



**SOCIAL PATTERNS INFLUENCING THE ADOPTION OF
MOBILE PHONES IN THE FARMING COMMUNITY**

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DEDICATION

To my wife Agnes E. Malima, my daughter Navoneiwa E. Lubua, and my son Maregesi E. Lubua for the love that gives a reason to work hard. .

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The completion of this study was due to the support of a number of people. First, I acknowledge the support of my supervisor, **Prof. Michael Kyobe**, who refined my ideas throughout the research process. His guidance was invaluable.

Moreover, I would like to thank my colleagues at the Institute of Accountancy Arusha's Research-Talk Team, who made a significant contribution to this work during the proposal stage.

Moreover, my wife, **Agnes Malima**, was an encouragement throughout. I cannot thank her enough.

Most importantly, in **GOD I Trust**. He is the ever-present support.

DECLARATION

I, the author of this work, understand that plagiarism is wrong. The work presented in this thesis is my own work, except where acknowledged in the text. I hereby declare that this work is not submitted elsewhere for academic consideration to any Institution.

Signed by candidate

Signature

23 June 2017

Date

ABSTRACT

The study determined the influence of social patterns on the adoption of mobile phones in agricultural society. It targeted small farmers in the African society, and its population was drawn from Tanzania. The study was conducted with the knowledge that small (peasant) farmers make up a large component of the African population. Enhancing the economic performance of farmers would improve the general economy of the addressed society, and eventually be translated to the Gross Domestic Product. On this basis, the adoption of ICTs (mobile phones in particular) would enhance the farmers' ability to access the right information for their day-to-day activities. Therefore, this was the reason why this study decided to find out whether social factors contribute to the adoption of mobile phones in the farming society.

There are numerous models regarding the adoption of a new innovation by users. Nevertheless, models discussed in this study had social factors as a common aspect. Conceptually the study considered farmers' spending ability, the influence of the success of others, and the adoption on demand, as the factors within social variables. Other variables included the perceived economic benefits, the perceived intention to use, and the rate of use (use behaviour).

Moreover, it is necessary to acknowledge that the study was conducted objectively, and embraced hypothesis testing as the basis for decision making. Data were obtained through a survey questionnaire. Generally, the findings of the study suggested the followings: Farmers' spending ability relates to their willingness to learn new mobile tools, peer influence relates to the intention to learn, adoption on demand influences the perceived usefulness of mobile tools, and the perceived usefulness relates with the rate of mobile use. The general view of this study is that social factors influence the adoption of mobile phones in the farming community, either directly or indirectly. Therefore, these factors may be applied to enhance the adoption of mobile phones in the farming community for improved production.

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CHAPTER 1: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

This chapter introduces the study. It begins by providing the background to the adoption of technologies in a traditional environment, including the farming communities. Also, the chapter sets the gap of the study by comparing what is expected in the adoption of ICTs (particularly, mobile technologies) in agriculture and the current status. Furthermore, it explains the usefulness of this study to different stakeholders of agriculture. The following are the contents of the chapter: The background information for the study, the statement of the research problem, research objectives, research questions, and the significance of the study.

1.2 Background of the study

World societies of agricultural science invest efforts to enhance technological innovations, which simplify the way different activities are accomplished (Nyamba & Malongo, 2012). In a traditional world, the most successful societies are the ones which have managed to adopt relevant technologies in simplifying their day-to-day activities (Muzari, Wirimayi, & Muvhunzi, 2012). To establish the benefits of different technologies to a particular society, one must understand patterns describing the behaviour of users toward the application of the subjected technology in their activities (Lubua, 2014; Muzari, Wirimayi, & Muvhunzi, 2012).

Studies have been conducted to address issues related to the adoption of new technologies in a given society. This adoption is by either individuals or corporations. One of the factors perceived to determine the behaviour of using the technology is the attitude of the user toward such technology (Thomas, Lenandlar, & Kemuel, 2013). Eventually, the attitude of the user defines the intention and behaviour of using the new technology. According to the Technology Acceptance Model (TAM), the new technology becomes difficult to adopt if the user has a negative attitude toward the

usefulness of such a technology (Park, 2009). The user must be comfortable about how the technology addresses challenges that s/he encounters in his/her activities. Moreover, the same model suggests the “ease of use” of the technology as another determinant of the attitude of the user toward the new technology (Park, 2009; Thomas, Lenandlar, & Kemuel, 2013).

In addition to assumptions by the Technology Acceptance Model, other models were tested to establish factors influencing the intention to use the new technology. One of the variables established by the Motivational Model of the Microcomputer Usage is the Perceived Enjoyment (Yang, Zhiling, & Mu, 2013). This variable suggests a situation beyond a simple completion of an assignment through the support of the new technology. The assumption is that if there is a technology which is useful in terms of completing the desired task, but does not lead to the user enjoying the process, it is more likely to be dropped than the one offering both (Kohnke, Cole, & Bush, 2014).

Moreover, the Motivational Model suggests that social factors influence the intention to use the technology (Yuan & Anol, 2014). People are social beings, and the extent to which they believe that other members of the society perceive them as important if they use the technology, influences their intention to use it (Yang, Zhiling, & Mu, 2013; Yuan & Anol, 2014). Also, the influence of social factors in the adoption of the new technology is approved by other different models, including the Unified Theory of Acceptance and Use of Technology (UTAUT) (Kimberley, Paul, & Sukanlaya, 2012).

In the above paragraphs (of this section), the attitude of the user toward the technology is established as an important factor in determining the behaviour towards the use. However, the UTAUT model introduced other variables. One of these variables is the Facilitating Conditions of the technology use (Nyamba & Malongo, 2012). This includes the required resources and other supports for the use of the technology (Kiseol & Forney, 2013). The availability of these conditions boosts the use. This study is conducted in the farming community of Tanzania, the country which was formerly based on socialistic policies (Ngowi, 2009). As the farming (rural) communities are

still likely to embrace socialistic ideologies to date, it is on this basis that the study has been established to determine whether social factors influence the intention and behaviour of users towards the use of the new technology in their activities.

1.3 Statement of the research problem

Reports show that in 2010, about 21,108,304 SIM Cards were registered in Tanzania (Tanzania Communications Regulatory Authority, 2010). If this number of subscriptions were to be equated to the equivalent number of mobile phones, about 44.5% of Tanzanians would own one mobile phone each. In statistical information released in March 2015 there were about 33,180,333 mobile phone subscriptions (Tanzania Communications Regulatory Authority, 2015). This is approximately 69% of all Tanzanians owning a mobile phone each; the current projected Tanzanian population is 47,421,786 people (National Bureau of Statistics, 2014). The information provided by the Tanzania Communications Regulatory Authority (TCRA) shows a significant increase of mobile phone subscriptions. Moreover, in December 2014, the reported internet users amounted to 14% of the whole population (Internet World Statistics, 2015). Arguably, the percentage of internet users is still low; however, the presence of many mobile phone users can boost information sharing within the community.

The growth in the use of ICTs is to benefit all citizens, including the agriculture community (Akudugu, Emelia, & Dadzie, 2012). This study recognises the presence of different services through ICT facilities (for example, mobile telephones) which benefit (or are to benefit) farmers in rural areas. Nevertheless, the uptake of these services is still challenged by factors such as the low awareness of provided services, affordability, availability, system complexity to users and after sale services (Paul, & Sukanlaya, 2012; Lubua, 2014). Arguably, acknowledging the presence of these challenges makes a clear understanding of the degree to which farmers are benefited necessary. This benefit can be determined through understanding users' uptake behaviour, and factors associated with such behaviour (Kohnke, Cole, & Bush, 2014).

This study establishes the influence of social factors on the use of mobile phone services in the rural farming community of Tanzania.

1.4 Research objectives

Overall, this study establishes the influence of social factors of the farming community on the behaviour and intention of using mobile phones in their activities. The following are specific objectives:

- i. To determine the extent to which social factors influence the intention of farmers to use mobile phones
- ii. To determine the relationship between social factors and the behaviour of farmers in using mobile phones
- iii. To determine the degree to which social factors determine the perception of farmers on the benefits of mobile phones in their day to day activities.

1.5 The significance of the study

This study is important to the following categories of people:

- i. Policy makers

The study is important to policy makers because it shows how local policies are to reflect social constructs of the society, to ensure that people benefit from the adoption of the mobile phone technologies in the farming community. This observation requires that policy makers consider each element of the policy independently. This is because circumstances fuelling the adoption of mobile phones (part of ICTs) differ depending on the variables defining social pressure.

- ii. To farmers

Farmers are the key beneficiary of the study. They are the one who are directly benefited by successes to be obtained through the use of mobile phone technologies in their societies for enhanced production. Therefore, if social factors influencing the adoption of mobile phone technologies in the farming community are known, they will

be used in ensuring that farmers are benefited by technological advancements in receiving and disseminating the information necessary for their progress.

iii. ICT and telecommunication companies

There are several ICT and Telecommunication companies working to ensure that farmers receive the required information to manage agricultural activities. Apart from agricultural activities, there are many other services to be received through the use of ICTs. The results from the study will help vendors of these services to understand the extent to which they must improve their services to sufficiently address challenges facing the farming community and how they could be addressed through aligning the adoption process with social influences.

1.6 The scope of the study

This section describes the scope of the study. It addresses the scope in terms of the geographical area, the population covered, and the scope in the form of the knowledge covered. Geographically, the study is conducted in same district of Kilimanjaro region. This is in Tanzania. In particular, the study was conducted in the west part of the Same district, which is the lower part of the Pare Mountain ranges. The study concentrated in areas along the Pangani River.

Moreover, the study targeted the farming community. The study categorises farmers in this area as semi-commercial. This is because, they engage in agriculture for food production, as well as having something in excess to enhance their economic status. Moreover, the majority of these farmers are characterised by a low income as explained in section 4.6.

In general, the knowledge area of interest was the adoption of ICTs (particularly mobile phone technologies) in human activities. This is influenced by the fact that innovations become more valuable if they are applied in addressing challenges faced by the community. Therefore, the study concentrated on social factors defining decisions by members of the society to adopt a new technology.

1.7 Philosophical underpinning of the study

The purpose of this study was to determine the influence of social factors to the adoption of mobile phones in agriculture. Soon after the research area was chosen, the study reviewed the literature to understand key components of the theories of the study. The studied theories were for the adoption of technological innovation in human activities. In addition, all the theories had social elements of the society, as part of the source of influence. Equally, they are found based on the past theoretical experience and studies in the contemporary society. Examples of the considered theories include: the motivational model of Microcomputer Usage, the model combining the Technology Acceptance Model and the Theory of Planned Behaviour, and the Unified Theory of Acceptance and Use of Technology.

Moreover, the study used concepts from the three key models to formulate the framework of the study. This framework is presented in section 2.5, and has four key variables. The variables are: the social pressure, the intention to use the technology, the technology usefulness and the use behaviour. The operationalisation of these variables resulted to the establishment of hypotheses used in the study. Section 2.5.1 presents these hypotheses.

Generally, the basis for this study is on existing theories and those which were proposed through the stated conceptual framework. Arguably, the study uses proposed hypotheses to establish theories; it is ontologically under realism philosophical stance. This stance supports the use of scientific procedures in conducting research (Easterby-Smith, Thorpe, & Jackson, 2008). Because of this reason, it was necessary for the study to adopt the positivism epistemological stance in its processes. Therefore, the operationalisation of the study followed the deductive approach under positivism philosophy (Crowther & Lancaster, 2008). The survey design was adopted where the structured questionnaire was used as the primary instrument for data collection. The key informants for the study were farmers along the Pangani River, in Same District, Tanzania.

1.8. Structure of the thesis

This document is organised into five chapters:

Chapter 1 – Introduction

This chapter presents the introduction, background of the study, a statement of the research problem, research objectives, the significance of the study, and the philosophical underpinning of the study. In summary, together with the effort invested towards using new technologies in enhancing human activities; the gap in the adoption of mobile phones in agriculture is still obvious. Farmers are expected to use mobile phones in managing most of their activities. Based on the importance of this subject, it was necessary to determine whether social factors can steer the pace for adopting mobile phones in agriculture.

Chapter 2 – Literature

The purpose of this chapter was to present the literature of the study. The first part defines the key term of the study. This is followed by the review of the literature in the area of technology adoption, including review of empirical studies in the area of mobile phone adoption. The chapter concludes with the established conceptual framework and establishment of hypotheses for testing. Generally, ascertained the importance of mobile phones in economic activities, including agriculture. Moreover, the reviewed theories acknowledged the importance of social factors in enhancing the adoption of mobile phones to individuals. Therefore, the establishment of hypotheses was influenced by this knowledge.

Chapter 3 – Methodology

This chapter provides the detail of the methodology used. This is through providing the design and the strategy fitting the study. Key elements of the discussed methodology include the ontology, epistemology and the adopted approach of the study. Moreover, an overview of the sampling procedure, data collection methods, data collection methods, and techniques for ensuring the reliability and validity are

discussed. In summary, the study adopted the realism ontological stance. Moreover, it adopted the positivism epistemology. Methodologically, the study used the quantitative survey questionnaire to collect its data. Interviews were necessary where an additional information was expected. Before the analysis, the study ensured that data were reliable and offered valid information. Then, data were processed through the use of the Statistical Package for Social Science (SPSS). The adopted analytical models include: ANOVA, Chi Square, Pearson Correlation Model, and the Multiple Regression Model.

Chapter 4 - Analysis and discussion of the study

This chapter presents the analysis of data, followed by its discussion. It begins with the presentation of the response rate and demographic descriptive information. Further to that, analytical models are equally used. The purpose of the chapter is to ascertain the position of hypotheses. This is accompanied by the discussion, which shows how the study compares with the literature. The last part of the chapter tests how the results fit to the proposed general model; that is the regression analysis model. The following were observed through the study: the familiarity of respondents with the mobile tools relates to the intention to use, the adoption on demand relates to the perceived usefulness, the peer influence relates to the perceived usefulness, the perceived usefulness to the rate of using mobile phones, and the spending ability relates with both the intention to use and the rate of using mobile phones in agriculture.

Chapter 5 – Conclusions and recommendations

The chapter provides the summary of the study, followed by key conclusions based on the findings. Moreover, the limitations of the study are presented, and future works are presented. Conclusively, social factors influence the adoption of mobile phones in the farming community. Among the limitations, the study acknowledged the fact that the study was characterised by small farmers, therefore a future consideration of large farmers will be valuable.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature relevant to the study. The chapter begins by introducing the concept of the use of Information and Communication Technologies (ICTs) and mobile technologies in agricultural communities. Moreover, the chapter provides an overview of theories for the adoption of new technologies. Theories included in the discussion are the motivational model, the model combining the Technology Acceptance Model and the Theory of Planned Behaviour, and the Unified Theory of Acceptance and Use of Technology. Other sections of the chapter describe the role of mobile phone technologies in enhancing the living standard of the farming community, information sharing and the awareness of users of mobile platforms, and the conceptual framework of the study.

2.2 The uses of mobile phones in agricultural communities

Information is important in human activities. Adequate and relevant information makes the process of decision making easy (Lubua, 2014). This is through presenting relevant options to the decision maker. The decision maker uses this option to decide about the direction of his undertakings. With the development of information systems, some systems are able to collect information and decide on behalf of the user. For example, there are numerous mobile phone applications collecting weather information (through the satellite) and report them to the user. On the other hand, there are applications, which use the collected information and propose economic interventions to be adopted. This includes those working in agriculture sector.

The relevance of the information matters. This relevance is determined by the reliability and validity of data used to produce such information, together with its processing. Information systems collect and process data more scientifically, the fact that makes them fit for decision making with more accuracy.

In agriculture, farmers require the information that provides guidance on how to obtain quality seeds, managing the land, professional advice on new agricultural strategies, market access and even access to credit to support their activities (Stienen, Bruinsma, & Neuman, 2007). This information changes regularly due to changes in the climate or any other factor (Byrne, Kelly, & Ruane, 2003). Unfortunately, farmers in a traditional rural environment access such information with difficulty because they use traditional means (Stienen, Bruinsma, & Neuman, 2007; Lubua, 2014). Under these circumstances, even the most experienced farmer would be affected if s/he fails to receive the current information.

Arguably, agriculture requires more attention because of the growing demand for farming products. In Sub-Saharan Africa, 25% of its inhabitants suffer from undernourishment (Chauvin, Mulangu, & Porto, 2012; Munyaka, 2014). Apart from nutritional needs, a large population (in this region) is engaged in farming activities. For example, in Tanzania, about 70% of people are engaged in agriculture (Ministry of Agriculture and Livestock, 2013).

Arguably, efficiency in information sharing is at the centre of addressing challenges of agriculture. Therefore, the use of ICTs (including mobile phones) by the farming community is timely. To farmers, the use of mobile services for agriculture lowers the working capital through providing agricultural advice efficiently and at a low cost (Akudugu, Emelia, & Dadzie, 2012; Gehrke, 2014; Livingstone, Schonberger, & Delaney, 2011). Moreover, it lowers the vulnerability of farmers to issues related to climate change due to readily available information, while providing access to the market (Akudugu et al., 2012; Lubua, 2014). Currently, about 69% of Tanzanians own either a mobile phone or have internet access (Tanzania Communications Regulatory Authority, 2015). Therefore, a mobile phone must be the main ICT tool for farmers because of its accessibility and usefulness. The position of this study is that the proper use of mobile phones by farmers will enable them in managing challenges brought by climate changes while enriching them with other relevant information.

2.3 Theories governing the adoption of e-technologies

In this section, the study presents a thorough discussion of theories governing the adoption of a new technology. The models that are discussed include the Motivational Model (MM), the Model Combining the Technology Acceptance Model and the Theory of Planned Behaviour (C-TAM-TPB), and the Unified Theory of Acceptance and Use of Technology (UTAUT). These models are included because they are established through refining previous models, and offer a required insight on the adoption of mobile phones by individuals. The purpose of this part of the study was to establish a clear understanding of theories governing the discussed models and their relevance to the current study. The knowledge extracted from this section is useful in establishing the theory governing this study.

