must use mobile farming platforms	1	2	3	4	5
4	Using mobile farming platforms as a farmer has become natural to me	1	2	3	4	5
AT. *Attitude towards Mobile Farming Platforms*						
1	Using mobile farming platforms make my work as a farmer enjoyable	1	2	3	4	5
2	I like using mobile farming platforms	1	2	3	4	5
3	Mobile farming platforms are beneficial	1	2	3	4	5
4	I look forward to those areas of my farming that require me to use mobile farming platforms.	1	2	3	4	5
BI. *Behavioral Intention (BI) about using Mobile Farming Platforms*						
1	I will always try to use mobile farming platforms to access agricultural market information in my daily life	1	2	3	4	5
2	I intend to continue using mobile farming platforms to access agricultural market information in the future	1	2	3	4	5
3	I plan to continue to use mobile farming platforms frequently	1	2	3	4	5
4	I will recommend others to use mobile farming platforms to access agricultural market information	1	2	3	4	5

SECTION C: ACTUAL USAGE (AU) of Mobile Farming Platforms (*EcoFarmer, eHurudza, eMkambo & Esoko)*

1= Have not used 2= Everyday 3= Once in 2- 3days 4= Once a week 5= Once a month

AU1	On average, how **frequently** do you use Mobile Farming Platforms	1	2	3	4	5

1= Almost never 2= Less than 30mins 3= From 30mins to 1hr 4= From 1hr to 2hr 5= 3hrs and above

AU2	On the average working **day**, how much time do you spend on the mobile farming platform system	1	2	3	4	5

38. Please indicate the extent to which you use the Mobile Farming Platforms to perform the following services.

1= Not at all 2= To a small extent 3= To some extent 4= To a moderate extent 5= To a greater extent

AUDW	Daily weather	1	2	3	4	5
AUWCI	Weekly crop information	1	2	3	4	5
AUFMT	Farming & market tips	1	2	3	4	5
AUDRA	Daily rainfall advice	1	2	3	4	5
AML	Adverts & marketing links	1	2	3	4	5
MPI	Market price information	1	2	3	4	5
WBFP	Weekly best farming practices	1	2	3	4	5
FL	Financial linkages	1	2	3	4	5

SECTION D: POWER DISTANCE, UNCERTAINTY AVOIDANCE, MASCULINITY/FEMININITY, INDIVIDUALISM/COLLECTIVISM AND LONG/SHORT TERM

Please rate the extent to which you agree with each statement below. (Please tick √ the most appropriate option for each statement below)

1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

PD. *Power Distance (PD)*						
1	Agriculture extension workers should make most decisions without always consulting farmers	1	2	3	4	5
2	Government should not always ask the opinions of farmers too frequently	1	2	3	4	5
3	Extension workers should not delegate important tasks to farmers	1	2	3	4	5
4	Farmers should not disagree with decisions made by extension workers and government	1	2	3	4	5
5	It is frequently necessary for extension workers to use authority and power when dealing with farmers	1	2	3	4	5
UA. *Uncertainty Avoidance(UA)*						
1	When starting a new farming process, I fear doing it.	1	2	3	4	5
2	I fear uncertainty about the future in my farming activities	1	2	3	4	5
3	I fear ambiguous situations and unfamiliar adventures in farming	1	2	3	4	5
4	It is risky to grow new crops that have never been grown before	1	2	3	4	5

***Please rate the extent to which you agree with each statement below*. (Please tick √ the most appropriate option for each statement below)**

1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

MF. *Masculinity/Femininity(MF)*						
1	It is preferable to have a male extension workers in high-level positions rather than a female ones	1	2	3	4	5
2	There are some areas in which a male farmer can always do better than a female farmer	1	2	3	4	5
3	Solving farming challenges require the active forcible approach which is typical of men.	1	2	3	4	5
4	Male farmers are more determined and competitive focusing on achievement and material success.	1	2	3	4	5
5	Women do not value recognition and promotion in their farming as much as men do	1	2	3	4	5
IC. *Individualism/Collectivism(IC)*						
1	Individual farmers should stick with their group even through difficulties	1	2	3	4	5
2	Individuals should sacrifice self-interest for the group that they belong to	1	2	3	4	5
3	Group welfare is more important that individual rewards	1	2	3	4	5
4	Group success is more important than individual success in farming	1	2	3	4	5
5	Group loyalty should be encouraged even if individual goals suffer	1	2	3	4	5
6	Being accepted as a member of a group is more important than having autonomy and independence	1	2	3	4	5
LT. *Long/Short Term(LT)*						
1	Respect for tradition is important for me as a farmer	1	2	3	4	5
2	As a farmer I plan for the short term & want to achieve quick results	1	2	3	4	5
3	Traditional values are important for me	1	2	3	4	5