2.3.1 The Motivational Model of Microcomputer Usage

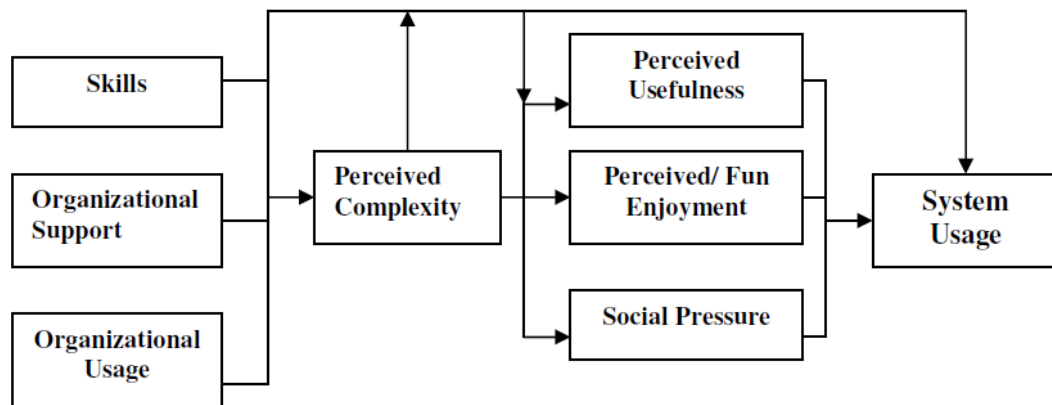
Currently, there are several models as the result of motivation studies for the use of ICTs. Nevertheless, this section discusses the Motivational Model of Microcomputer Usage, which was the result of the testing of extrinsic and intrinsic motivations assumed to derive the intention of users toward technology use (Igbaria, Parasuraman, & Baroudi, 1996). Provided that the user perceives the technology as useful, extrinsic motivations are the result of expected rewards upon the use of the technology (Teo, Lim, & Lai, 1999). Meanwhile, intrinsic motivations are derived from the perceived enjoyment regardless of the performance.

Generally, the final framework that formed the Motivational Model of Microcomputer Usage was found to encompass the assumptions from two models: The Theory of Reasoned Action (TRA) and the Technology Acceptance Model (Igbaria, Parasuraman, & Baroudi, 1996). The key assertion of the TRA Model featured in the study was that behaviours expressed by an individual are the subject of his attitude toward such technology (Thomas, Lenandlar, & Kemuel, 2013). This assertion is also supported by the TAM. Another assertion that features in the TAM is that the attitude of the user is the result of the perceived usefulness of the technology (Basgoze, 2015). However, unlike the TAM, the Motivational Model of Microcomputer Usage considers the complexity of the technology (the ease of use) as an intervening variable (Gehrke, 2014; Igbaria et al., 1996). The TAM gives the Complexity of the

Technology the same weight as the perception of users on its usefulness in solving their work problems.

In all its discussions; the Motivational Model of Microcomputer Usage concluded that the actual use of computer technologies is the subject of the perceived usefulness, perceived enjoyment and the social pressure (Igarria, Parasuraman, & Baroudi, 1996; Kimberley, Paul, & Sukanlaya, 2012; Thomas, Lenandlar, & Kemuel, 2013). Figure 2.1 presents the model, followed by the discussion of the variables.

Figure 2.1: The Motivation Model of Microcomputer Usage



Source: Igarria, Parasuraman, and Baroudi, 1996

i. Perceived usefulness

The Technology Acceptance Model and the Theory of Reasoned Action acknowledge that the perceived usefulness of the technology exerts an influence on the actual use (of the technology) because of the re-enforcement it offers to the outcome (Ha, 1998; Park, 2009). The main reinforcement offered, is the perceived level to which the technology solves work problems with the minimum effort. Several other studies that analysed the influence of perceived usefulness found it to consistently influence the use of the new technology (Kimberley, Paul, & Sukanlaya, 2012; Nyamba & Malongo, 2012).

This study targets the rural farming community of Tanzania, in the Kilimanjaro Region. Therefore, it is necessary for the literature to provide a further description of

the perceived usefulness of the technology in this community. Like other economic groups, farmers consider the new technology as useful, if it is relevant to their day-to-day-activities. This relevance is determined through understanding the extent to which ICTs can be used in addressing challenges by farmers (Shahadat, 2012). ICT tools must enable farmers to communicate within the affordable range of costs. Farmers must be able to access information (such as weather conditions, pesticides, seeds, and market conditions) relevant to agriculture through ICTs. This may be through text messages, voice calls, mobile applications and other online tools (Lubua, 2014).

Moreover, farmers are likely to consider the new technology as useful if it is easy to use. A good system is the one that allows minimum efforts for users to adopt it (Igbaia, Parasuraman, & Baroudi, 1996; Shahadat, 2012). Arguably, many Tanzanians (including farmers) are faced with the language barrier when it comes to the use of technological tools (Lubua, 2014). Many ICT tools use foreign languages, while the majority of Tanzanians are conversant with the Swahili language. Moreover, many members of the farming community of Tanzania did not have the privilege of acquiring post-primary school education (Icarbord & Allen, 2013). Therefore, the implementation of a program that involves complex procedures is likely to challenge users in the rural community.

ii. **The perceived enjoyment and fun**

The use of a new technology may be influenced by an immediate enjoyment that the user is likely to experience upon the use (Ramayah & Ignatius, 2014), which does, however, not eliminate the value of the anticipated performance. Apart from the expectation of the user towards the work performance they must enjoy the use of the technology. Several studies have concluded that the fun and enjoyment the user of the technology perceives significantly influences the adoption (Astrid, Mitra, & David, 2008; Muzari, Wirimayi, & Muvhunzi, 2012). A study conducted by Igbaria, Parasuraman, & Baroudi (1996) suggested that the system which allows the user to solve his/her work problems while enjoying its application enhances the level of its acceptance. Anticipated enjoyment triggers usage.

One of the factors found to enhance the enjoyment of the user of the new innovation is the flexibility that the system offers on where and when to use the technology for work (Basgoze, 2015; Priyanka, 2012). Moreover, the Motivational Model affirms that the degree of system complexity is an important intervening variable in determining the degree of user enjoyment (Igarria et al., 1996). Examples of variables thought to define the level of system complexity include: the level of user technical skills and the support offered by the organisation to users.

iii. **Social pressure**

Social pressure makes the third variable suggested to influence the decision of an individual to adopt the new technology. This pressure is the result of the influence of the people or beliefs associated with the user, on whether the user must adopt the new technology or not (Akudugu, Emelia, & Dadzie, 2012). If the use of the technology differs with the belief of the society or organisation associated with him/her, the adoption will be difficult (Al-Qeisi, 2009). However, if the used technology is supported by the belief (values) of the society (or organisation); users are likely to adopt the technology, even if its usefulness is low (Akudugu, Emelia, & Dadzie, 2012; Al-Qeisi, 2009). Sometimes the pressure may come from individuals who are considered as important by the user(s). Examples of possible influencers include work supervisors, subordinates or peers. Therefore, users adopt the technology because they think they will look important to their associates.

2.3.2 The model combining the Technology Acceptance Model and the Theory of Planned Behaviour (C-TAM-TPB)

The Technology Acceptance Model (TAM) is one of the most discussed models for the adoption of a new technology in the society by individual users. The model has had a number of critics over time. The model was criticised for failing to accommodate factors of the society, which are proven to influence the actual intention of using the technology (Al-Qeisi, 2009; Priyanka, 2012). As a result, Taylor and Todd (1995) conducted a series of studies that formed the basis for bringing the TAM and the TPB model together, to formulate a single model. Overall, the resultant model has taken into consideration all variables of the Technology Acceptance Model and two others

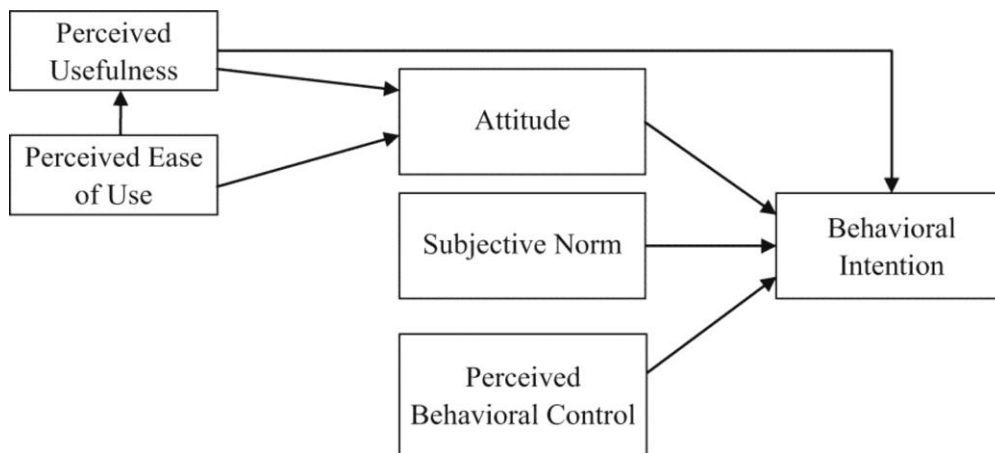
from the Theory of Planned Behaviour Model. The following are the key variables of the C-TAM-TPB Model: Ease of Use, Perceived Usefulness, User Attitude, Subjective Norms, Perceived Behavioural Control and the Use Behaviour.

One of the TAM determinants impacting the use of the new technological innovation is discussed in section 2.3.1 (i) of this study: that is the perceived usefulness. Another variable is the perceived ease of use. The perceived ease of use is defined as the extent to which the user is comfortable enough to interact with the new technology to accomplish the desired task with minimum effort (Nyamba & Malongo, 2012). According to the Motivational Model of Computer Usage, the ease of use is simply an intervening variable, regulating the magnitude to which the key variables of the model impact the use of the new technology. Nevertheless, in this case the ease of use is a variable on its own, defined to impact the perceived usefulness of the technology and the attitude of the user toward the use (Priyanka, 2012).

The paragraph above acknowledges the user attitude among variables of the resultant model. Also, it acknowledges the fact that the variable (user attitude) experiences the influence from the ease of use and the usefulness of the technology. According to Figure 2.2, the user attitude is one of the three key variables defining the position of the use behaviour of the new technological innovation. This is the attitude toward the use of the technology (Chuttur, 2009).

On the other hand, the TPB model brings variables related to both voluntary and involuntary behaviours toward the use of new technological innovations. However, this study puts emphasis on voluntary behaviours, which contribute to the use of new innovations. The first variable extracted from this model is known as subjective norms. The variable focuses on the highly valued beliefs of the society, which dictate certain patterns of voluntary decisions on technology use (Truong, 2009). These beliefs exert a certain pressure on the user, as to whether s/he should use or reject the technology (Taylor & Todd, 1995; Truong, 2009). The new technology that does not identify itself with the values of the society is likely to be dropped. This variable is equally supported by the Motivational Model of Microcomputer usage, discussed in section 2.3.1 (iii).

Figure 2.2: C-TAM-TPB Model



Source: Taylor & Todd, 1995

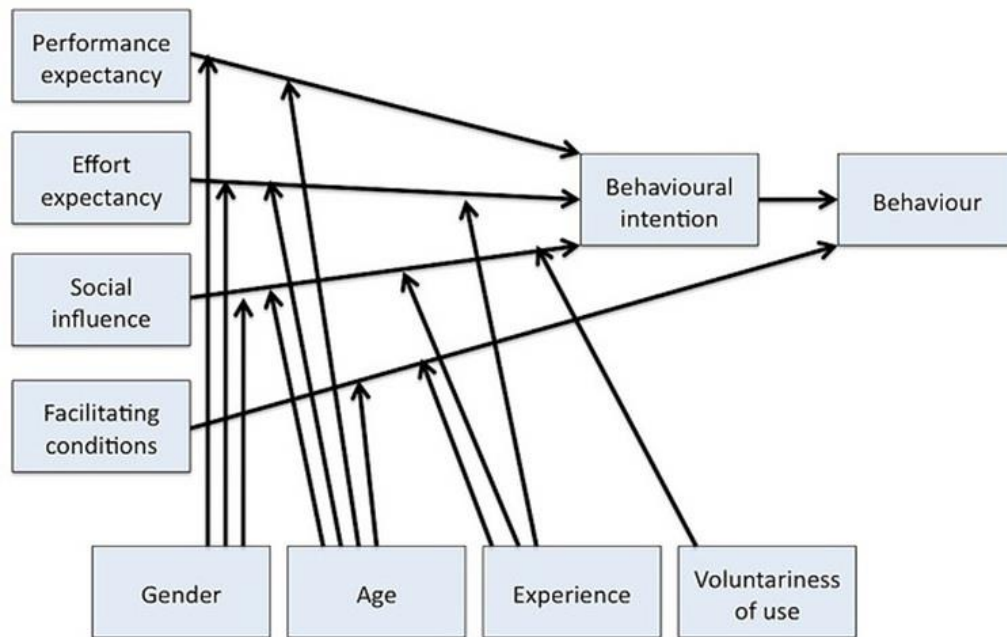
The second variable of the TPB featuring in Figure 2.2 is the perceived behavioural control. Future discussions of the study do not concentrate on this variable; however, it is important to highlight its position in the C-TAM-TPB model. The perceived behavioural control is the degree to which an individual feels that s/he can perform according to a certain expected behaviour (Chuttur, 2009; Taylor & Todd, 1995). It is linked to control beliefs and the power of such beliefs. These are beliefs about the presence of factors which may facilitate or impede the process of meeting conditions for the expected behaviour. The presence of factors for facilitating the implementation process would speed up the pace, and vice versa. Such factors include the presence of the technical support of financial support to facilitate the process (Al-Qeisi, 2009).

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

The Unified Theory of Acceptance and Use of Technology is the model for the individual adoption of technology, which is the result of bringing together constructs from eight (8) models. Models whose constructs are considered in the UTAUT include: The Theory of Reasoned Action (TRA), the Motivational Model (MM), the Technology Acceptance Model (TAM), the Theory of Planned Behaviour (TPB), the Model of Personal Computer Use, a Combined Theory of Planned Behaviour/Technology Acceptance Model (C-TPB-TAM), Diffusion of Innovations theory (DOI), and the Social Cognitive Theory (Al-Qeisi, 2009). After the constructs of the above-mentioned eight (8) models were studied, the UTAUT adopted four (4)

constructs suggested to influence the user to adopt the new technology. The constructs of the UTAUT are the performance expectancy, effort expectancy, social influence, and facilitating conditions.

Figure 2.3: The UTAUT Model



Source: Al-Qeisi, 2009; Thomas, Lenandlar, & Kemuel, 2013

i.) Performance expectancy

In most cases, the technology is introduced to improve the performance of an individual within an organisation (or society). Eventually, the contribution of individual performance affects the overall performance of the whole organisation (Al-Qeisi, 2009; Astrid, Mitra, & David, 2008). According to the Performance Expectancy construct of the UTAUT, the degree to which an individual believes that the use of a certain technology will improve his performance at work, influences the intention of technology use (Thomas, Lenandlar, & Kemuel, 2013). The following are the constructs from other models that advocate the message similar to the Performance Expectancy construct of the UTAUT: perceived usefulness (TAM, and combined TAM-TPB), relative job-fit (MPCU), extrinsic motivation (MM), outcome expectancy

(SCT) and advantage (DOI). These constructs were proven to have a positive influence to the adoption of the new technology.

This study was conducted in the agricultural community of Tanzania. It is expected that the use of ICTs (particularly mobile phones) would be quickly adopted if it increases the performance of farmers in their day-to-day activities.

ii.) Effort expectance

Effort Expectance defines the degree of effort, which the user of the new system must put in to be able to apply the new system. In the TAM, this is referred to as the “ease of use” of the new technology (Park, 2009). In the DOI and MPCU models, this is referred as the “complexity of the system” (Al-Qeisi, 2009). Therefore, studies of these theories proposed that the degree to which the user perceives the system as complex, influences the intention to use (Igbaria, Parasuraman, & Baroudi, 1996; Park, 2009; Lubua, 2014). This construct applies to both voluntary and mandatory use of the new technological innovation, especially after training. Furthermore, the construct is more influential to individuals of a young age and older workers in the early stage of the system implementation. While young professionals may be ready to take a new challenge in organisation changes, senior employees may be reluctant to change their ways of solving work problems, especially if it involves complex technological procedures (Al-Qeisi, 2009; Kohnke, Cole, & Bush, 2014; Thomas, Lenandlar, & Kemuel, 2013).

iii.) Social influence

This is a third construct of the UTAUT. This construct simply refers to beliefs within the society that would determine the status of the user of the technology within the society (Thomas, Lenandlar, & Kemuel, 2013). These beliefs and values offer pressure to users of the technology, which determines their status of use. The technology that contradicts the moral standards and values of the society is likely to be dropped. In this case, the society may be members of the family, friends, co-workers and the community in general. In the society where the use of the new technology makes the user perceived as important, the likelihood of adoption is higher than in the society where a new adoption is likely to embarrass the user. In the TAM2, TRA, TPB/DTPB,

and combined TAM-TPB models this construct is referred to as subjective norms (Chuttur, 2009; Priyanka, 2012; Thomas et al., 2013). In the MPCU and DOI the construct is referred to as the “social factor” and the “image” respectively.

iv. Facilitating conditions

This variable refers to the belief by the user of the technology that the organisation and the infrastructure support the adoption of the new technology. In the TPB and combined TAM-TPB models, the variable used is the perceived behavioural control (Priyanka, 2012). In the MPCU, the variable is referred to as the facilitating condition. In the DOI it is referred to as compatibility (Kohnke, Cole, & Bush, 2014). In circumstances where the use of technology depends on some institutional policy or/and facilitating infrastructure, the influence of facilitating conditions is proven to be significant (Al-Qeisi, 2009). This is true of both voluntary and mandatory use.