Appendix B: Cover Letter

Vaal University of Technology (VUT)
Faculty of Applied & Computer Sciences.
Department of Information & Communication Technology

Dear Participant

I am a DTech research student at Vaal University of Technology, South Africa, under the supervision of Professor Tranos Zuva and Dr Martin Appiah in the department of Information & Communication Technology. The research title is:

A Model for the Adoption of Mobile Farming Platforms (MFPs) by Smallholder Farmers in Zimbabwe.

The main aim of this study is to investigate and understand how cultural values, individual differences and other factors affect smallholder farmers' perceptions and behaviors when using mobile farming platforms in order to generate a comprehensive model that determines the acceptance of mobile technology by smallholder farmers in developing worlds particularly Zimbabwe. This research will help to better understand various underlying factors that influence behavior towards successful adoption of mobile farming platforms. The outcome of the research should help policy makers to understand the constraints and factors facing the usage of mobile farming platforms and for technology start-up companies to understand "how" they could improve their technologies and implement them in different cultural contexts.

The questionnaire consists of four parts. The first part collects data about the participant's general and demographic information. The second part assess the individual factors that affect the adoption of mobile farming platforms. The third part measures the actual usage of mobile farming platforms. The last part measures the cultural factors about the participants (farmers). The questionnaire will take approximately 7 to 10 minutes of your time. Your participation is voluntary. If you do not wish to participate, simply discard the questionnaire at any time. All your information including your name will be kept completely anonymous and will be used for the purpose of this PhD research and destroyed after two years.

If you have any questions or concerns, please contact me at fine.masimba@gmail.com or my supervisors tranosz@vut.ac.za, martina@vut.ac.za.

Appendix C: Pilot Study

Sample Distribution by Sex and Age

Age	Number	Sex	Total
34 years or less	3	Male	15
35-50 years	9		
51yrs and above	3		
35 years or less	4	Female	25
35 – 50 years	18		
51 yrs and above	3		

Cronbach's Alpha and Inter Item correlation

Factor	Number of Items	Cronbach Alfa	Inter-Item Correlation	Item-to-total Correlation
PE	4	.978	.906 -.956	.932 - .965
EE	5	.994	.949 - .988	.970 - .991
SI	4	.980	.890 - .953	.936 - .970
FC	4	.984	.906 - .954	.944 - .977
HM	3	.972	.912 -.948	.929 - .957
PV	4	.932	.824 - .961	.902 - .922
HB	4	.773	.385 -.933	.535 - .636
AT	4	.940	.736 - .862	.801 - .912
BI	4	.716	.336 -.962	.514 -.843
PD	5	.946	.690 - .929	.755 - .942
UA	4	.982	.905 - .977	.930 - .971
MF	5	.906	.365 - .977	.591 - .909
IC	6	.957	.703 - .960	.782 - .940
LT	3	.964	.879 - .947	.907 - .961

Appendix D: Descriptive Analysis

Demographic Characteristics

Gender	Count	Percent
Male	153	43.5%
Female	199	56.5%
Total	352	100%
Age	Count	Percent
34 years or less	54	15.3%
35-50 years	201	57.1%
51yrs and above	97	27.6%
Total	352	100
Level of Education	Count	Percent
Diploma and below	297	84.4
Degree	39	11.1
Masters and above	16	4.5
Total	352	100
Province	Count	Percent
Mashonaland East	107	30.4
Mashonaland Central	117	33.2
Harare Metropolitan	128	36.4
Total	352	100