Moreover, some literature suggests that in the presence of Effort Expectancy and Performance Expectancy the influence of facilitating conditions is insignificant (Al-Qeisi, 2009; Kohnke, Cole, & Bush, 2014). The assumption is that Effort Expectance and Performance Expectance provide an influence required for the user to adopt or reject the system. Also, the influence of Facilitating Conditions decreases as users become more experienced. The decrease is simply because users find new avenues for support. In the current study, the influence of facilitating conditions to the adoption of the new technology is not considered.

v. Issues arising from UTAUT 2

Variables discussed through section 2.3.3(i-iv) were introduced through the first version of UTAUT presented in figure 2.3. In the year 2012, the UTAUT model was reviewed to accommodate more variables that would influence the decision of a consumer to accept and use the new technology. The added variables include: hedonic motivation, price value, and the habit of the user under study. The hedonic motivation refers to the value of pleasure that the user would experience during the use of the mobile phone (Venkatesh, Thong, & Xu, 2012). The study by Venkatesh, Thong and Xu (2012) concluded that hedonic motivation is an important predictor of the use

behaviour. This observation agrees with the Motivational Model of Microcomputer Usage, discussed in section 2.3.1 of this study.

The price value is another addition of the UTAUT 2 model. In the context where an individual user has to bear the cost of the new technology, and not the organisation, the price is an important determinant. Therefore, the implementation of the new technology must provide the element of pricing with the same consideration as the quality of service offered (Aker & Mbiti, 2010). The last addition of the UTAUT 2 is the habit of the user. Habit is defined as the extent to which the user tend to perform a certain behaviour automatically as the result of learning (Venkatesh, Thong, & Xu, 2012). Generally, the past experience of using a technology develops a belief which become a habit of the user (Venkatesh, Thong, & Xu, 2012; Aker & Mbiti, 2010). The UTAUT 2 confirms this habit to be an important predictor of the use behaviour (Venkatesh, Thong, & Xu, 2012).

2.3.4 Summarising the discussion of models

This part of the study summarises the discussion conducted in the sub-sections of section 2.3. The sections discussed three (3) models: the Motivational Model, the Combined TAM and TPB model, and the Unified Theory of Acceptance and Use of Technology. The models were adopted because they combine a number of other models that exist in the literature. In the discussion of the models, the literature focused on factors influencing the attitude and the behaviour of users of the new technology.

In summarising the Motivational Model, the actual use of the new technology depends on the perceived usefulness, perceived enjoyment and social pressure. The combined TAM-TPB considers all variables brought about by the TAM influencing the attitude to using the technology. However, the emphasis is on society beliefs which may dictate a voluntary choice of behaviour. The UTAUT 2 uses the following construct to explain the intention and behaviour in using the new Technology: Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value and Habit: In all the models, the social factor is a common construct. The current study establishes the influence of this variable on farmers in the adoption of

ICTs. The motivation behind this choice is the fact that Tanzania was found under socialistic environment, and it is possible that these beliefs still impact different decisions of citizens.

2.4 The role of mobile phones (ICTs) in farming

It can be agreed that increasing production in agriculture would significantly enhance the economic capacity of farmers. This would be translated to national GDPs of associated nations, in the African continent. Arguably, the rural African communities (which are mostly characterised by the low income) would receive more benefits from farming output (Chauvin, Mulangu, & Porto, 2012). This is because a large portion of the rural population (about 90% in Africa) is engaged in agriculture (Livingstone, Schonberger, & Delaney, 2011).

It is believed that an inefficient value chain is among the reasons why the agricultural sector performs weakly (Mitchell & Leturque, 2010). The agricultural value chain includes the following stakeholders: farmers themselves, input suppliers, distributors and even end users of the products (Chauvin et al., 2012; Livingstone, Schonberger, & Delaney, 2011; Mitchell & Leturque, 2010).

Farmers are the key players in the farming activities. They dedicate their time and means to making sure that there is an increase in production. While other stakeholders are important, their positive effect on agriculture depends on the ability of the farmer to manage his/her activities (Gehrke, 2014). Therefore, farmers must have the required knowledge of agriculture activities to excel (Gehrke, 2014; Lubua, 2014). They must be aware of recommended ways of carrying out their day-to-day activities. This includes: having the right judgement on the relevant weather for farming, and understanding the application of agriculture input for enhanced production.

Generally, integrating the farmer with other stakeholders is inevitable. This would provide a comprehensive value chain for agriculture (Livingstone et al., 2011). However, this integration requires the availability of the information to all stakeholders

on time. This is possible with the proper use of ICT tools (including mobile phones) in managing agricultural activities and disseminating information (Lubua, 2014).

One of the things required by farmers in the value chain of agriculture is reliable capital. A number of initiatives are in place to ensure that farmers in Tanzania access funding to support their activities. However, it is agreeable that the challenge still persists (Benard, Delle, & Ngalapa, 2014). On the other end, the use of mobile phones could ease the problem. Studies reveal that community members in the East African Region who subscribe to the use of Mobile Money Services have greater potential of absorbing financial shocks than those who are not (Asongu, 2013). One reason could be that mobile phones add informal connections to users, where they could source funding for different activities. Also, there are formal schemes which use mobile money to disburse finances for supporting the farming community, though encountered with limitations such as collateral (Akudugu, Emelia, & Dadzie, 2012; Benard et al., 2014; Muzari, Wirimayi, & Muvhunzi, 2012). In this case, it is important to acknowledge that the use of ICTs in agriculture addresses the acuteness of the lack of capital for agriculture, and that more effort is required in supporting this scheme.

Moreover, as in any commercial activity, agriculture comes with uncertainties. Some such uncertainties are the result of climate changes and natural disasters (Mitchell & Leturque, 2010). To a certain extent, the loss that farmers encounter due to natural disasters may be compensated for, if not insured against. In recent years, insurance companies have started to provide services through mobile phones. Farmers are allowed to pay for insurance services based on ‘the pay as you plant’ scheme. For example, in Kenya the scheme is known as *Kilimo Salama*, meaning safe agriculture (Gehrke, 2014). Although not all farmers are engaged in the insurance scheme, mobile phones make such services available to farmers wherever they may be.

Additionally, ICT technologies enable farmers to manage farming activities based on current weather conditions. Smartphones offer a platform for the installation of applications that provide instant weather information. These applications also provide a weather forecast that may even cover the whole farming season (Nyamba and

Malongo, 2012). For example, Mobile phones supported by Android Operating Systems are installed with an application which provides an immediate forecast of the weather and even provides the forecast that goes beyond one month. Moreover, local telecommunication countries are also providing the service. A good example is an application known as Tigo Kilimo¹, which provides an instant weather forecast to farmers in the local language.

Generally, ICTs (and the whole concept of e-agriculture) offer valuable tools that minimise negative impacts of agriculture through information sharing. Nevertheless, the ability of farmers to minimise the impact of e-agriculture is affected by a number of factors, including the following:

i. Farmers' technical ability to use e-agriculture services. Currently, the Tanzanian literacy rate is 67.8% (United Nations Children's Fund, 2013). This rate suggests the percentage of those who can read and write in Swahili. With this information, it is likely that many farmers are struggling to understand how to use e-agriculture services. This is because some applications require a series of steps to complete, and may be presented in a technical language.

Also, there are circumstances where farmers may fail to access e-agriculture information because they are not aware of the availability of such services. In such circumstances, the user awareness is to be raised (Kimberley, Paul, & Sukanlaya, 2012). User awareness can be raised through educative meetings, TV shows, advertisements and the use of social groups and other means.

ii. Timely access of information. This is another factor which may affect the perception of farmers toward the use of ICT-enabled agriculture services. Users expect a quick reply whenever they apply for services through online media. This is possible if there is a well-established online information centre with adequate information on agriculture. Also, employees must offer quick responses to service queries that require

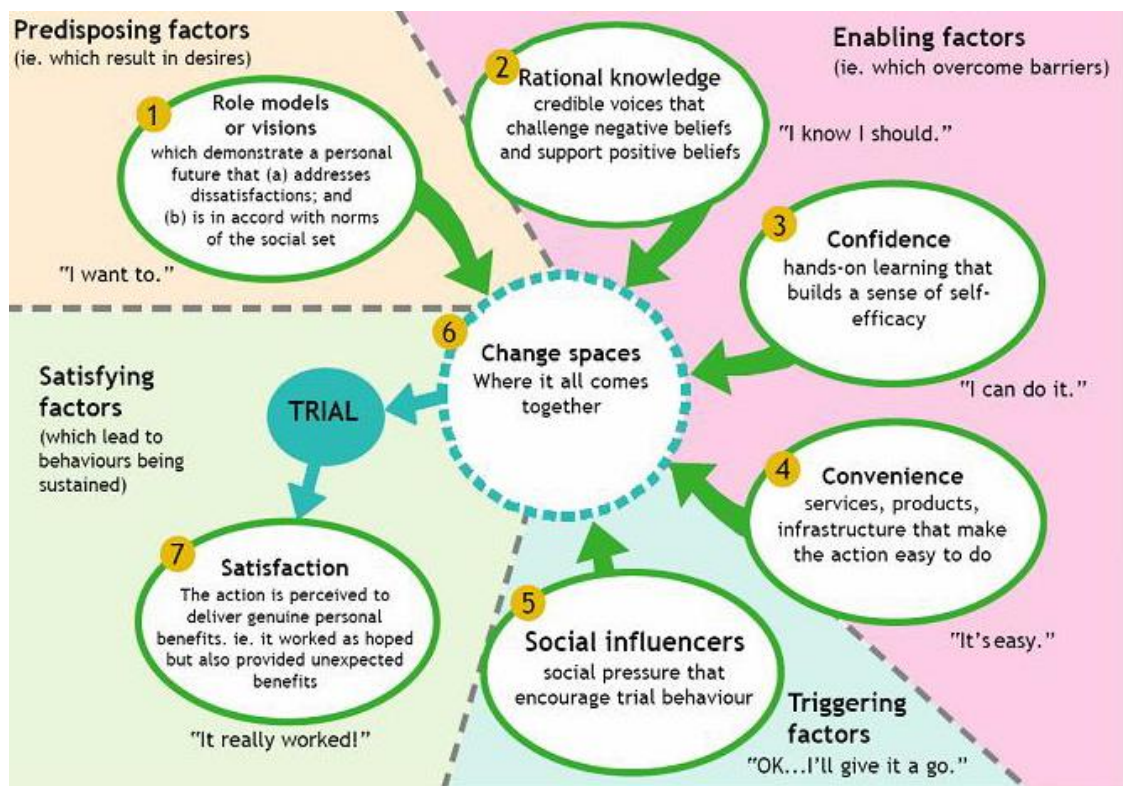
1 The Tigo Agriculture Page: <http://www.tigo.co.tz/value-added-services/tigo-kilimo>

them to respond. Also, the inaccessibility of the online system may delay farmers from timely access to agricultural information.

2.4.1 Behaviour change models in adopting ICT services

In 2007, the Robinson model of behaviour change was formulated (Mackinnon, 2007). In his model, Robinson concluded that it is difficult to change people’s behaviour, unless changes support what the audience desires. Therefore, to make effective changes, it necessary to offer people the environment that enables them to take a step toward the improvement of their lives. In this context, the Robinson model agrees with the ADKAR Model of Change in Behaviour (published in 1998), which advocates the establishment of an environment that promotes changes in the society. For example, in e-agriculture, providing an adoptive environment which promises the increase of production would speed the process. Figure 2.1 summarises the Robinson model.

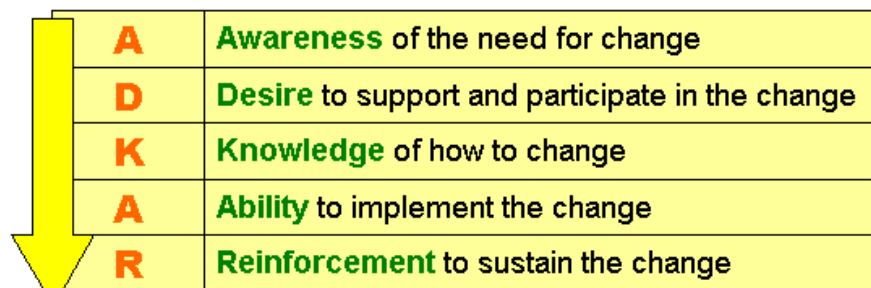
Figure 2.4: Steps for Behaviour Change Model



Source: Mackinnon, 2007

In Figure 2.1, the model has seven steps which fall into four important categories. In the first stage, the purpose for behaviour change is set. In the farming community, this is the stage to make farmers, who are the target audience, aware of the reason why changes are necessary. One of the reasons for changes in the way this group manages its activities is to improve their performance through the use of simple ICT tools available on mobile phones. This is because the current status of activity management in agriculture is not satisfactory. In the ADKAR Model (Figure 2.5), this stage is equated to the awareness development.

Figure 2.5: ADKAR Model



Source: Connelly, 2008

The second stage of the Robinson model discusses factors that enable an individual to overcome existing barriers for attaining expected changes. This stage requires the establishment of three factors: knowledge, confidence and convenience (Connelly, 2008; Mackinnon, 2007). The farmer is required to enhance his knowledge to overcome negative feelings to succeed. Farmers are introduced to mobile tools supporting agriculture, and how they are useful in meeting goals. In building the knowledge, the tools are to be related to how they will be used to overcome drawbacks experienced in traditional farming. With adequate information the confidence of farmers is enhanced (Nyamba & Malongo, 2012). This makes the process of behaviour change more simplified. Furthermore, the confidence of farmers may be improved through developing their technical ability in using available mobile phone tools. The combination of knowledge and confidence toward the adoption of m-agriculture equips users with the ability to decide whether mobile phones are/not useful in supporting their activities. Users will be more willing to use the system if they see the

value attached to it, as well as the convenience to be enjoyed. In the ADKAR Model, this whole process could be equated to the process of raising the desire to implement changes.

Furthermore, the Robinson model presents another stage of the model to ensure the adoption of changes. The stage consists of the factors triggering the change in the behaviour of the user. In the context of this study, one of the triggering factors is the social influence of members of the same group, which is the group of farmers. The implementation process may target few members of the community who are influential. Their success story (about the adoption of ICTs) enhances the implementation pace with the rest of the community (Livingstone et al., 2011). Social pressures that encourage behaviour change are useful in the process.

Lastly, it is important to ensure that farmers (who are the clients of the m-agriculture) are satisfied with the service offered. This is possible through making sure that the system is easy to use, and it accommodates the needs of each individual farmer. Also, the information must be available to enhance the convenience of access. In this study, some stages (variables) of the Robinson model are incorporated through the use of hypotheses stated in section 2.6.2. It was important to understand models that provide explanation on how changes occur.

2.4.2 Types of mobile phones available to farmers

The literature shows that mobile phones are widely adopted worldwide. In Tanzania about 33,180,333 SIM Cards are registered (Tanzania Communications Regulatory Authority, 2015). The registered number of SIM Cards can be translated that approximately 69% of Tanzanian owns mobile phones, if each SIM Card was to represent a user.

Currently, there are two main categories of mobile phones: feature phones and Smartphones (North, Johnston, & Ophoff, 2014). In the early period of the mobile phone adoption, only feature phones were accessible to users. These are mobile phones

with limited capabilities. The Operating Systems used by these phones include Series 30 (S30) and Series 40 (S40). Basically, their tools are limited to supporting the following: voice calls, text messages, multimedia and the internet (Economides & Grousopoulou, 2008). Also, they are able to accept certain services offered by the wireless service provider of the user. Moreover, early feature phones lacked the ability to facilitate multitasking (Roy et al., 2012). The following are examples of services offered by mobile service providers in Tanzania, which could be accessible through feature phones to farmers: Money Transfer and Agriculture tips.

On the other hand, the introduction of Smartphones draws a sharp contrast with feature phones. Smartphones are like mini-computers; hence, they incorporate all functions of the feature phones, and those of computers (Economides & Grousopoulou, 2008). They support multitasking through accommodating different mobile applications. Therefore, the use of these applications requires the user to have additional skills, when compared to feature phones (North, Johnston, & Ophoff, 2014). Generally, any mobile phone that does the work of a computer is considered as a Smartphone. Some Operating Systems of Smartphones include Android, iOS, and Windows.

Moreover, the use of Smartphones requires some additional skills, because they use computer-related applications. This differs from the use of feature phones, because their tools are simplified. The tools for feature phones allow the user to apply few steps to accomplish the desired task. Unfortunately, regardless of their benefits, mobile phones with a complicated sequence of steps for completing a certain task are not favourable for slow learners and the elderly (Sang-Zo, 2013).

Another contrast is that feature phones have the ability to economise on the power (Economides & Grousopoulou, 2008; Sang-Zo, 2013). They require less input that lasts longer. For example Nokia 107 power consumption is 950mAh, while that of Nokia Lumia 638 is 1830 mAh. The latter is a Smartphone under the same company banner (Sang-Zo, 2013). In developing countries, many rural areas are not connected to national grids. Citizens depend on other sources of power to charge their phones (Dinkelma, 2011). This comes with an additional cost, and is not convenient. Under

such circumstances, the battery which requires low power to charge (while lasting longer upon the use) is ideal. In rural environments, feature phones are more favourable, because they retain the battery power for an extended time. This is because of the simplicity of their functions.

Apart from above contrasting differences, an obvious similarity between feature phones and Smartphones is the fact that they both require a SIM Card to operate. The card enables the user to receive communication signals from the telecom operator. In Tanzania, SIM Cards must be registered before use. Arguably, the process comes with security benefits to the user and the whole community. One of the most important security benefits is the protection of the user from fraudulent SIM Card replacement (Lubua, 2014). Nevertheless, in rural areas, the registration of SIM Cards is one of the factors affecting the adoption. It is unfortunate that the rural communities access the registration centres with difficulty because of their locations. The centres are located in the townships, and physical access is mandatory (Asongu, 2013; Lubua, 2014).