Mean (M) and standard deviation

Questions	Mean (M)	Std. Dev
Section A: Demographic Information		
1. Gender	1.30	1.244
2. Age	2.05	1.310
3. Education Level	1.76	1.002
4. Province	2.11	1.038
Section B: Assesses Farmer's Beliefs about using Mobile Farming Platforms Using a rating scale of 1 to 5 from strongly disagree to 5 strongly agree		
Performance Expectancy (PE)		
Items	Mean (M)	Std. Dev.
PE1: The platform enhance my effectiveness in farming.	3.69	1.121
PE2: The platform make it easier to access and disseminate my agricultural product prices	3.82	1.041
PE3: The platform increase my farming productivity	3.78	1.009
PE4: The platform enable me to get accurate and reliable agricultural information	3.73	0.957
Effort Expectancy (EE)		
EE1: Learning to use Mobile Farming Platforms is easy for me	3.20	1.006
EE2: My interaction with mobile farming platforms is clear & understandable	3.31	1.233
EE3: It is easy for me to become skillful at using mobile farming platforms	3.43	1.167
EE4: I find it easy to get the mobile farming platform do what I want it to do	3.81	1.101
Social Influence (SI)		
SI1: My friends & relatives encourage me to use mobile farming platforms	2.74	1.345
SI2: Extension workers think that I should use mobile farming platforms	3.22	1.059
SI3: Other farmers think that I should use mobile farming platforms	2.82	1.175
SI4: Generally speaking, I would do what extension workers think I should do	2.67	0.979

Facilitating Conditions (FC)		
FC1: I have the knowledge necessary to use mobile farming platforms	3.15	1.234
FC2: I have the resources necessary to use mobile farming platforms	2.94	1.192
FC3: I can get help from others when I have difficulties using mobile farming platforms	2.83	1.053
FC4: I believe the government provides training services for using mobile farming platforms	2.46	1.079
Hedonic Motivation (HM)		
HM1: Using mobile farming platforms to access agricultural market information is fun	2.89	1.234
HM2: Using mobile farming platforms is enjoyable	3.31	1.123
HM3: Using mobile farming platforms is entertaining	3.67	1.035
Price Value (PV)		
PV1: It is less costly to use mobile farming platforms to access agricultural marketing information	3.90	1.214
PV2: Mobile farming platforms are reasonably priced comparing with other channels	3.21	1.187
PV3: At the current price, mobile farming platforms provide a good value for smallholder farmers to access agricultural information	3.01	1.167
PV4: I think it is cheaper to acquire a mobile communication device.	2.96	1.132
Habit (HB)		
HB1: The use of mobile farming platforms to access agricultural information has become a habit for me	2.91	1.187
HB2: I am addicted to using mobile farming platforms	3.12	1.051
HB3: I must use mobile farming platforms	3.71	1.141
HB4: Using mobile farming platforms as a farmer has become natural to me	3.07	1.191
Attitude (AT)		
AT1: Using mobile farming platforms make my work as a farmer enjoyable	4.11	1.902
AT2: I like using mobile farming platforms	3.54	1.113
AT3: Mobile farming platforms are beneficial	3.68	1.056

AT4: I look forward to those areas of my farming that require me to use mobile farming platforms.	3.31	1.160
Behavioral Intention (BI)		
BI1:I will always try to use mobile farming platforms to access agricultural market information in my daily life	4.12	1.356
BI2: I intend to continue using mobile farming platforms to access agricultural market information in the future	3.96	1.293
BI3: I plan to continue to use mobile farming platforms frequently	3.67	1.309
BI4: I will recommend others to use mobile farming platforms to access agricultural market information	4.71	1.320
Section C: Actual usage of Mobile Farming Platforms		
AU1:On average, how frequently do you use Mobile Farming Platforms	3.27	1.684
AU2: On the average working day, how much time do you spend on the mobile farming platform system.	3.58	1.245
Mobile Farming Platform usage		
To what extent do you use the Mobile Farming Platform to perform the following services?		
Daily weather	3.78	1.093
Weekly crop information	2.87	1.148
Farming & market tips	3.32	1.254
Daily rainfall advice	3.45	0.787
Adverts & marketing links	2.93	1.311
Market price information	3.65	1.282
Weekly best farming practices	3.35	1.284
Financial linkages	2.89	1.345
Section D: Assess moderating effect of cultural values Using a rating scale of 1 to 5 from strongly disagree to 5 strongly agree		
Power Distance (PD)		
PD1: Agriculture extension workers should make most decisions without always consulting farmers	3.13	1.542
PD2: Government should not always ask the opinions of farmers too frequently	3.50	1.658
PD3: Extension workers should not delegate important tasks to farmers	4.21	1.568