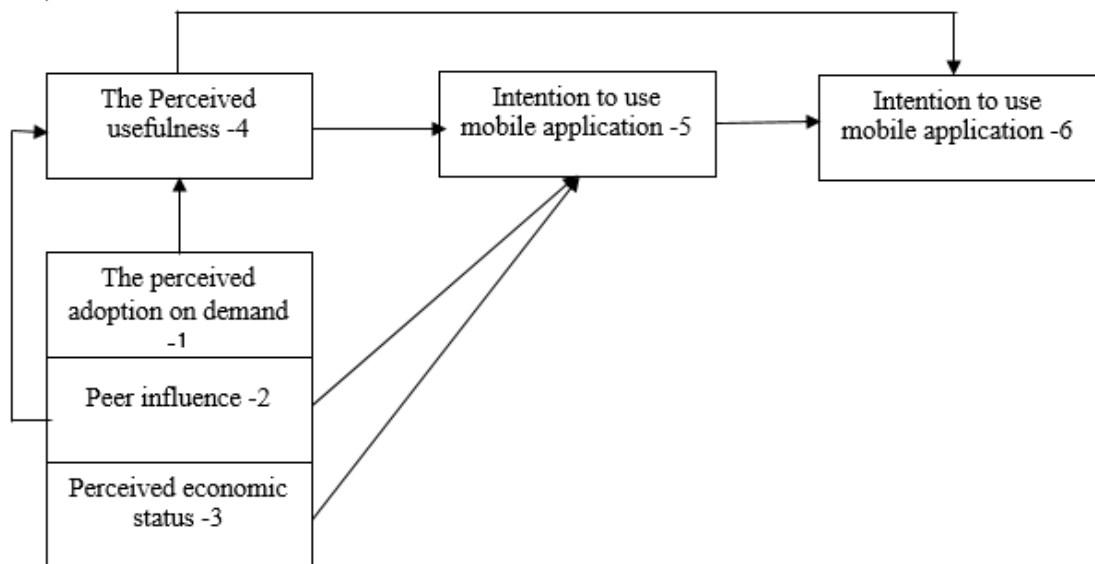
Another factor affecting the adoption by rural communities is the fear of associated expenses (North et al., 2014). The use of mobile phones comes with expenses, linked with the airtime and maintenance costs. If the use of mobile phones is not associated with financial benefits, it is difficult for low-income earners to adopt. Moreover, lack of technical awareness may equally be the challenge. Many mobile phones lack the Swahili user manual. This creates difficulties for users to raise their technical awareness, since they are not conversant with the foreign language.

2.5 The Conceptual Framework

This section presents the conceptual framework of the study, and describes its variables. The conceptual framework organises ideas about the research project so as to achieve the research purpose (Bolner, Poirier, Welsh, & Pace, 2013; Williams, 2007). The framework contains elements (variables) useful in establishing the coverage of the study. The same elements are used in measuring the achievement of the purpose of the study (Bolner et al., 2013). As shown in Figure 2.6, the following

are the independent variables of the study with respect to the intention to use technology: the perceived adoption on demand, peer influence, the perceived economic status and the perceived usefulness. Moreover, the absolute dependent variable is the behaviour of users toward the use of the technology, and it receives a direct influence from the intention to use. Nevertheless, it is practically true to suggest that all variables have a way to relate with the use behaviour. These variables are used to formulate hypotheses for testing, as shown in section 2.5.1.

Figure 2.6: Conceptual Framework



Source: Researcher's Construction, 2015

2.5.1 Description of variables

This section provides a brief description of variables of the study.

i. Sources of the Social pressure

The social pressure is discussed in detail in section 2.3 of this report. Studied theoretical models offer diversified conclusions on the impact of social factors on the adoption of technological tools, including mobile phones in economic activities. According to the Unified Theory of Acceptance and Use of Technology, social factors

influence the intention to use (Davis, Davis, Venkatesh, & Morris, 2003; Venkatesh & Davis, 2000). This intention supports a continue desire to use the new technology in economic activities (Osah, 2015). The same relationship is supported by the modified Technology Acceptance Model, where subjective norms influence the intention to use (Al-Qeisi, 2009; Venkatesh & Davis, 2000).

Moreover, social factors (in Figure 2.6) are suggested to influence the level to which users of the new technology perceive its benefits. This aspect is important because it would be difficult for users to adopt the technology without any benefits. This relationship is a reflection of the one shown in the modified Technology Acceptance Model. The same relationship is shown in the C-TAM-TPB Model (section 2.3.2).

A general perspective of this variable (social pressure) is that the degree to which users are attached to social beliefs of the society, decides whether they should accept or reject the technology (Al-Qeisi, 2009; Kohnke, Cole, & Bush, 2014; Thomas, Lenandlar, & Kemuel, 2013). People will not adopt what is not valued by their society. On the other hand, the opinions of some member of the society are highly valued (Al-Qeisi, 2009). These may be leaders, supervisors, family members and well-educated people within the society. These are likely to influence members of their society. Also, an individual can receive influence from other social groups with which s/he affiliates (Thomas, Lenandlar, & Kemuel, 2013). Moreover, other social factors may equally add pressure to the user.

This study adopted the following variables in understanding sources of social pressure which determines the adoption of mobile phones in the farming community. The variables are the peer influence, perceived adoption on demand, and the perceived economic status (ability).

In this study, the peer influence is an important variable because, soon after independency, the Tanzanian society was established under communal life (Ngowi, 2012). Therefore, the recommendation of fellow farmers may have an impact to the adoption. Moreover, the literature supports the peer influence to the adoption of new

innovations. For example the study by Bindah and Othman (2016), and that of Huili & Chunfang (2011) confirmed that peer influences significantly predict the ambition to adopt the new technology. With this regard it was necessary to contextualise the study, to understand whether peer influence impacts the adoption of mobile phones in the farming community. Moreover, the study determined whether the peer influence relates to the perceived usefulness (benefits) of the mobile phone technology.

Another variable with the social effect is the perceived adoption on demand. In this case, users adopt the technology because of the demand to meet their social and personal responsibilities. In the study by Osah (2015), the demands of those who affiliates with the user may dictate the adoption of the new technology. Moreover, the same demands may decide whether the user continue to use the new technology, or drop it (Park, 2009; Osah, 2015). One example of the adoption on demand is justified through the adoption of mobile money services; those who are in the same business circle with the mobile user require him/her to adopt for effective transactions (Kiseol & Forney, 2013). In this study, this variable was used in testing whether it influenced the intention to adopt the new technology. Another relationship was between the peer influence and the perceived usefulness.

The last variable with the social impact is the perceived economic status (ability). Arguably, the economic status of the farmer is easily translated through the spending ability (Ngowi, 2012). Vodacom is the largest telecommunication networks of Tanzania, and defines its services based on bundles which offer the user with the airtime and internet service (Tanzania Communication Regulatory Authority, 2016). The purpose of this categorisation of bundles by Vodacom² is to ensure that different social classes based on the income are addressed through their services. Nevertheless, the amount and number of services accessible to the subscriber depends on the payment made. Different categories of packages are the result of different amounts paid (Lubua, 2014, Osah, 2015). The difference in the ability to purchase creates the

² Vodacom Tanzania Bundles - https://vodacom.co.tz/internetservices/prepaid_packages

invisible social groups based on their purchase power. Therefore, it contributes to the social pressure. In this study, the relationship between the economic status and the intention to adopt mobile phones was studied. This was through understanding users' spending ability on mobile services.

ii. **Intention to use the technology**

This variable expresses the intention of the user to use the technology in the near future. According to the modified Technology Acceptance Model, this variable is under the influence of several other variables, including social factors (Davis et al., 2003). The relationship with social factors is explained in the last paragraph of section 2.5.1(i). Accordingly, the same model suggests the relationship between the perceived ease of use and the intention to use. This relationship is supported by studies such as those by Ramayah and Ignatius (2014) and Kimberley et al. (2012). Although the later relationship is not part of the main studied relationships, it was a supplement to the study, in affirming the required model.

Another factor identified to determine the intention of the user to use the technology is technological usefulness (Akudugu, Emelia, & Dadzie, 2012). When the user is confident that the new technology attaches certain benefits to the use, the likelihood of adopting such a technology increases (Al-Qeisi, 2009; Lubua, 2014).

iii. **Perceived usefulness**

This variable explains the perception of users towards benefits of using mobile phones (or other ICT-related equipment) in their farming activities. According to Davis et al. (2003) and Astrid, Mitra, and David (2008), the perceived usefulness is reported to relate with the intention to use. As explained earlier, social pressure also influences the perceived intention to use. In Figure 2.6, social pressure is assumed to exert influence on perceived usefulness. Additionally, the intention to use the technology is influenced by the perceived usefulness of mobile phone services.

iv. **Technology use behaviour**

This is the fourth variable of the conceptual framework. It represents the behaviour of an individual toward the use of the technology in his/her activities. It is fully dependent on the existence of the variables discussed in section 2.5.1 (i, ii & iii). Through the behaviour expressed in the use of the technology, the study can understand the uses of mobile phones by farmers (Clarke, 2009). This informs the community whether the technology is well adapted or not (Park, 2009; Truong, 2009). In this study, the variable used to explain the use behaviour is the rate of use of the technology. The study by Davis et al. (2003) suggests that the use behaviour is under the influence of the intention to use as well as social factors. The UTAUT Model suggests that the use behaviour is influenced by facilitating conditions and the intention to use (Al-Qeisi, 2009; Kohnke et al., 2014).

Based on discussions conducted in this section, the following are the hypotheses of the study:

Hypothesis One

H₀: The adoption of mobile phones on demand does not influence the perception of farmers of its usefulness

H₁: The adoption of mobile tools on demand influences the perception of farmers of its usefulness

Hypothesis Two

H₀: The extent to which farmers perceive the usefulness of mobile phones does not relate to their current rate of use in agriculture

H₁: The extent to which farmers perceive the usefulness of mobile phones relates to their current rate of use in agriculture

Hypothesis Three

H₀: The perceived usefulness of mobile tools in managing agriculture does not relate with the way they associate the success of others with the use

H₁: The perceived usefulness increase if farmers associate the success of others with the use

Hypothesis Four

H₀: Farmers' spending ability (economic status) does not relate to their willingness to learn about new mobile tools for managing agriculture

H₁: Farmers' spending ability relates to their willingness to learn about new mobile tools for managing agriculture

Generally, the whole conceptual framework is summarised through a function (equation) provided below. This equation is validated through a discussion conducted in section 4.7 of this study. Variables which comply with this equation are identified to affirm the position of the resulting model.

The Rate of Use = f(perceived usefulness, the adoption on demand, the peer influence, the economic status, intention to use)

2.6 Chapter Summary

In this chapter the study reviewed the literature. The study targeted publications with relevance to the adoption of innovative technologies (such as mobile phones) in human activities. Initially, the study introduced the concept of mobile phone use in agriculture. This part of the review ascertained the value of information in making different decisions in the farming community. It also highlighted the contribution of information systems in gathering data, which are processed to provide the information relevant to this community. Moreover, the ability of modern ICT tools to capture and process data is highlighted. This includes the ability to decide on behalf of the user.

Besides, the study reviewed key theories within its subject. Technically, three theories were reviewed. Nevertheless, the establishment of these theories considered the review of the theories which existed before. The three theories are: the Motivational Model of Microcomputer Usage, the Combining of the Technology Acceptance Model and the Theory of Planned Behaviour, and the Unified Theory of Acceptance and Use of Technology. Collectively, these models have their differences and similarities. Among others, this study considered the fact that all of the models acknowledged the

contribution of social factors to the adoption of a new technology. This supported the main theme of this study.

The other element within this chapter was about the contribution of mobile phones to the farming community. A number of benefits such as communication, financial transactions, understanding the weather condition and others were discussed. Nonetheless, farmers are likely to miss these benefits if they fail to make positive changes for the adoption. On this basis, a conceptual framework was introduced, summarising the variables for the adoption of mobile phones in the farming community. The absolute dependent variable was the use behaviour of mobile phones in agriculture. Factors suggested to influence the use behaviour include: the social pressure, the intention to use, and the perceived usefulness.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology adopted in this study. The information provided covers the research design, ethical issues, the research population and sampling procedures, data collection methods, data analysis and the reliability and validity testing.

3.2 Research Paradigm

A research paradigm is a framework or a set of assumptions, enabling the organisation of studies around us (Al-Qeisi, 2009). The reasons why researchers need to have a clear understanding of their research paradigm include the fact that a paradigm guides the researcher through highlighting issues challenging the discipline under study, it provides theories supporting researchers to solve problems, and it establishes criteria for tools to be used in the research process (Scotland, 2012).

Arguably, a clear understanding of a research paradigm fitting the study is necessary for a successful completion. This is because, a paradigm influences the way the study is designed and operationalised (Crowther & Lancaster, 2008; Collins, 2010). Understanding the paradigm of the study helps the researcher in crafting the strategy for integrating different components of the study. These components are necessary in attaining a coherent study, in a logical manner (Collis & Hussey, 2014). Moreover, the components ensure that the research problem is addressed adequately, through the following principles for data collection, measurement of research elements, and analysis. Collectively, the choice of a research paradigm must aid the research to properly design the study in such a way that evidences collected from the field address the problem logically and without ambiguity (Easterby-Smith, Thorpe, & Jackson, 2008).

Generally, there are two important aspects to consider when choosing a research paradigm. The first is the view of the knowledge (ontology), and the second is the procedure to bring out the new knowledge (Krauss, 2005). These two aspects are the main part of the discussion in this section.

3.2.1 Ontology

Traditionally, ontology is an important component of philosophical studies examining the nature of reality. It is a system of beliefs explaining how an individual interprets what he designate as facts (Littlejohn & Foss, 2009). Its basis provides the viewpoints embraced by theories under study (Aliyu, Bello, Kasim, & Martin, 2014). It seeks to understand what thing(s) exist within the subject under study. Since ontology provides the required viewpoint of the nature of things in the real world, it is appropriate to consider it in Information Systems studies. This is because services offered through Information Systems (IS) are part of the real world system (Aliyu, Bello, Kasim, & Martin, 2014).

Generally, there are two extreme ontological views Information Studies. The two main views are realism and relativism. Table 3.1 below summarises the two ontological views, while their subsequent discussion follows in the section below.

Table 3.1: Ontological views

Realist	Relativist
Realism is found under the assumption that the world is made of tangible pre-existing structures which are external and independent of the viewer.	Relativists believe that the view of the external world varies because it is subjected to the influence of the mind of the viewer. It advocates that the view of the reality is influenced by social factors around the viewer.

Source: Fitzgerald & Howcroft, 1998

3.2.1.1 Descriptions about Realism and Relativism

In realism, the word objectivism is used as a synonym. Realism simply represents the belief that something is real (Ramanathan, 2008). It simply suggests that the knowledge which is searched can be verified (Littlejohn & Foss, 2009). Both the knowledge and its point of existence are verifiable. Therefore, to come to such a conclusion the researcher must understand different assumptions regarding the knowledge searched (Saunders, Lewis, & Thornhill, 2012). The understanding of such assumptions may be through studying the knowledge environment through physical experience or the review of related literature.

For realists, the external world is independent of the viewer's experience or thoughts. The world exists naturally and can be verified by different viewers, under similar conditions (Denscombe, 2003). The result of this verification is expected to be the same. Realists are detached from participants, and are required to remain emotionally neutral to make a distinction between reasons and feelings (Denscombe, 2003; Scotland, 2012). Moreover, realism works under the assumption that we conduct our studies in the world that exists with its principles and laws. Therefore, human knowledge acts as an informant of what exists, rather than being part of the reality (Scotland, 2012). In this case, it is assumed that the study under realism has no chance of influencing the reality (facts) of the study.

On the contrary, relativism is the ontological branch suggesting that there is no absolute truth or validity to the knowledge under study (Wilson, 2010). The knowledge is subjective and relative (Scotland, 2012). The relativity is constituted by differences in individual perception and consideration (Littlejohn & Foss, 2009). Moreover, the meaning is influenced by social interactions that the observer makes with the real world (Kura, 2012). Therefore, all meanings that the observer provides to the studied object are legitimate, because the truth is relative to individual perception. Therefore, relativists advocate the concept of diversity in our views due to factors such as difference in our customs or genetic views; therefore, relativists are opposed to the views which consider pre-existing standards in defining the reality (Fitzgerald & Howcroft, 1998; Kura, 2012; Miller, 1999).

3.2.1.2 The ontological stance of this study

This study has declined relativism because it allows diversified views on reality. The output and interpretations are centred on the viewer. The current study follows scientific procedures; therefore, it is objective. The subjective approach which is advocated by relativism is not appropriate for testing hypotheses formed under scientific principles, such as those of this study (refer section 2.5.1). Arguably, since the knowledge of the knower exists in his/her mind, it would be difficult to understand if there is anyone else who shares the same perception (Collins, 2010). Equally, it is significantly challenging for the relativist to know if there is a different knowledge (about the studied object) beyond the world perceived by their minds.

It must be made clear that this study was initiated because the literature lacked adequate information about the relationship between social patterns of the farming community and their adoption of mobile phones in their economic activities. With this purpose, the objective view of knowledge is imperative for a number of reasons. First, the study uses hypotheses, and they require a scientific approach in testing. In this case, objectivity is indispensable for any scientific approach of solving a problem. Moreover, it is the intention of the study to block the possibility of the researcher to influence the results of the study. In this aspect, relativism is appropriate because it advocates that the researcher is independent of the study. In this case, the study established procedures for addressing the problem to provide the room for other researchers to verify the authenticity of the study. This is possible with realism.