PD4: Farmers should not disagree with decisions made by extension workers and government	4.06	1.515
PD5: It is frequently necessary for extension workers to use authority and power when dealing with farmers	3.16	1.443
Uncertainty Avoidance (UA)		
UA1: When starting a new farming process, I fear doing it.	2.17	1.668
UA2: I fear uncertainty about the future in my farming activities	2.38	1.592
UA3: I fear ambiguous situations and unfamiliar adventures in farming	2.06	1.597
UA4: It is risky to grow new crops that have never been grown before	2.22	1.616
Masculinity/Femininity (MF)		
MF1: It is preferable to have a male extension workers in high-level positions rather than a female ones	2.16	1.461
MF2: There are some areas in which a male farmer can always do better than a female farmer	2.01	1.460
MF3: Solving farming challenges require the active forcible approach which is typical of men.	1.98	1.659
MF4: Male farmers are more determined and competitive focusing on achievement and material success.	1.53	1.569
MF5: Women do not value recognition and promotion in their farming as much as men do	1.89	1.456
Individualism/Collectivism(IC)		
IC1: Individual farmers should stick with their group even through difficulties	4.21	1.412
IC2: Individuals should sacrifice self-interest for the group that they belong to	3.98	1.223
IC3: Group welfare is more important that individual rewards	4.10	1.291
IC4: Group success is more important than individual success in farming	3.92	1.319
IC5: Group loyalty should be encouraged even if individual goals suffer	4.04	1.269
IC6: Being accepted as a member of a group is more important than having autonomy and independence	4.01	1.478
Long/Short Term (LT)		
LT: Respect for tradition is important for me as a farmer	3.76	1.234
LT: As a farmer I plan for the short term & want to achieve quick results	3.66	1.654
LT: Traditional values are important for me	4.10	1.541
Average of means	3.29	1.301
Total respondents	352	

Appendix E: Statistical Analysis

Model Summary Table 6.6.1: H1a

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.763[a]	.582	.581	.1815221	.582	443.609	1

b. Predictors: (Constant), SI

Coefficients[a] Table 6.6.2 H1a Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.505	.207		2.433	.016
	SI	.895	.043	.763	21.062	.000

Model Summary Table 6.6.3: H1b Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.710[a]	.503	.502	.1950242	.503	322.352	1

b. Predictors: (Constant), SI

Coefficients[a] Table 6.6.4: H1b Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.875	.223		3.926	.000
	FC	.820	.046	.710	17.954	.000

a. Dependent Variable: BI

Model Summary: Table 6.6.5 : H2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.960[a]	.921	.921	.0766286	.921	370.703	1

b. Predictors: (Constant), PE

Coefficients[a]: Table 6.6.6: H2 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.343	.075		4.601	.000
	PE	.931	.015	.960	60.850	.000

a. Dependent Variable: AT

Model Summary: Table 6.6.7 : H3 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.617[a]	.380	.378	.2145288	.380	194.994	1

b. Predictors: (Constant), EE

Coefficients[a]: Table 6.6.8 : H3 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.923	.140		20.837	.000
	EE	.406	.029	.617	13.964	.000

b. Dependent Variable: AT

Model Summary: Table 6.6.9 : H4a Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.727[a]	.528	.527	.1871759	.528	355.882	1

a. Predictors: (Constant), FC

Coefficients[a]: Table 6:6.10 : H4a Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.844	.214		3.948	.000
	FC	.827	.044	.727	18.865	.000

b. Dependent Variable: AT

Model Summary: Table 6.6.11 : H4b Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.710[a]	.503	.502	.1950242	.503	322.352	1

b. Predictors: (Constant), FC

Coefficients[a]: Table 6:6.12 H4b Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.875	.223		3.926	.000
	FC	.820	.046	.710	17.954	.000

b. Dependent Variable: BI

Model Summary: Table 6:6.13 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.987[a]	.974	.974	.0421235	.974	12101.902	1

b. Predictors: (Constant), FC

Coefficients[a]: Table 6:6.14 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.422	.048		-8.773	.000
	FC	1.085	.010	.987	110.009	.000

b. Dependent Variable: AU

Model Summary: Table 6:6.15 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.254[a]	.065	.062	.2676618	.065	21.956	1

b. Predictors: (Constant), HM

Coefficients[a]: Table 6:6.16 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.168	.151		27.628	.000
	HM	.301	.064	.254	4.686	.000

b. Dependent Variable: BI

Model Summary: Table 6:6.17 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.210[a]	.044	.041	.2706027	.044	14.607	1