In studies relevant to the adoption of new technologies, the use behaviour simply explains the characteristics of users when using the technology (Akudugu et al., 2012; Al-Qeisi, 2009; Yang, 2009; Yonazi, Henk, & Boonstra, 2010). In the context of this study, the use behaviour is the perceived rate of using mobile phones in farming activities. Based on the conceptual framework presented in figure 2.3, the use

behaviour is linked³ to the intention of the user to use the technology. Both the intention to use and the use behaviour are completely independent of the researcher's opinions. A closer view of the two variables suggests that the researcher is absolutely independent of the values recorded from respondents. The researcher can neither influence the intention of users, nor their behaviour of use (Crowther & Lancaster, 2008).

Additionally, the intention to use the technology is influenced by the perceived usefulness and the social pressure. The perceived usefulness is simply the extent to which the user thinks that the use of the mobile phone in managing agriculture is of benefit (Crowther & Lancaster, 2008). This is completely linked to respondents rather than the researcher. Moreover, the studied social pressures are those which were hypothesised to influence the user of the mobile technology. The study crafted the questionnaire which became a guide in extracting data, without the influence of the researcher. The whole process ensured the independence of the units of inquiry from the researcher for scientific results (Saunders, Lewis, & Thornhill, 2012; Collins, 2010).

Given the arguments in the above paragraph, it is safe to suggest that things influencing the position of this study are independent of the researcher: their conclusions can receive verification by other researchers. Therefore, the study inclines to the realism point of view, which suggests that the structures of the world are independent of the viewer (Easterby-Smith, Thorpe, & Jackson, 2008). Therefore, the researcher depends on observations as the way to gain experience about the subject. Moreover, the researcher depends on informers to gain experience.

With this view, the objective of the study fits better in this ontological view. The main objective was to determine social patterns influencing the adoption of mobile phones in Tanzania. Therefore, the study employed a survey questionnaire in making sure that

³ Refer the relationship established in Figure 2.3

the requirement for independence in data collection is met. The respondents provided the feedback without interventions from the researcher. The suggested approach allows generalisation of results provided that the population shares similar characteristics.

3.2.2 Epistemology

An epistemology is the theory explaining the nature of the knowledge. It explains the channel for establishing the knowledge, therefore, it responds to the question: how do we know? Littlejohn & Foss (2009) explains an epistemology as a theory of knowledge, about the method to be used in searching for a new knowledge, the validity of the findings and the scope of the subject. The epistemology is important because it provides explanations on how we think, it is used in determining the truth, it helps in establishing a proper method for evaluating facts, and used in deciding how to use the knowledge around us (Crowther & Lancaster, 2008).

In this section, epistemological considerations are discussed based on five main philosophical perspectives: Pragmatism, Positivism, Realism, Interpretivism and Post-positivism. The choice of an epistemological view needs to be supported by the chosen ontology (Wilson, 2010). Therefore, the choice of an ontological view (in section 3.2.1.2) makes the decision on which epistemology to adopt much simpler. This is because each epistemological view specifies its corresponding ontology.

Table 3.2: Summarised epistemological views

Epistemological Views	
Positivism <ul style="list-style-type: none"> - The world conforms to established laws of causation - The complexity of the studied subject can be addressed through reductionism - The study must pay attention to repeatability, objectivity, and measurement 	Pragmatism <ul style="list-style-type: none"> - Observable phenomena, subjective meanings or their combination can produce an acceptable knowledge, based on what the research questions demand - The epistemology focuses on practical research and allows the combination of ontological views to establish the knowledge - Both realism and relativism are acceptable ontologies
Interpretivism <ul style="list-style-type: none"> - No Universal truth - Effective research approach uses the understanding and interpretation from researchers, because knowledge is socially constructed - The knowledge is subjective, and may change. Multiple meanings may be attained 	Critical Realism <ul style="list-style-type: none"> - It is objective, as it relies on observable phenomena to obtain credible data - The interpretation is under social conditioning. Interpretation does not follow strict established rules

Source: Mkansi & Acheampong, 2012

3.2.2.1 Positivist philosophy

This section discusses the Positivist epistemological view. Generally, Positivism refers to a philosophical position that emphasises empirical data and scientific procedures in conducting research (Clarke, 2009). It further emphasises that every assertion that is rationally justifiable can be verified through scientific procedures (Krauss, 2005). Scientific procedures refer to the use of logical or mathematical procedures (Wilson, 2010).

Generally, the philosophy follows scientific procedures in solving problems. In social research, Positivism aims at discovering patterns and the regularities of the social world through scientific methods adopted in natural science (Denscombe, 2003). Therefore, Positivist philosophies are also applied by social scientists.

Moreover, Positivists believe that there is an objective reality to the knowledge (Al-Qeisi, 2009). Therefore, based on the discussion in section 3.2.1, positivists are under realism ontological perspective. The emphasis is that the knowledge determined by the researcher exists independently and can be verified (Krauss, 2005). The presence of interference during the study is likely to threaten the validity of the study of this nature (Clarke, 2009; Mkansi & Acheampong, 2012).

Overall, Positivism favours variance theory where variables are studied together with their relationships (Kura, 2012). The variance theory uses probability to determine the relationships between related variables. In order to have a successful study, the researcher has the obligation of identifying the variables, with their relationship (Collins, 2010; Collis & Hussey, 2014). This study accomplished this component through a conceptual framework presented in figure 2.3. In this context, before the study is conducted, hypotheses for testing are suggested. Quantitative studies qualify more under positivism. This is because they follow scientific procedures which include: Generating hypotheses, operationalisation of hypotheses ready for measuring, choosing the technique for measuring operationalised concepts, and the step for rejecting or confirming of hypotheses (Aliyu, Bello, Kasim, & Martin, 2014). Hence, the study observes the pre-defined phenomenon useful in reaching a conclusion.

On the other hand, positivism is characterised by a number of shortcomings. First, positivism relies on experiments to obtain the expected knowledge (Easterby-Smith, Thorpe, & Jackson, 2008). This limits important concepts which may equally be a good source of knowledge (such as knowing the cause and timing); all of these cannot be studied through experiments. Moreover, positivism puts emphasis on studying relationships between variables. Equally, positivism is criticised for being too

descriptive because the researcher lacks a link with the studied object (Saunders, Lewis, & Thornhill, 2012).

3.2.2.2 Interpretivism

Interpretivism represents a group of philosophers opposing the views presented by Positivists (Aliyu, Bello, Kasim, & Martin, 2014). Basically Interpretivism and positivism are the two most adopted epistemological stances. Interpretivism believes in relativism (Collins, 2010; Collis & Hussey, 2014). This suggests that the philosophy considers the researcher as the key instrument for measuring its output. Arguably, the development of knowledge through research highly depends on social interaction between human beings and other elements of the study (Ramanathan, 2008). Therefore, it is generally accepted to suggest that the researcher is not isolated from the study under Interpretivism (Scotland, 2012). The output of the research work is directly affiliated to the viewer; this is the reason why Interpretivists believe that the knowledge of the world is built intentionally through life experience (Walsham, 2006). While the goal of Interpretivism research is to develop an understanding toward a scenario, it is characterised by a low predictive ability (Crowther & Lancaster, 2008).

The researcher with this philosophical stance must identify with and comprehend the principles of nature before seeking the experience within the boundaries of his/her perception (Clarke, 2009). This is the basis for Interpretivists to believe in multiple realities toward the same element. Different viewers may present with different knowledge on the same object (Harris & Brown, 2010; Scotland, 2012). Therefore, the knowledge is socially constructed, subjective and may change (Clarke, 2009; Rowlands, 2005). Even the said multiple realities cannot be ascertained because it depends on other factors. Ontologically, Interpretivists concede to relativism.

The main weakness of Interpretivism is subjectivism. This subjectivity allows multiple interpretation of the same scenario, and this is heavily under the influence of the researcher (Collis & Hussey, 2014). Under this epistemology, the generalisation of the results is impossible. This is because the findings are impacted by personal viewpoint

(Easterby-Smith, Thorpe, & Jackson, 2008). Moreover, the reliability and representation of data cannot be guaranteed. The main advantage is its ability to accommodate qualitative studies. Issues related to organisations and the culture are accommodated, with a great level of validity. Data in these studies are trustworthy. According to Ramanathan (2008), table 3.3 summarises features for Interpretivist studies.

Table 3.3: Features of Interpretivism

Element	Social Constructionism
The researcher	Is part of what is being observed
Human interests	Are the key drivers of the research work
Explanations	The purpose is to increase the general understanding of the situation
Research process	Uses gathered rich data to induce the idea
Concepts	It is necessary to incorporate stakeholder' perspectives
Units of analysis	It is likely to include the whole complex of situations
Generalisation	Theoretical
Sampling requires	Requires a small number of cases chosen for specific reasons

Source: Ramanathan, 2008

3.2.2.3 Pragmatism philosophy

Pragmatism philosophy accepts a concept that supports action. It also recognises that there are diversified methods for conducting research, as well as for interpreting the world (Saunders, Lewis, & Thornhill, 2012). Therefore, no single point of view can present a complete picture of the studied scenario. It also acknowledges the fact that there could be multiple realities from the same object of the study (Crowther & Lancaster, 2008). This study acknowledges the fact that positivism and Interpretivism are the two opposing philosophies. Moreover, most researchers find themselves adopting one of them for their studies. However, there are cases where positivism and Interpretivism need to find a common ground (Bolner et al., 2013). This can be

accomplished through the adoption of pragmatism epistemology (Saunders, Lewis, & Thornhill, 2012).

Generally, under pragmatism, the position of the study depends on the scenario under investigation. This ontological perspective embraces the belief that there are many ways to obtain the truth. Hence, the study that manages to integrate multiple views of the knowledge is able to establish a comprehensive picture of knowledge (Rowlands, 2005; Williams, 2007). Pragmatism emphasises that a single point of view provides a partial knowledge of the knowledge.

Pragmatists take a research approach depending on the research question addressed. In the case where statistical measures are desired, pragmatism adopts the quantitative approach (Kura, 2012). This includes when the research requires a generalisation for the findings to the population under study (Aliyu et al., 2014; Mkansi & Acheampong, 2012). Equally, it can be adopted where there is a need to test the theory. Nevertheless, a qualitative approach could be employed independently, even adopting the two approaches at the same time, to form a mixed research method (Dalsgaard, 2014). Pragmatists do not seek to show whether the knowledge is true or right, but seeks to know whether the knowledge works. It capitalises on practical outcomes (Dalsgaard, 2014; Rowlands, 2005). Table 3.4 summarises key aspects of pragmatism.

Table 3.4: Pragmatism epistemology

Element of Study	Description
Research approach	Deductive/inductive
Ontology	Realism/relativism
Research strategy	Quantitative and/or Qualitative

Source: Researcher's construction, 2017

Although pragmatism addresses the weaknesses and strength of the two most applied epistemological stances, it requires an experienced researcher to integrate the two ontological perspectives at the same time (Ramanathan, 2008).

3.2.2.4 Critical theory

The original purpose of the critical theory was to enable Marxist theories to be applicable in the modern society (Myers & Klein, 2011). The key intention was to address complex phenomena in social and economic structures. Epistemologically, it operates under the following assumptions: The knowledge is constructed through social agents, the value of the knowledge depends on the influence of the one advocating, and knowledge production is an expression of social power rather than the truth (Bolner et al., 2013; Myers & Klein, 2011).

Ontologically, the Critical theory is a socially created reality. Critical realists acknowledge the presence of the reality or knowledge, but are convinced that the presence of social beings influences what is to be measured (Kura, 2012). Therefore, the interpretation of knowledge depends on social conditioning (Myers & Klein, 2011). Some of the ontological assumptions include the following: Human beings define the social reality, and the social reality is constructed by the media, an institution, and the community (Dulock, 1993; Scotland, 2012).

Methodologically, the Critical theorists use engagement methods (Myers & Klein, 2011). For example, the method could be conversations, followed by reflections to deduce assumptions. The purpose of engagement methods is to obtain historical information in the form of knowledge; aspects of this knowledge are then subjected to critique and optimism (Mkansi & Acheampong, 2012; Myers & Klein, 2011; Scotland, 2012). With these processes, it is important to acknowledge that the purpose of Critical theory is to scrutinise social realities so as to alter, evaluate or/and liberate them. Based on this discussion, the Critical theory does not fit this study. The study focuses on the quantification of social issues influencing the adoption of mobile phones among farmers, rather than changing or liberating some form of knowledge.

3.2.2.5 Post-Positivism

Historically, there have been debates on the gap between Positivism and Interpretivism. This is because each of these ontological views has weaknesses which can be complemented by the other. With this view, Post-Positivism was brought into being to establish a point of reconciliation between the two extreme ontological views (Scotland, 2012). Post-Positivism presents an ontological view known as “critical realism”. Just like Positivists, ontologically, Post-Positivists concede that knowledge exists; however, it can be known imperfectly and within certain probabilities (Mkansi & Acheampong, 2012; Scotland, 2012).

Post-Positivism embraces methodological pluralism because its proponents believe that a single method is not adequate to establish the truth (Mkansi & Acheampong, 2012). Multiple methods are required to strengthen findings. Moreover, the literature suggests that multiple research approach refines the knowledge and is good for its development, even within the field of Information Systems (Teddlie & YU, 2007; Williams, 2007). Moreover, the literature commends Post-Positivism for its effort to reduce errors because of pluralism; however, the challenge remains in the vagueness of the language used to define the resultant ontological view – that is imperfect and probabilistic realism (Marshall & Rossman, 1995; Sobh, Perry, & Coast, 2006). The current study is uncomfortable with the lack of confidence expressed through the ontological view of this epistemology, and is convinced that the Post-Positivism is not good enough to respond to its hypotheses. Testing hypotheses requires an explicit reality.

3.2.2.5 The Epistemological stance of the current study

This study adopted the epistemological view, providing a clear distinction between scientific facts and personal views. This perspective is important to enable the researcher to make decisions valuable to the study (Scotland, 2012). Based on this information, the following epistemologies were discharged: Interpretivism, Pragmatism, Critical theory, Pragmatism and Post-Positivism.

Interpretivists seek to assign meaning to objects under study. The acquired knowledge is relative, and subjected to interpretation given by the researcher (Kelliher, 2006; Walsham, 2006). Critical theorists seek to assess, modify or liberate pre-existing social knowledge with a social realist perspective (Myers & Klein, 2011). This perspective does not fit in with the current study. Pragmatism is interested in showing whether the current knowledge works and not whether it is true (Dalsgaard, 2014). On the other hand, Post-Positivists rely on researcher's perception and views to make discoveries; the new knowledge is restricted from generalisation (Mkansi & Acheampong, 2012). Also, Post-Positivists embrace an imperfect view of its ontological perspective; this is the reason why it encourages pluralism in its methodology. Generally, these views favour descriptions provided based on personal views, instead of explanations resulting from scientific research processes. These views cannot provide conclusive answers to hypotheses stated in section 2.5.1.

Generally, in the view of the discussion conducted in section 3.2.2.1, this study adopts an Objectivist (realist) ontological view, and Positivist epistemology. The study adopts Positivist philosophical views because it assumes a distinct separation between the researcher and the population under study (Miller, 1999). The researcher is not expected to influence the results. Moreover, the study is objective in the sense that the knowledge can be generalised provided that the population for generalisation shares important characteristics with the studied population (Kura, 2012). Additionally, this study is based on hypotheses set out in section 2.5.1, and it follows the deductive approach. According to Heit and Rotello (2010), the deductive approach is the one that develops hypotheses based on existing theories, followed by designing a strategy to test such hypotheses. These factors qualify the study under a Positivist epistemological view.

In addition to facilitating the adoption of Positivist views, the study used the relationship-based research design. The design studies how social variables stated in section 2.5.1 relate to the decision of farmers to adopt mobile phones. Nevertheless, the operationalisation of the study depends on mixed research methods. The primary method is the use of the survey questionnaire. This enabled the study to obtain

quantifiable data, relevant for testing hypotheses (Harris & Brown, 2010). This method was supplemented by the use of interviews. Interviews aimed at clarifying issues arising from analysed input from the questionnaire (Macan, 2009). Moreover, the literature was used in comparing observations of the study with findings from other researchers. Also, it was used in explaining some behaviours observable to the study.

3.2.3 Selected methodology

In research, the confidence of stakeholders is raised based on the extent to which the research process is reliable and valid (Chassan, 1979; Dulock, 1993; Yates, Partridge, & Bruce, 2012). The reliability and validity are linked with the appropriateness of the research methodology used, and whether it leads to the achievement of the expected end (Williams, 2007). In modern days, the Information Systems domain boasts of the development of scientific research philosophies, which guide its research operations. These paradigms offer necessary research methods to complete studies in the field of Information Systems (i.e. Qualitative and Quantitative methods).

Normally, quantitative methodologies are adopted if the epistemological stance adopted is Positivism (Kura, 2012). Operations of this study viewed the world in an objective manner, and comply to the phenomenon that the relationships between variables and other involved facts can be established explicitly. On the contrary, studies which use qualitative methods adopt Interpretivist philosophical views (Clarke, 2009; Kelliher, 2006). In this philosophical view, the researcher purposefully defines the knowledge, and there is a link between the researcher and the knowledge under study (Kelliher, 2006). In the light of the discussion conducted in sub-sections of section 3.2, this study adopted the quantitative approach (Kelliher, 2006). It used closed questions as the main data collection tool. Consistent with this, the study applied analytical models relevant to stated hypotheses (refer section 3.6). The study used the literature to justify the use of these models in addressing provided hypotheses.