a. Predictors: (Constant), PV

Coefficients[a]: Table 6:6.18 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.121	.197		20.928	.000
	PV	.185	.048	.210	3.822	.000

a. Dependent Variable: BI

Model Summary: Table 6:6.19

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.935[a]	.875	.874	.0980405	.875	221.869	1

a. Predictors: (Constant), HB

Coefficients[a]: Table 6:6.**20**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.167	.100		1.667	.097
	HB	.965	.020	.935	47.073	.000

a. Dependent Variable: BI

Model Summary: Table 6:6.25

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.733[a]	.538	.536	.1790006	.538	369.795	1

a. Predictors: (Constant), BI

Coefficients[a] Table 6:6.26

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.469	.177		8.300	.000
	BI	.697	.036	.733	19.230	.000

a. Dependent Variable: AU

Model Summary: Table 6:6.21

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.748[a]	.560	.559	.1746319	.560	404.637	1

a. Predictors: (Constant), HB

Coefficients[a] Table 6:16.22 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.286	.178		7.212	.000
	HB	.734	.037	.748	20.116	.000

a. Dependent Variable: AU

Model Summary: Table 6:6.23

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.938[a]	.879	.879	.0962050	.879	231.478	1

b. Predictors: (Constant), AT

Coefficients[a] Table 6:6.24

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.229	.097		2.371	.018
	AT	.952	.020	.938	48.099	.000

a. Dependent Variable: BI

Model Summary: Table 6:6.25

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.733[a]	.538	.536	.1790006	.538	369.795	1

a. Predictors: (Constant), BI

Coefficients[a] Table 6:6.26

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.469	.177		8.300	.000
	BI	.697	.036	.733	19.230	.000

a. Dependent Variable: AU

Combined Influence of FC, PE and EE on AT.

Model Summary: Table 6:6.27

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.965[a]	.931	.930	.0720185	.931	1411.975	3

b. Predictors: (Constant), FC, PE, EE

Coefficients[a] Table 6:6.28

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.585	.089		6.557	.000
	PE	.952	.022	.982	42.678	.000
	EE	.110	.017	.167	6.608	.000
	FC	-.180	.036	-.158	-4.990	.000

b. Dependent Variable: AT

Combined Influence of HB, PV, HM, FC and SI on BI.

Model Summary: Table 6:6.29

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.942[a]	.888	.886	.0932850	.888	496.960	5

a. Predictors: (Constant), HB, PV, HM, FC, SI

Coefficients[a] Table 6:6.30

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.153	.131		-1.173	.242
	SI	.968	.214	.863	4.513	.000
	FC	-.855	.214	-.740	-3.996	.000
	HM	.081	.028	.068	2.893	.004
	PV	.045	.017	.051	2.560	.011
	HB	.842	.033	.816	25.811	.000

a. Dependent Variable: BI

Combined Influence of FC and HB on AU.

Model Summary: Table 6:6.31

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.988[a]	.977	.976	.0403481	.977	6609.976	2

b. Predictors: (Constant), HB, FC

Coefficients[a] **Table 6:6.32**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.483	.047		-10.186	.000
	FC	1.031	.014	.938	75.100	.000
	HB	.067	.012	.068	5.441	.000

a. Dependent Variable: AU

Moderating Effects of Cultural Values

Model Summary: Table 6:6.33

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.959[a]	.920	.920	.0769350	.920	3670.744	1

a. Predictors: (Constant), EExIC

Coefficients[a] Table 6: 6.34

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.346	.075		4.620	.000
	EExIC	.930	.015	.959	60.587	.000

b. Dependent Variable: AT

Model Summary: Table 6:6.35

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.899[a]	.808	.807	.1213468	.808	1336.012	1

a. Predictors: (Constant), SIxIC

Coefficients[a] Table 6:6.36

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.562	.118		4.761	.000
	SIxIC	.885	.024	.899	36.551	.000

b. Dependent Variable: BI

Model Summary: Table 6:6.37

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.749[a]	.561	.560	.1744440	.561	406.195	1

b. Predictors: (Constant), BIxIC

Coefficients[a]: Table 6:6.38

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.298	.177		7.317	.000
	BIxIC	.732	.036	.749	20.154	.000

b. Dependent Variable: AU

Model Summary: Table 6:6.39

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.936[a]	.876	.876	.0973800	.876	2250.359	1

a. Predictors: (Constant), ATxIC

Coefficients[a]: Table 6:6.40

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.187	.099		1.889	.060
	ATxIC	.961	.020	.936	47.438	.000

a. Dependent Variable: BI

Model Summary: Table 6.6.41

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.517[a]	.267	.265	.2369134	.267	115.926	1

a. Predictors: (Constant), PVxMF

Coefficients[a] Table 6.6.42

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.402	.051		105.798	.000
	PVxMF	.047	.004	.517	10.767	.000

a. Dependent Variable: BI

Model Summary Table 6.6.43

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.320[a]	.102	.099	.2622332	.102	36.177	1

a. Predictors: (Constant), ATxMF

Coefficients[a] Table 6.6.44

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.186	.054		95.612	.000
	ATxMF	.023	.004	.320	6.015	.000

b. Dependent Variable: BI

Model Summary Table 6.6.45

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.780[a]	.609	.607	.1646685	.609	494.731	1

a. Predictors: (Constant), BIxUA

Coefficients[a] Table 6.6.46

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.308	.160		8.164	.000
	BIxUA	.731	.033	.780	22.243	.000

a. Dependent Variable: AU

Model Summary Table 6.6.47

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.933[a]	.871	.870	.0994399	.871	2145.055	1

a. Predictors: (Constant), ATxUA

Coefficients[a] Table 6.6.48

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.156	.102		1.533	.126
	ATxUA	.967	.021	.933	46.315	.000

a. Dependent Variable: BI

Model Summary Table 6.6.49

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.787[a]	.620	.619	.1622574	.620	519.064	1

a. Predictors: (Constant), BIxPD

Coefficients[a] Table 6.6.50

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.345	.155		8.689	.000
	BIxPD	.724	.032	.787	22.783	.000

b. Dependent Variable: AU

Model Summary Table 6.6.51

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.937[a]	.878	.877	.0967695	.878	2282.869	1

a. Predictors: (Constant), ATxPD

Coefficients[a] Table 6.6.52

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.208	.098		2.124	.034
	ATxPD	.957	.020	.937	47.779	.000

a. Dependent Variable: BI

Model Summary Table 6.6.53

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.883[a]	.779	.778	.1281119	.779	1120.484	1

a. Predictors: (Constant), PExLT

Coefficients[a] Table 6.6.54

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.042	.055		55.104	.000
	PExLT	.079	.002	.883	33.474	.000

a. Dependent Variable: AT

Model Summary Table 6.6.55

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.848[a]	.719	.718	.1395218	.719	814.097	1

a. Predictors: (Constant), BIxLT

Coefficients[a] Table 6.6.56

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.145	.061		51.677	.000
	BIxLT	.074	.003	.848	28.532	.000

a. Dependent Variable: AU

Model Summary Table 6.6.57

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.840[a]	.705	.705	.1501867	.705	761.773	1

a. Predictors: (Constant), ATxLT

Coefficients[a] Table 6.6.58

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.085	.065		47.262	.000
	ATxLT	.077	.003	.840	27.600	.000

a. Dependent Variable: BI

Appendix F: Support Letter

All correspondence should be addressed to

"THE SECRETARY"

Telephone: 706081/9
Fax: 734646
Telex: ZIM AGRIC: 22455 ZW

ZIMBABWE

MINISTRY OF LANDS, AGRICULTURE, WATER, CLIMATE AND RURAL RESETTLEMENT
Ngungunyana Building
1, Borrowdale Road
Private Bag 7701
Causeway
Harare

24 January 2019

Mr Fine Masimba
12 St Martins Crescent
Hatfield
Harare

AUTHORITY TO CONDUCT DOCTORAL RESEARCH ON SMALL HOLDER FARMERS IN ZIMBABWE.

The Ministry acknowledges receipt of your letter requesting to conduct doctoral research on Smallholder Farmers in Zimbabwe. Also noted is that you are a Lecturer at the Catholic University of Zimbabwe, and a PhD student at Vaal University of Technology in the Republic of South Africa.

I believe, your thesis, titled *A Model for the Adoption of Mobile Farming Platforms (MFPs) by Smallholder Farmers in Zimbabwe,* is relevant to the work of the Ministry. Once completed, such a study will bring insights in policy decisions in the Ministry and Government.

In light of this, authority is granted for you to carry out your research, where you will collect data from farmers. The Ministry's Provincial staff will give you the assistance you may require to access the areas of your research.

I wish you all the best in your doctoral research endeavours.