3.3 Sampling

The target population of this study was the rural farming community in African settings. The intension was to determine how the agricultural management activities

(in the farming community) can be enhanced through the use of mobile phones and related technologies. Nevertheless, because of time constraints the study was conducted in Same and Korogwe Districts of Tanzania. The actual population included farmers within the Pangani River Basin. The Pangani River Basin is within four Districts of Kilimanjaro and Tanga Regions. These are Mwanga, Same, Korogwe and Pangani Districts. The location of these farmers was easily accessible to the principal researcher, and there was a mixed level of mobile phone adoption by the members of this community. Therefore, this community will be benefited from the study. Moreover, the results are eligible for generalisation in areas with similar characteristics, more especially in the Sub-Saharan Africa. These characteristics are discussed in Chapter Four of this study.

3.3.1 Sample and sampling frame

The size of the population stated in section 3.3 is too large for the researcher to manage, given the time and financial constraints. Therefore, it is important to set a framework to obtain the sample scientifically, without affecting the credibility of the study (Teddlie & Yu, 2007). A sampling frame is different from the population in the sense that the population is general, while the sampling frame is specific to where the sample is extracted (Collis & Hussey, 2014). The study established its sampling frame based on two wards, where data were collected: One in Same District and the other in Korogwe District. The study established a framework of 140 respondents, where 70 members of the framework represent each Ward. The purpose was to have a manageable population representing the entire community (Kura, 2012; Teddlie & YU, 2007).

To establish the framework based on the above criteria, the study used four (4) active farmers to establish the list of other farmers, in their respective clusters. In the list that exceeds 70 farmers within a ward, appropriate systematic random sampling procedures were adopted to obtain the required number for the framework. This type of sampling was used to eliminate possible biases and ensure the representation of the actual population in the framework (Thomas, Lenandlar, & Kemuel, 2013).

The establishment of the framework was followed by defining the required sample of the study. A sample is a subset, representing characteristics of the whole population (Turabian, 2013). The sample of 30 respondents (items) is minimally recommended for statistical operations (Chassan, 1979; Frankfort-Nachmias & Nachimias, 1996). Nevertheless, this does not ensure the representation of the population in the sample. To ensure this representation in the sample, the study adopted the standards established through the Krejcie and Mogan (1970) model. This model is summarised and presented through table 3.5 (Krejcie & Mogan, 1970).

Based on the Krejcie & Mogan (1970) framework, this study decided to use the sampling frame of 140 units, where the appropriate sample size is at least 116 respondents (refer table 3.5). The sample was extracted from the framework through systematic sampling. Systematic sampling is a probability sampling method where members are selected from a large population (according to a random starting point), with respect to a certain interval (Littlejohn & Foss, 2009). This interval is known as the sampling interval, and is established through finding the ratio between the population and the size of the desired sample (Saunders, Lewis, & Thornhill, 2012).

Moreover, it is necessary to acknowledge that the sample was mainly used in obtaining quantitative data. Nevertheless, there were few incidents where the information obtained through quantitative methods required clarifications. In this case, follow-up interview questions were administered to obtain clarifications about some research patterns. The researcher used purposive sampling to obtain the desired information.

Table 3.5: Krejcie and Mogan Model of sample determination

Population	Sample	Population	Sample	Population	Sample
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Source: Krejcie & Mogan (1970)

3.4 Data Collection

This section introduces methods used in the collection of data. Data collected in research work comes from different sources. Extracting data from these sources may require different techniques or methods. In this study, the main methods included the use of the survey questionnaire and the interview. Additionally, the use of these methods was supported by the continuous review of the literature. This is because the literature provides the foundation of the study through the use of available theories (Turabian, 2013), and is useful in ensuring that the research does not duplicate effort through attending the subject area already covered (Vyhmeister & Robertson, 2014). The literature also provides a constructive analysis of the methodology to be adopted by the study (Turabian, 2013; Vyhmeister & Robertson, 2014).

3.4.1 Closed-end survey questionnaire

A closed-end questionnaire is the most popular tool adopted by researchers in quantitative survey studies (Van der Zee, Bakker, & Bakker, 2002). It provides the respondent with a set of possible answers, from which s/he must choose. This is useful because it provides the study with the desired information (Collins, 2010; Crowther & Lancaster, 2008). One of the advantages of the closed-end questionnaire is its support of scientific procedures of research (Al-Qeisi, 2009). Therefore, it fits better under Positivist philosophy. Furthermore, the use of the closed-end questionnaire allows the collection of large amounts of data within a short period (Van der Zee, Bakker, & Bakker, 2002). This is because the same questionnaire may be distributed to all respondents at the same time, and respondents fill them independently (Littlejohn & Foss, 2009). Other advantages include: It is easy to analyse (through scientific methods), easy to compare, and useful in formulating new theories.

The closed-end questionnaire may be administered through different methods. First, the researcher may decide to physically distribute the questionnaires (Wilson, 2010). Moreover, the researcher may decide to use posting facilities. Other methods include emails and other web supported facilities (Al-Qeisi, 2009).

This study used the closed-end questionnaire as the main tool for data collection. The questionnaire was physically administered by the researcher. The adoption was because the closed-end questionnaire supports the quantitative research approach, and is suitable in collecting large amounts of data, which can be analysed within a short period (Harris & Brown, 2010). Each section of the questionnaire corresponds to the theme of a particular hypothesis. The purpose is to ensure that all key variables of the study are well represented. The questionnaire was distributed to respondents by the principal researcher, to ensure that participants are those desired. A copy of the distributed questionnaire is attached in Appendix I.

3.4.2 Interview

Traditionally, interviews are linked with qualitative studies (Krauss, 2005; Williams, 2007). However, pure quantitative studies may adopt interviews, and it is possible to make interview questions in a closed-end or open-end format (Al-Qeisi, 2009). A closed-end format simplifies the analysis process. Moreover, a closed-end does not require additional coding and restructuring of responses (Frankfort-Nachmias & Nachimias, 1996; Williams, 2007). With the open-end, coding is mandatory before the analysis begins. The complexity of the latter case makes the analysis process tedious and prone to errors.

Generally, the quantitative approach adopts interviews when the response rate is expected to be low upon the use of a survey questionnaire (Van der Zee, Bakker, & Bakker, 2002). Furthermore, interviews are used if the researcher is interested in receiving clarification (from respondents) on the trend observed through questionnaire data (Turabian, 2013; Van der Zee, Bakker, & Bakker, 2002).

This study used structured interviews as a follow-up tool to obtain data that supplement the quantitative information obtained through the closed-end questionnaire. In this case, the study used interviews to seek clarification on issues emerging from analysed quantitative data. Therefore, interviews did not form the basis of analysis, as in closed-end survey questions, but offer the required explanation of the observed behaviour of analysis. Interview questions are formulated after questionnaire data are analysed.

3.4.3 Research Instrument

A copy of a research questionnaire is attached in Appendix 1 of this study. Questions within the questionnaire are formulated based on the conceptual framework and research hypothesis placed in section 2.5. Therefore, the components of the questionnaire reflect themes of research hypotheses. The intention was to make sure that the extracted information adequately meets the research needs (Harris & Brown, 2010). Moreover, the questions in the questionnaire are in a closed-end format. The purpose is to ensure that they are easy to respond to, and easy to analyse (Scotland, 2012). Also, closed-end questionnaires minimise the ambiguity to respondents (Harris & Brown, 2010; Teddlie & Yu, 2007). Interviews were to offer clarification to observed research patterns. In this regard, the questions were formulated as the needs emerged.

3.5 Validity and reliability of data

This section explains how the study ensured the validity and reliability of its data. Nevertheless, before a detailed explanation of the validity and reliability of data, it is important to understand the nature of the data used. Generally, the collected data reflected the following variables: the social pressure, the perceived usefulness of the technology, the intention to use the technology and the behaviour of using the technology. Both primary and secondary sources of data were considered. This is because they are the key types of data acknowledged by the literature (Bolner, Poirier, Welsh, & Pace, 2013; Cox & Hassard, 2005). Primary sources provided first-hand information (Cox & Hassard, 2005), and the execution of this study was mainly based on primary sources. Methods used in extracting data from such sources are the survey questionnaire and interview questions.

In addition, secondary data included the information from the literature. The purpose was to establish the theoretical part of the study (Icarbord & Allen, 2013). Also, secondary data were used in discussing the results of the study (Teddlie & YU, 2007).

3.5.1 Validity of data

Data validity ensures that available data measure established patterns (Turabian, 2013). Therefore, it was imperative to employ measures for enhancing the validity of this study. This is because data lacking the required level of validity are not suitable in making scientific decisions (Dulock, 1993; Sobh et al., 2006). In this study, the researcher tested two types of validity: *content validity* and *face validity*. The purpose was to ensure that the questionnaire extracted the right data, and that data measured proposed constructs.

Content validity is an important aspect of data validity. It ensures that extracted data (through the questionnaire) measure the intended target, as defined through the conceptual framework (Bolner et al., 2013). To ascertain that the study meets the required level of content validity, it is necessary to have the support of the literature and expert opinions (Frankfort-Nachmias & Nachimias, 1996; Y. Yang, Zhiling, & Mu, 2013). In this study, the literature was reviewed extensively. Moreover, the study used one Professor from the University of Cape Town to obtain constructive opinions. Moreover, four PhDs based at the Institute of Accountancy Arusha (Tanzania) were consulted for opinions. Their feedback was used in ascertaining this type of validity.

Another form of validity considered in the implementation of this study was *face validity*. This form of validity determines whether the data collection tool extracts the right types of data (Scotland, 2012; Teddlie & YU, 2007). It makes sure that respondents do not fail to interpret the questions (Al-Qeisi, 2009). To meet the face validity requirements, it was necessary to conduct a pilot study. This was randomly conducted in Hedaru Village, one of the residences of farmers along the Pangani River. The study took necessary measures to adjust the content of the questionnaire, for participants to interpret and understand without difficulties.

3.5.2 Reliability

Reliability is an important aspect of ensuring the research credibility. It ensures that study's operations can be replicated, and provides similar results in similar settings. This is attained through measuring the accuracy of research tools, which eliminate

inconsistencies and flaws in results (Bolner et al., 2013; Harris & Brown, 2010). This study employed Cronbach Alpha to test inter-item levels of consistency. Cronbach tests the consistency of responses to all items measuring the constructs of the conceptual framework. It applies the reliability coefficient between 0 and 1, and increases the reliability as the value grows closer to 1. Accordingly, the literature recommends that 0.70 is ideal for a minimum reliability tag. In this study the Cronbach Alpha value of the two independent variables (Perceived Usefulness and Social Pressure) and the Intention to Use Mobile Phones in Agriculture was 0.71. This reliability value is acceptable.

3.6 Data analysis methods

This section describes how research data were analysed. First, the variables of the questionnaire were coded into the Social Science Statistical Package (SPSS) acceptable format. Each question of the closed-end questionnaire is represented by a variable in the SPSS data sheet. All responses were translated into numbers. Then, data from each questionnaire were entered to the SPSS data sheet. The SPSS data sheet was inspected to make sure that there are no outliers. At this point, data were ready for analysis.

The research hypotheses presented in section 2.5.1 intended to determine the relationships between the stated variables. Specifically, the interest of this study is to establish the categorical relationships and the correlation between variables. On this basis, the study used descriptive statistics to understand the basic features of the sample. Moreover, the study adopted the One Way ANOVA Model to establish the categorical relationship between the variables. The study adopts the One Way ANOVA because it provides more information on the variance between and within studied groups (Shapiro, 1965). Additionally, the study adopted the Pearson Correlation model for establishing the linear relationship between the studied variables (Al-Qeisi, 2009; Shapiro, 1965).

The One Way ANOVA and the Pearson Correlation Models mentioned above are parametric models. These models are not to be applied to Non-Parametric data, unless the sample is above 30 respondents and the sample is normally distributed. The study used at least five (5) levels of the scale (ordinal) and no extreme scores (Yu, 2010). This study chose to use these models for the following reasons: First, the outlined conditions are met. In particular, the study used the five-level Likert scale to rate its questions. Moreover, the used scale limits extreme scores and anomalies in data, and the models can draw more conclusions about a single subject under study (Al-Qeisi, 2009).

After the completion of the analysis, the study made a reference to the conceptual framework (Figure 2.5), where the framework suggests that the behavioural use and the intention to use, both depend on the social pressure and the perceived usefulness. This assertion was tested using the Multiple Regression model.

It can be recalled that data from the literature and interview are to clarify and discuss issues, which were inadequately addressed by the closed-end questions. Also, the information provides the basis for interpretation and discussion of findings, before conclusions are drawn (Clarke, 2009; Williams, 2007). Therefore, the study grouped data from the literature according to areas (of research) they responded to.

3.7 Ethical issues

This study understands the presence of ethical guidelines for research practices around the world, and those of the University of Cape Town. In this study, respondents had the freedom to participate in research (Chassan, 1979; Frankfort-Nachmias & Nachimias, 1996; Turabian, 2013). Therefore, before they responded to the questionnaire, the researcher obtained their consent through a formal letter. This allowed respondents to sign if they agreed to participate. The letter informed respondents of the significance of the study. In the whole research process, the researcher consistently ensured the confidentiality of respondents' information.

This is an academic study; therefore, its process ensured that the work is free from plagiarism. The ‘Turnitin’ software was used to test the credibility of the report. Furthermore, the study ensured the proper use of references, and the final report was delivered to stakeholders in a verifiable format. Also, the researcher completed the ethical clearance form, as the tool to show readiness to adhere to ethical guidelines of the UCT. The completed ethical form is attached in Appendix 2.

3.8 Chapter Summary

This chapter presented the methodology adopted by the study. The choice of the methodology was influenced by the ontological and epistemological stances of the study. Ontologically, the study is under realism. Epistemologically, the study is under positivism. The adoption of these views dictates the study to follow scientific procedures. Therefore, it was proper to use the survey questionnaire to collect data for addressing hypotheses stated in section 2.5.1, of the second chapter of this study. Moreover, the chapter acknowledges the use of interviews as a tool to seek more clarifications on patterns observed through the analysed data (of the closed-end questionnaire).

Moreover, the study used a framework to trim its population, for a manageable process. The study used systematic sampling to extract data from this framework. Moreover, the model for determining the sample was used to decide the acceptable number of respondents. Moreover, the collection of data was followed by testing the reliability and validity of data. Then, data were analysed through the SPSS, with the use of descriptive statistics, ANOVA, Chi-Square, and the Multiple Regression Model.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis and discussion of research findings. It begins by providing an overview of demographic characteristics thought to relate to social factors in the farming community. Eventually, the relationship between these factors and the adoption of mobile phones in agriculture is drawn. Furthermore, the chapter presents the remaining sections based on the research themes they address from research hypotheses. The last section is the summary of the chapter.

4.2 Response rate

In the survey, the response rate refers to the ratio between the number of respondents who managed to return their questionnaires and the total number of questionnaires issued (Frankfort-Nachmias & Nachimias, 1996). Ethically, the researcher has the responsibility to inform respondents about the importance of the study, and assure them of the liberty to withdraw from the process at any time (Teddlie & Yu, 2007; Williams, 2007). Since respondents use their free will to return the questionnaire, it is difficult to set a standard about the acceptable response rate (Jiang, Chang, Saunder, & Sivo, 2006).

This study issued a total of 140 questionnaires to respondents. These were all respondents in the sampling frame. The number of questionnaires which were returned was 116, about 83% of the whole sample. This percentage is within the range supported by Krejcie & Mogan (1970), who argued that a response rate of at least 73% is required for a study with 140 respondents in a sampling frame. The reported response rate is consistent with other studies in the area of mobile phones use (Jiang et al., 2006; Teddlie & Yu, 2007). This was conducted in an active farming environment, where many people promised to fill the questionnaire and return it to the researcher. Unfortunately, not all respondents managed to return the questionnaire; however, this rate is adequate because it yields the number of respondents proposed

by the Krejcie and Mogan (1970) framework. Nevertheless, the study agrees with other scholars who cautioned that there is no universal rule in deciding on the sample size relevant to the study (Mogan & Krejcie, 1970; Scotland, 2012; Walsham, 2006). The study must adequately consider different factors supporting the decision to adopt certain guidelines for deciding the appropriateness of the sample size.

4.2 Demographic characteristics

Demographic characteristics are used to profile the sample based on their similarities and differences (Mogan & Krejcie, 1970). Some of the units commonly used in grouping the characteristics of the sample include the age, gender, marital status, education, and occupation, among others (Marshall & Rossman, 1995; Myers & Klein, 2011; Turabian, 2013; Walsham, 2006). A good number of studies on information systems established demographic characteristics in understanding factors for technology adoption (Al-Qeisi, 2009; Myers & Klein, 2011; Park, 2009; Truong, 2009; Yang, 2009). Consistent with aforementioned studies, this section presents data about demographic characteristics included in the research activity. The characteristics included were thought to influence respondents' decisions toward the use of the mobile phone technologies. The characteristics studied include: the age of respondents, gender, marital status and level of education. These characteristics are further discussed in the next sub-sections in the following order: The age of respondents (section 4.2.1), gender (section 4.2.2), marital status (section 4.2.3), and level of education (section 4.2.4). Table 4.1 provides the statistical summary of four demographic variables. Their discussion follows in their respective sub-sections.

Table 4.1: Demographic information

Variables	Scale	Frequency	Per cent
Age	Age<=30	32	27.6
	30<Age<=45	58	50
	Age>45	26	22.4
	Total	116	100
Gender	Male	90	77.6
	Female	26	22.4
	Total	116	100
Marital Status	Single	20	17.2
	Married	94	81
	Divorced	2	1.7
	Total	116	100
Education	Primary Education	104	89.7
	Secondary Education	8	6.9
	Post-Secondary Education	4	3.4
	Total	116	100

4.2.1 Age

In this study, the age of respondents was analysed to understand the existing parity in the farming community, and whether it affects the adoption of mobile phone technologies in agriculture. The analysis is based on the descriptive presentation of data. The relationship between the reported age groups and different categories of the remaining studied variables follows in later sections of this chapter. The data collection tool (questionnaire) captured the response from the sample (on age), in three main groups: those aged below 30 years, those aged between 31 and 45 years, and those aged 46 years and above. This categorisation of the age of respondents desired to capture the information from the young farmers, middle-aged farmers and senior citizens.

Moreover, the results presented in Table 4.1 show that about 27.6% of respondents were aged below 30 years, 22.4% above 45%, and the remaining group covers the ages between 30 and 45 years. Normally, the age group above 45 year, includes the senior workforce, and in most cases few members of the community are the candidates of the group (National Bureau of Statistics, 2011, 2014). Arguably, the community under

study is well composed because the majority of young and middle-aged people are actively engaged in production activities. Their total composition is about 77.6%. This composition compares positively with the report by the Tanzanian Ministry of State which reported that about 88% of Tanzanians above 15 years of age are in the age range between 15 and 54 years (National Bureau of Statistics, 2012).

Moreover, the study tested the significance of this variable with the intention to use mobile phones. In this case and others, which involves demographic variables, the study used the intention to use mobile phones in testing the significance of observed differences. In the conceptual framework presented in section 2.5.1, the intention to use is one key variable defining the use behaviour of farmers. After using the One Way ANOVA Model for testing, the results (Table 4.2) showed that there is no significant difference between the age of respondents and the intention to use. The observed P-Value is greater than 0.05 ($p=0.175$). Regardless of clear age groups, many of these respondents have a common pattern in their intention to use mobile phones in agriculture. The patterns do not bear a significant difference from the intention to use, when compared across age groups. Osah (2015) conducted a study of the intention of users of mobile money to continue using such services in the Kenyan environment, and observed similar results. Adults across age groups have a similar pattern of behavioural intention to use, unless there is another factor defining their position, based on their age (Ardjouman, 2014).

Table 4.2: The Extent to which the farmer intend to use mphone in agriculture

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.486	2	1.243	1.770	.175
Within Groups	79.342	113	.702		
Total	81.828	115			

4.2.2 Gender

This section discusses the gender of respondents. In many of the rural communities (of developing countries), gender is still a sensitive topic. This is because traditionally the difference in gender results the difference in economic privileges between the gender-groups (Mduma, 2014; Sandys, 2008). The understanding of the gender composition of the community (through the sample) is useful in understanding their reflection on important themes of this study (Sifers, Puddy, Warren, & Roberts, 2000).

In addition, the results in Table 4.1 show that the sample composition is 77.6% of men, and 22.4% of women. These statistics are adequate to study gender influences to other variables of the study. However, it is important to highlight that the composition significantly differs from the gender ratio, reported by the National Statistics Bureau and the Food and Agriculture Organisation of United Nations (FAO), where females are 51% of the general Tanzanian population (Food and Agriculture Organization of the United Nations, 2014; National Bureau of Statistics, 2011). Arguably, the observed difference is because this sample is from farmers who camp and work away from their regular residences because of the distance. Hence, men are much more suited, because of the natural tradition of women to look after their families (Mduma, 2014). Although women are equally engaged in agriculture, they work near their residences. The study targeted the population working along the Pangani River Basin, hence depending on irrigation. In this type of farming, farmers usually camp away from their residences.

Moreover, the study used the Chi Square Model, because the independent variable is dichotomous. Table 4.3 presents data showing the significance of the observed results. The observed P-Value=0.000, and $p < 0.05$: on the basis of these results, it is arguable that gender groups result to a significant difference in their intention to use mobile phones. For example, it is surprising to learn that 55% and 77% of males and females, respectively, desire to use mobile phones in agriculture. The statistical information is against a traditional African environment, where males define the trend (Mduma, 2014; Sandys, 2008). This is because they have more privileged access to economic means than their female counterparts, especially in rural communities.

Table 4.3: Gender*Use Intention – Chi Square

	The Extent to which the Farmer Intend to Use mPhone in Agriculture	Gender
Chi-Square	33.241	35.310
Df	3	1
Asymp. Sig.	.000	.000

4.2.3 Marital status

This section of the study provides statistical information about the marital status of the sample. It was necessary to study this variable, due to the assumption that married people have more family and community responsibilities than unmarried. Therefore, the study needed to know whether the marital status relates in any way to adopting mobile phone services in the farming community. While this aspect is covered in later stages, this section focuses on presenting statistical information useful in describing the marital status of the sample.

According to results presented in Table 4.1, 17.2% of respondents have never engaged in marital responsibilities. On the other hand, the 2012 National Census reported that about 35% of Tanzanians above 15 years were engaged in marital responsibilities (National Bureau of Statistics, 2012). Although the two statistical results differ, they both show that many Tanzanians (above 18 years old) have marital responsibilities. Arguably, the married respondents include a significant percentage of the young people in the sample. The results from a cross-tabulation suggested that 56% of respondents aged below 30 years are in marriage relationships. This study assumed that the marital status comes with more responsibilities. Therefore, the study uses this information in its later sections to understand the impact of marital status in adopting different mobile services in the farming community.

Additionally, the analysis applied the Chi Square Model to understand the level of significance in the relationship between the marital status and the intention to use

mobile phones in agriculture. Table 4.4 shows that all categories of the two variables resulted in a significant difference in their relationship. The observed P-Value was 0.000, which is acceptable for a significant relationship. Additional information was obtained upon the use of a cross-tabulation: about 70% and 57% of single and married people, respectively, intend to use mobile phones. The basis for using the marital status in this test was the fact that married people are attached to more social responsibilities than their counterparts. These results support the findings by other researchers who admitted that people with lesser social responsibilities are more aggressive in adopting new technologies (Kohnke, Cole & Bush, 2014; Thomas, Lenandlar, Kemuel, 2013). It is natural to attend immediate social needs associated with the well-being of the family, before the user opts to adopt the technology which would increase expenditures (Ngowi, 2009).

Table 4.4: Marital Status* Intention to Use

	The Extent to which the Farmer Intend to Use mPhone in Agriculture	Marital Status
Chi-Square	33.241	122.966
Df	3	2
Asymp. Sig.	.000	.000

4.2.4 Education

Formal education is an important determinant of individuals' understanding ability. This section decided to offer the statistical information, which led to understanding the education status of people engaged in this study. Moreover, the study uses this information to understand how it relates to different facets associated with adopting mobile phones in agriculture.

The analysis presented in Table 4.1 shows that a large part of the sample is a predominantly primary-school-educated. About 89.7% of the sample received primary school education, leaving a small part of the sample which was privileged to attend secondary and post-secondary school education. Nevertheless, it is encouraging to find

people with at least secondary education in rural areas. This result is due to the government's effort at meeting the millennium goal of providing education to its citizens (National Bureau of Statistics, 2012). Nonetheless, the current information still affirms that many farmers in Tanzania have primary education.

Moreover, the One Way ANOVA Model was used to test the significance of the relationship between the education of respondents and their intention to use the mobile phones in agriculture. It used ANOVA because education levels are ordinal. Based on the results presented in Table 4.5, the relationship is not significant. The P-Value is 0.06 ($p > 0.05$). In this perspective, the decision to use mobile phones in agriculture does not relate to the education of respondents. The position of this study is supported by several other studies. For example, Oshah (2015) observed insignificant relationship between education and the intention to continue using mobile technology. This nature of the results is likely to happen where the majority of farmers are aware of the importance of the technology in their activities, regardless of their education status (Chukwunonso, 2012).

Table 4.5: Education*The Extent to which the Farmer Intends to Use mPhone in Agriculture

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.828	2	1.914	2.773	.067
Within Groups	78.000	113	.690		
Total	81.828	115			

4.2.6 Familiarity with mobile tools

This section of the chapter analyses the general familiarity of respondents with different mobile phone tools. The word ‘familiarity’ refers to ‘what they are’, and ‘for what reason’. The study considered the tools which are important in contributing to the work performance of farmers.

According to the results presented in Table 4.6, only 15.5% of respondents are at least familiar with the tools available on their mobile phones. Additional information shows that about 31% are unfamiliar with those tools on their mobile phones. These are the tools other than those for making calls and sending text messages. The presented percentage is higher (twice as much) when compared with those who are familiar with the tools available no their mobile phones. This information suggests that many people do not understand the tools they see on their mobile phones. The study by Hosman and Fife (2012) conducted in rural African societies provided corresponding comments.

Table 4.6: Familiarity with mobile phone programs

		Frequency	Per cent	Valid%	Cumulative%
Valid	Very Familiar	12	10.3	10.3	10.3
	Familiar	6	5.2	5.2	15.5
	Moderate	62	53.4	53.4	69.0
	Unfamiliar	34	29.3	29.3	98.3
	Very Unfamiliar	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

An additional analysis was conducted to show whether there is any relationship between the familiarities with the levels of education of the farmers. Recalling from the results presented in Table 4.1, about 89.7% of the whole surveyed sample had basic education. Accordingly, 7.6% of those with the basic education, and 83.3% of those with at least secondary education, admitted to being familiar with the tools. The difference is high. In the One Way ANOVA, the P-Value representing the relationship is 0.000; Table 4.7 has more results. The presented statistics show a significant relationship between the variables. Arguably, the low familiarity is the subject of the low level of education possessed by respondents, as established by other studies (Chian-son, 2012; Economides & Grousopoulou, 2008; Nyamba & Malongo, 2012). Therefore, unless additional training is acquired, the level of respondents' formal education is a reflection of the familiarity of the incumbent.

Table 4.7: Mobile Programs Familiarity*Education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	26.487	2	13.243	21.701	.000
Within Groups	68.962	113	.610		
Total	95.448	115			

Furthermore, the study decided to understand whether the familiarity shown relates to the intention to use mobile phones in agriculture. The analysis revealed that the P-Value is 0.001 ($p < 0.05$); therefore, it suggests a significant relationship between the variables. Table 4.8 provides more results. The descriptive information provides further information for these results. About 67% of those who are familiar and 61% of those who are unfamiliar, intend to use mobile phones in agriculture. It is agreed that people will not adopt something that they are not aware of (Yamanda, 2001). Therefore, increasing the level of awareness must be the first priority, before requiring them to engage in the application.

Table 4.8: Familiarity*Intention to Use - ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.558	4	3.139	5.031	.001
Within Groups	69.270	111	.624		
Total	81.828	115			

Moreover, this study decided to understand the extent to which respondents were contented with their knowledge on using mobile phones (Table 4.9). Approximately 48.8% of respondents showed at least a high level of contentment. Those with low contentment constituted about 24.1%. It is surprising that while the general level of familiarity is low, nearly half of the sample is contented with the level of knowledge they possess. Therefore, it can be suggested that many respondents are simply comfortable with the basic functions of communication that they access. This is

probably because the low awareness of other programs makes knowing how to make calls and send text messages a desired knowledge to many members of the rural society (Islam, 2011; Nyamba & Malongo, 2012).

Table 4.9: The adequacy of the knowledge to use mobile phone tools

		Frequency	Per cent	Valid%	Cumulative%
Valid	Very High	20	17.2	17.2	17.2
	High	36	31.0	31.0	48.3
	Moderate	32	27.6	27.6	75.9
	Low	26	22.4	22.4	98.3
	Very Low	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

This study focused on the adoption of ICTs (particularly mobile phones) by farmers. Most importantly, the study is interested in the adoption of tools other than those for calls and messaging in supporting farming activities. With the above results, the observed perception does not take into consideration various tools available on mobile phones to support farmers. Therefore, available additional tools are unlikely to be adopted if a proper level of motivation is not achieved by farmers (Chukwunonso & Tukur, 2012).

In an additional analysis, the study noted that the level of knowledge possessed by farmers of using mobile phones does not relate with the intention to use. Results in Table 4.10 show that the P-Value is 0.099 ($p > 0.05$). This is the technical knowledge. Therefore, the desire to use mobile phones in agriculture was not affected by whether the respondent belonged to the category with the low or high knowledge. In this perspective economic benefits are more desirable (Al-Qeis, 2009).

Table 4.10: Knowledge possessed* Intention to Use

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5.512	4	1.378	2.004	.099
Within Groups	76.315	111	.688		
Total	81.828	115			

4.3 Adoption on demand and the usefulness of mobile services

This section addresses the hypothesis which suggested that the adoption of mobile phones on demand does not influence the perception of farmers on its usefulness. In this part of the study, ‘adoption on demand’ is the variable that represents a situation where users are obliged to learn to use a certain mobile application to access important services to their economic activities (Chian-son, 2012; Chukwunonso & Tukur, 2012). On the other hand, the user perception is the general attitude of the usefulness and ease of use of the subjected technology (Kohnke et al., 2014; Ramayah & Ignatius, 2014).

According to results presented in Table 4.11, many respondents agree that they happened to integrate different mobile tools to their activities on demand. This is about 72.4% of all respondents. For example, in an interview a number of respondents cited the adoption of mobile money as a case representing their adoption on demand. Farmers were obliged to subscribe to mobile money services to receive money from agriculture partners (Asongu, 2013; Cruze, Neto, Munoz-Gallego, & Laukkanen, 2010). Additional information from the results shows a very small percent of respondents admitting that their adoption of mobile tools (other than those for calls and messaging), was not pressured by their immediate demands. This group represents about 8.6% of the whole studied sample.

Table 4.11: Adoption on demand

		Frequency	Per cent	Valid%	Cumulative%
Valid	Highly Agree	28	24.1	24.3	24.3
	Agree	56	48.3	48.7	73.0
	Moderate	21	18.1	18.3	91.3
	Disagree	10	8.6	8.7	100.0
	Total	115	99.1	100.0	
Missing	System	1	.9		
Total		116	100.0		

Since the demand (which is the reason for adoption) is the source of social pressure, the above observation supports assumptions by numerous theories of technology adoption. For example, in the UTAUT, social pressure influences the intention to adopt a new technology (Al-Qeisi, 2009; Kohnke et al., 2014; Thomas et al., 2013). In the C-TAM-TPB, subjective norms influence the intention to use, and in the Motivation Model, social pressure influences the use of the new technology (Park, 2009; Priyanka, 2012; Taylor & Todd, 1995; Truong, 2009).

Furthermore, the study was interested to know whether the adoption on demand varies based on the age of respondents. The percentage of the adoption on demand based on the age of respondents is as follows: age below 30 years (75%), age between 30 and 45 years (69%), and age above 45 years (77%). For each category, above 50% of all members adopted on demand, and the categorical relationship between the age of respondents and the adoption on demand is insignificant. The One Way ANOVA P-Value is 0.157, which is greater than the threshold value (0.05). Table 4.12 provides additional results. These results agree with the statement that the age difference does not necessarily relate to electronic needs among adults (Asongu, 2013; Teo et al., 1999).

Table 4.12: Age and the extent to which the user agrees that s/he adopted mobile phones on demand

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.849	2	1.425	1.884	.157
Within Groups	85.461	113	.756		
Total	88.310	115			

It can be recalled that the hypothesis used in this section is based on two variables: the adoption on demand is an independent variable, and the perceived usefulness as a dependent variable. Before a detailed relationship was established the study conducted a simple statistical analysis to know the extent to which the adoption on demand enhances the perception of respondents about the used mobile tools. The results show that 63.8% of respondents are confident that the adoption of mobile tools on demand enhances their perception of the usefulness of the subjected tools. This percentage is against 17.2% of those who do not agree that the use on demand enhances their perception toward the usefulness of applied tools. Table 4.13 provides detailed results.

Table 4.13: Adoption on demand enhances the perceived usefulness

		Frequency	Per cent	Valid%	Cumulative%
Valid	Highly Agree	30	25.9	25.9	25.9
	Agree	44	37.9	37.9	63.8
	Moderate	22	19.0	19.0	82.8
	Disagree	18	15.5	15.5	98.3
	Highly Disagree	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

A further analysis was conducted to understand the categorical relationship between the extent to which respondents agree that they adopted services on demand, and the extent to which the adoption on demand enhances the perceived usefulness of mobile

phone services. The analysis adopted the One-Way ANOVA to establish this relationship, and Table 4.14 presents the results.

Table 4.14: Use on demand vs the perceived usefulness

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	51.428	3	17.143	23.819	.000
Within Groups	80.606	112	.720		
Total	132.034	115			

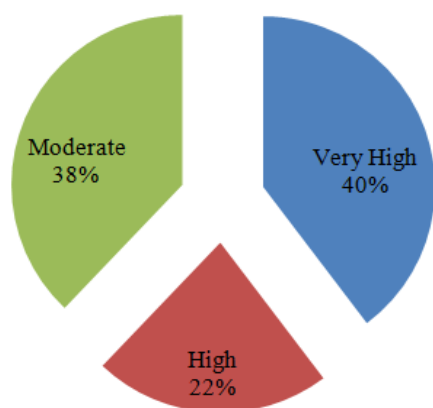
The results presented in Table 4.14 suggest a significant categorical relationship between the two variables. The observed P-Value is 0.000, and this value is less than 0.05, which is a threshold value. With this observation, it can be explained that the extent to which respondents agree that they adopted mobile tools on demand, relates to the extent to which the adoption on demand enhances their perception about the usefulness of mobile tools. Studies by Lubua (2014) and Ardjouman (2014) found similar results on how the use on demand impacts the perceived usefulness of mobile tools. However, these studies were conducted in other areas of service. They both concluded that mandatory use of e-services enhances the perception of users on the benefits of such services. For a well-tailored program, mandatory use of the system allows the user to enjoy the benefits more quickly (Lubua, 2014).

Accordingly, a further analysis conducted using a cross-tabulation provides an additional explanation about the results in Table 4.14. It is observed that about 86% of respondents who admit to having adopted mobile tools on demand, agree that the use on demand enhances their perceived usefulness on the applied tools. On the contrary, only 40% of those who did not adopt mobile tools out of necessity agreed that this type of adoption enhanced their perception of mobile services. This variation justifies the above observed P-Value.