PERMANENT SECRETARY
MINISTRY OF LANDS, AGRIC., WATER,
CLIMATE & RURAL RESETTLEMENT
24 JAN 2019
No. 1 BORROWDALE RD.
P. BAG 7701, CAUSEWAY
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Appendix G: Language Editing Certificate

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CERTIFICATE OF EDITING

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TITLE: A MODEL FOR THE ADOPTION AND ACCEPTANCE OF MOBILE FARMING PLATFORMS (MFPS) BY SMALLHOLDER FARMERS IN ZIMBABWE

AUTHORS: FINE MASIMBA (STUDENT NUMBER 218000715)

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EDITOR'S COMMENT

The author was advised to effect suggested corrections in regards to clarity of terms, referencing style, consistency in structure and logic, and expression.

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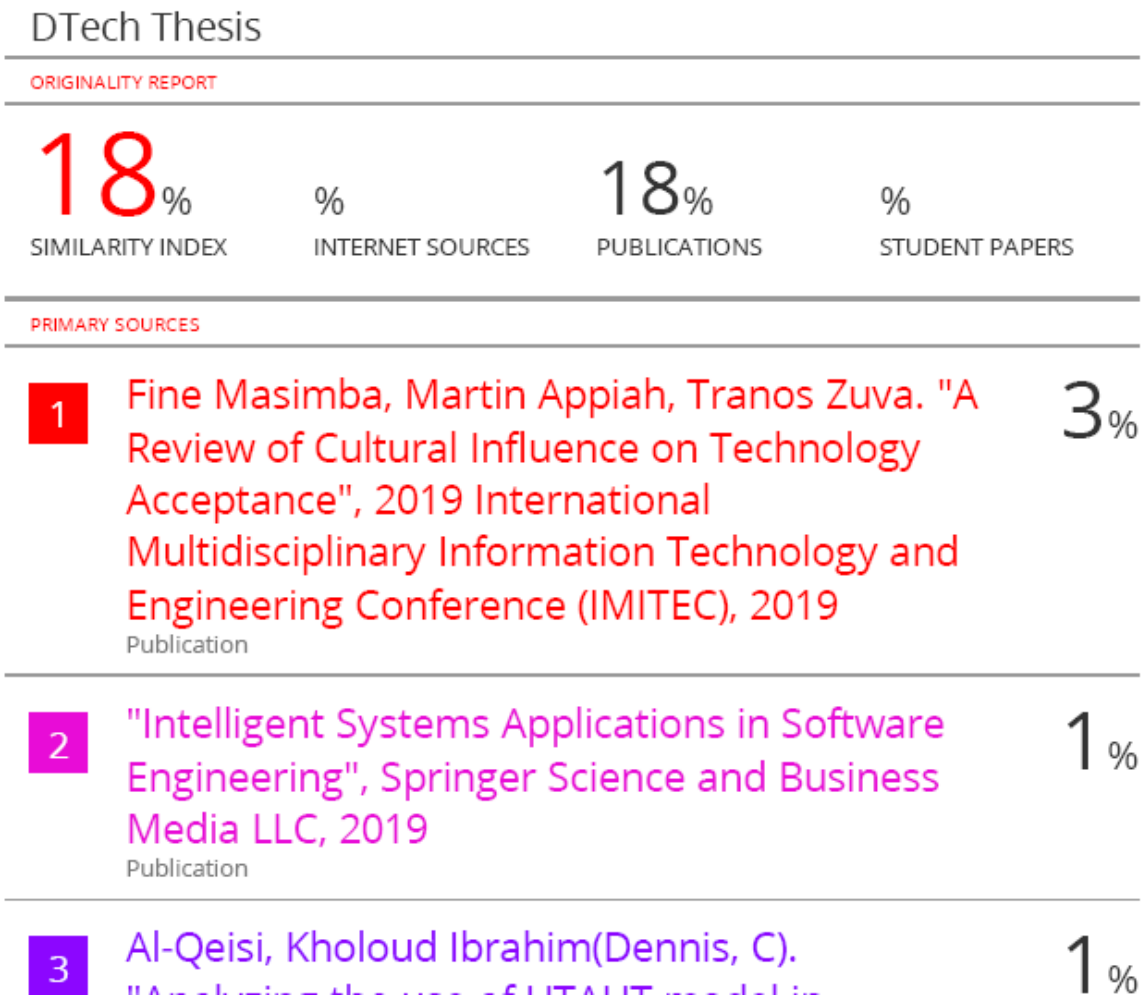
Appendix H: Plagiarism Score



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PRIMARY SOURCES

1	Fine Masimba, Martin Appiah, Tranos Zuva. "A Review of Cultural Influence on Technology Acceptance", 2019 International Multidisciplinary Information Technology and Engineering Conference (IMITEC), 2019 Publication	3%
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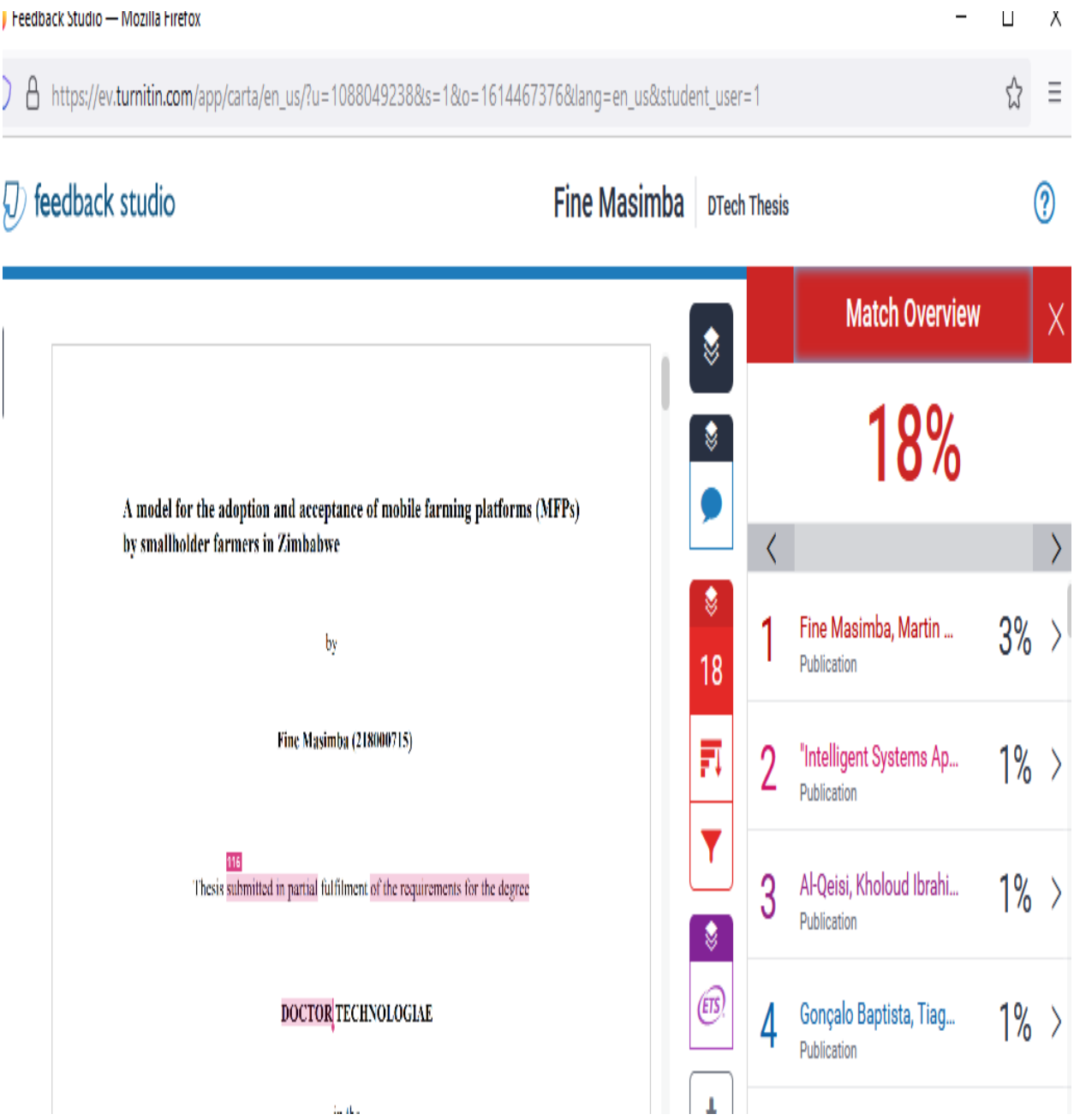
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