Moreover, the study determined the perceived economic usefulness of the use of mobile phones in agriculture. It further determined whether the adoption on demand

influenced the perceived economic usefulness. The results in Figure 4.1 show that about 62.1% of all respondents at least agreed that mobile tools carried economic benefits in their farming activities. Nevertheless, it was observed that the most referred advantage comes with the use of mobile phone in seeking capital and the market (refer section 4.6.1). While farmers are satisfied with this level of understanding, it can be suggested that additional awareness of the tools facilitating agriculture would make mobile use more meaningful in their economic activities (Astrid, Mitra, & David, 2008; Kiseol & Forney, 2013). Currently, mobile phones are able to facilitate agriculture through enhancing communications, supporting financial transactions, predicting the weather, receiving agricultural tips and information from the web necessary for self-training, and mapping the market (Akudugu et al., 2012; Byrne, Kelly, & Ruane, 2003; Chauvin et al., 2012; Muzari et al., 2012, 2012).

Figure 4.1: Perceived usefulness of mobile tools in agriculture



In order to determine whether the adoption on demand influenced the perception of respondents of economic usefulness, the study applied a correlation analysis. The testing tool adopted is the Pearson Correlation Model. Table 4.15 suggests that the P-Value for the Pearson Correlation is 0.000. In this case the P-Value is less than 0.05. The result suggests a significant correlation between the two variables. The increase of the extent to which respondents admit that they adopted the use of mobile tools in agriculture on demand, does also increase their perception of the usefulness of mobile tools in their activities. The observation receives the support from studies which agree

that socioeconomic factors impact the perception of users on the benefits of mobile services (Astrid et al., 2008; Huili & Chunfang, 2011; Park, 2009). Those who own mobile phones and agree that they adopted mobile tools on demand, perceive a low benefit.

Table 4.15: Use on demand vs perceived usefulness

		Mobile phone contribution to economic usefulness	Extent to which the user agrees that s/he adopted mobile phones on demand
Mobile phone contribution to economic usefulness	Pearson Correlation	1	.339**
	Sig. (2-tailed)		.000
	N	116	116
Extent to which the user agrees that s/he adopted mobile phones on demand	Pearson Correlation	.339**	1
	Sig. (2-tailed)	.000	
	N	116	116

** . Correlation is significant at the 0.01 level (2-tailed).

Moreover, the results in table 4.15 are supported by those of table 4.14. Table 4.14 presented more details about the results through the use of the One Way ANOVA. The purpose was to know whether the same variables suggested a categorical relationship. The results of the analysis suggested a significant categorical relationship between the groups of the two variables. The observed P-Value is 0.000. Arguably, the extent to which the respondents agree that s/he adopted mobile services on demand relates to the perceived economic usefulness of mobile services.

Additionally, the results of the cross-tabulation suggest that 69% of those who agree that they adopted on demand perceive the usefulness, while 43% of those who disagree perceive benefits. A simple explanation for this observation is that the use on demand provided immediate benefits to users. According to the TAM and the Motivational Model of Microcomputer Usage; the benefits are synonymously used as the perceived

usefulness of the technology (Igbaria et al., 1996; Priyanka, 2012; Teo et al., 1999). In the perspective of the two mentioned models, the user is likely to adopt a new technology, in the case where it is valuable to her/his daily activities. This is supported by the findings of this study. Collectively, the results of this section led to the rejection of the hypothesis which suggested that the adoption of mobile phones on demand does not influence the farmers' perception of its benefits.

4.4 The Influence of the success of others to the perceived usefulness in agriculture

This section tests the hypothesis suggesting that the increase of the extent to which farmers link the success of their peers with the use of technology does not increase their perceived usefulness of mobile tools in managing agriculture. Therefore, there are two key variables. The first variable is how farmers associate the success of peers with the use (or peer influence), and the perceived usefulness of mobile phones in economic activities. Moreover, along this section, the study analysed other variables. The purpose of studying these variables was to establish whether they relate with variables provided by the tested hypothesis.

In this part of the analysis, the extent to which farmers link the success of others with the use of mobile phones is an independent variable. This part of the study was established because the community where the study was conducted is based on communal life. Moreover, there are other studies which admit the impact of peer influence on the adoption of the new technologies (Bindah & Othman, 2016; Huili & Chunfang, 2011). In Table 4.16, the study rates the influence received by respondents toward their decisions to adopt mobile services, through witnessing the success of someone they associate with in agriculture. In this case, the study links the success with the use of mobile phones in farming activities.

Table 4.16: Perceived influence from associates (Peer Influence)

		Frequency	Per cent	Valid%	Cumulative%
Valid	Highly Influential	36	31.0	31.0	31.0
	Influential	40	34.5	34.5	65.5
	Moderate	24	20.7	20.7	86.2
	Not Influential	14	12.1	12.1	98.3
	Highly Not Influential	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

Based on the results presented in Table 4.16, about 65.5% of respondents admit that the success of their peers (who use mobile phones in their activities) significantly influences their decision toward adopting similar tools in their activities. On the contrary, 13.8% of respondents are against this suggestion. These results suggest the power of the witness from successful cases in fuelling the rate of adopting mobile phones and associated technologies in farming activities.

The study also conducted further analysis to determine the significance of results presented in Table 4.16. Therefore, it established whether farmers' perception toward the usefulness of mobile tools in managing agriculture relates to the way they associate the success of others with the use. To arrive at a reasonable conclusion, the study used both the One Way ANOVA and the Pearson Correlation Model. The perceived usefulness is a dependent variable while the degree of associating the success of others with the use is the independent variable. The results from the One Way ANOVA Model are presented in Table 4.17.

Table 4.17: Perceived usefulness vs influence from associates - ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	23.048	4	5.762	9.558	.000
Within Groups	66.917	111	.603		
Total	89.966	115			

Based on the results presented in Table 4.17, there is a significant relationship between the categories of the two studied variables. The observed P-Value is 0.000, where $P < 0.05$. This relationship received a further explanation through using a cross-tabulation. The results (of a cross tabulation) show that 68% of respondents admitting the influence from the success of others perceive the use of mobile phones in economic activities as beneficial, and 50% of those who do not admit the influence from the success of others perceive such benefits. This observation agrees with explanations by other authors that the use of practical avenues where farmers can learn the application of mobile phones in agriculture (and how this is translated to solving their problems) would enhance their perception of the usefulness (Islam, 2011; Ramayah & Ignatius, 2014; Yang, 2009).

Astrid et al. (2008), North, Johnston, and Ophoff (2014) and Priyanka (2012) made a common argument in their studies about peer influence. Their studies acknowledged that the influence of peers enhances the adoption of a new technology. This observation is more special to Tanzania, because the nation was founded under socialistic ideologies, and social cohesions are still strong in rural societies (Ngowi, 2009). A good example of where this observation is applicable is in agriculture: *Shamba Darasa* – a common Swahili word for *Agriculture Class*, where different companies identify a piece of land to demonstrate their farming products to farmers (Mwamakimbula, 2014).

In addition, Table 4.18 presents the results of applying the Pearson Correlation Model in analysing the two variables. The purpose is to understand whether the success of others significantly influences the perceived usefulness. The results of the analysis show a significant correlation between the two variables. The observed P-Value is 0.000, and the Pearson Correlation (r) Value is 0.355. With these results, increasing the influence of the success of others, positively affects the perceived usefulness of mobile phones.

Arguably, since the increase of the influence of the success of others positively impacts the perceived usefulness, this increase would eventually increase the rate of adopting

mobile phones in agriculture. Therefore, it is reasonable to suggest that the social pressure that farmers receive as the result of the success of their peers influences them toward the adoption of mobile tools. Therefore, the study rejects the hypothesis that the increase of the extent to which farmers link the success of their peers with the use of technology does not increase their perception of the usefulness of mobile tools in managing agriculture. This observation is supported by both the TAM 2 and UTAUT frameworks (Al-Qeisi, 2009; Chian-son, 2012; Kohnke et al., 2014).

Table 4.18: Influence from Associates*Perceived Economic Usefulness - Correlations

		Mobile Phone Contribution to Economic Usefulness	Influence from Associates
Mobile Phone Contribution to Economic Usefulness	Pearson Correlation	1	.355**
	Sig. (2-tailed)		.000
	N	116	116
Influence from Associates	Pearson Correlation	.355**	1
	Sig. (2-tailed)	.000	
	N	116	116

** . Correlation is significant at the 0.01 level (2-tailed).

In addition to the areas of the section discussed above, the study thought of testing the relationship between the peer influence and the intention to use the new technology. Although this was not part of the stated hypothesis of the study, its result is useful in deciding the structure of the model of the study. The study revealed the following results: The One Way ANOVA P-Value is 0.000. The results are set out in Table 4.19.

Table 4.19: Peer influence*intention to use mPhone in agriculture

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.415	4	3.604	5.934	.000
Within Groups	67.413	111	.607		
Total	81.828	115			

Moreover, the Pearson Correlation between the two variables is represented by the following values: P-Value is 0.000, and $r = 0.406$ (Table 4.20). With these results, the peer influence determines the intention of the farmer to use mobile phones in economic activities. These results conform to relationships established by the modified TAM Model. According to the TAM 2 model, subjective norms influence the intention of users to adopt a new technology (Astrid et al., 2008; Chuttur, 2009; Priyanka, 2012). These subjective norms are equally defined through social cohesions within the organisation or community settings. Moreover, the way members of the society relate forms a social link, which becomes part of subjective norms (Priyanka, 2012).

Table 4.20: Peer influence*intension to use

		Influence from Associates	The extent to which the farmer intends to use mPhone in agriculture
Influence from Associates	Pearson Correlation	1	.406**
	Sig. (2-tailed)		.000
	N	116	116
The extent to which the farmer intends to use mPhone in agriculture	Pearson Correlation	.406**	1
	Sig. (2-tailed)	.000	
	N	116	116

** . Correlation is significant at the 0.01 level (2-tailed).

Furthermore, whether the proposed level of social influence in Table 4.16, varies based on the gender of respondents, is possibly because gender is occasionally reported as a

reason for economic and education difference in the local society of Tanzania (Mduma, 2014; Plessis, 2011; Sandys, 2008). Based on the results, about 66% and 62% of males and females respectively, rate the influence they receive through observing the success of their peers as high. The reported percentages of the two gender categories are high. To know the level of significance, the study conducted an additional analysis to determine whether the observed difference is significant. The results from the Chi Square Model suggest that the P-Value is 0.770; Table 4.21 provides additional results. This value shows that the result is indifferent across the gender on the studied subject. With these results, all gender groups put an equivalent level of influence to the level of the success of their peers. This observation is supported by a review by Peek et al. (2014), who commented on a similar pattern of influence on both genders, provided that respondents are subjected in the same social setting.

Table 4.21: Gender * peer influence - Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.813 ^a	4	.770
Likelihood Ratio	2.275	4	.685
Linear-by-Linear Association	.414	1	.520
N of Valid Cases	116		

Moreover, the age of respondents is another demographic variable tested against the level of influence exerted by the success of other farmers who use mobile phones in their day-to-day activities. The purpose was to know whether the difference in age groups results in different perceived levels of influence from peers. The results of the analysis are surprising because about 75% and 76% of the categories of respondents with the age below 30 years old and above 45 years respectively, admit that the success of others would influence them toward the adoption. The observed values are definitely high when compared with those of the age in between, where 55% of respondents admit that the success of others is influential. In addition, the result of the

analysis (Table 4.22) through the One Way ANOVA showed the P-Value is 0.002. These results confirm a significant categorical relationship between the variables.

Table 4.22: Age * influence from associates

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.345	2	6.672	6.473	.002
Within Groups	116.483	113	1.031		
Total	129.828	115			

Arguably, the high percentage of the group aged under 35 years is attributed to the fact that most of these are new entrants to such economic activities, and would prefer to learn from their peers; the senior members in the rural society may be slow to catch up given their current limitations with mobile technologies (Akudugu et al., 2012; Livingstone et al., 2011; Mwamakimbula, 2014). Hence, they depend on peer influence for new adoptions. Nevertheless, even within the observed difference between the age groups, in each case, there are more respondents who admit that the success of others would offer an influence in favour of their decision to adopt the mobile technology in managing agriculture.

4.5 The perceived usefulness and mobile use in agriculture

The discussion in this section is based on two important variables. The independent variable is the perceived usefulness based on economic benefits of mobile phones, and the dependent variable is the rate of using mobile phones in agriculture. Moreover, it is important to acknowledge that this study agrees with the statement by other researchers that the perceived economic benefit of using mobile phones is the result of the experienced usefulness on the application of the mobile tool (Ardjouman, 2014; Nyamba & Malongo, 2012). Alternatively, it is due to the influence of peers as discussed in section 4.4 of this chapter. Whichever the case, the degree to which the user perceives that the mobile tool is beneficial (or useful) puts a certain level of pressure on the adoption and the use of the mobile technology (Chuttur, 2009; Peek et al., 2014; Priyanka, 2012).

Since the level of perceived usefulness is influenced by the success of individual farmers, or that of his/her peers, it is thus considered as a socioeconomic factor (Bindah & Othman, 2016). Hence, it forms a link with the theme of this study, which is on social pressure influencing the adoption.

In the analysis, it was important to understand the perceived contribution of mobile phones to the economic benefits of farmers. The results of the analysis presented in Table 4.23 suggested that about 62.1% of all respondents perceived that the use of mobile phones contributed to different levels of economic benefit to their day-to-day lives. Furthermore, there is no one respondent who did not perceive economic benefits. The findings agree with both of these researchers (Chauvin et al., 2012; Stienen, Bruinsma, & Neuman, 2007), who support the argument, and advocate more use of mobile phones in enhancing farming activities.

Table 4.23: Mobile phone contribution to economic benefits

		Frequency	Per cent	Valid%	Cumulative%
Valid	Very High	46	39.7	39.7	39.7
	High	26	22.4	22.4	62.1
	Moderate	44	37.9	37.9	100.0
	Total	116	100.0	100.0	

This study acknowledges that the African perspective of property ownership is traditionally inclined to favour men (Ngowi, 2009; Plessis, 2011). While the portrayed general result (Table 4.23) revealed that there is no negative perception towards the contribution of mobile phones to the economy of farmers, it was within the interest of the study to know the role of gender to the observed results. With the results of the cross-tabulation, above 50% of respondents (in the two gender categories) have a positive perception toward the economic usefulness of mobile phones in agriculture. The actual results are 64.4% for males and 54% for females.

Although the female percentage shown in above analysis is slightly lower than that of males, it can be argued that the mobile phone technology provides the right platform for empowering the two gender categories (Nyamba & Malongo, 2012). This is confirmed through the use of the Chi Square Model for testing. The observed P-Value is 0.530 (Table 4.24). The required P-Value for a significant relationship between the variables must be less than 0.05. Therefore, all members of the sample showed an equivalent trend in their perception of the economic usefulness of mobile phones regardless of their gender. In their studies, Ardjouman (2014), Hosman and Fife (2012), and Huili and Chunfang (2011) admitted that the use of mobile phones contributed in different ways to the economy of the society to both genders.

Table 4.24: Gender * Perceived Economic Benefits

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.271 ^a	2	.530
Likelihood Ratio	1.284	2	.526
Linear-by-Linear Association	1.254	1	.263
N of Valid Cases	116		

Furthermore, the study extended the analysis to know whether the familiarity shown by respondents toward mobile phone programs provided any special relationship with their perception of benefits attached to the use of mobile phones. According to results presented in Table 4.6, only 15.5% of the sample admitted that they were familiar with the programs they access. The programs are intended for other uses than for calls and text messages. This percentage is low. Moreover, the result suggests that about 89% of all who are familiar with the programs for their mobile phones perceive that they are economically. Besides, about 55% of those who are unfamiliar with different mobile programs on their mobile phones suggest that the use of mobile phones has a significant economic impact. The difference between the two categories is large, and the One Way ANOVA confirms a significant relationship between the categories of the two variables. The observed P-Value is 0.005, and it is less than 0.05 which is a maximum value required for a significant relationship. Table 4.25 provides more

results. Besides, studies by Al-Qeisi (2009), Park (2009), and Yuan and Anol (2014) support this observation of the study by suggesting that respondents with more familiarity perceive more usefulness than those with a low level of familiarity.

Table 4.25: Mobile use familiarity vs mobile phone contribution to economic usefulness

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.246	4	2.811	3.964	.005
Within Groups	78.720	111	.709		
Total	89.966	115			

Moreover, the P-Value for the Pearson Correlation between the two variables is 0.035 (Table 4.26). The r-value is 0.196. With this value the increase in the level of familiarity enhances the perception of users of the economic usefulness by 19.6%. Therefore, changes in the familiarity have a significant impact on the perceived usefulness. These results are useful to telecommunication companies and to other stakeholders who are introducing new services to the farming community. A successful introduction of a new technological service to farmers requires them to be familiar with the importance of such a service (Lubua, 2014). They need to know the tangible benefits to be expected, because the adoption involves their efforts and finances (Benard et al., 2014; Connelly, 2008).

Table 4.26: Familiarity*perceived economic benefits

		Familiarity with mobile phone programs	Mobile phone contribution to economic benefits
Familiarity with mobile phone programs	Pearson Correlation	1	.196*
	Sig. (2-tailed)		.035
	N	116	116
Mobile phone contribution to economic benefits	Pearson Correlation	.196*	1
	Sig. (2-tailed)	.035	
	N	116	116

*. Correlation is significant at the 0.05 level (2-tailed).

Moreover, the analysis studied another variable thought to relate to the perceived economic usefulness. The variable is the ease of use (Astrid et al., 2008; Ramayah & Ignatius, 2014). The ease of use represents a technical awareness. It is interesting to learn that the perceived ease of use of mobile programs does not offer any noticeable relationship with the perceived economic usefulness of mobile phones. The study used the One Way ANOVA Model to prove this relationship, and the results are presented in Table 4.27. The results of the analysis showed that the P-Value is 0.114, which is greater than the threshold value. In this population, it is clear that the perceived economic usefulness of a mobile program does not relate to the perceived ease of use. Arguably, the emphasis is on the awareness of users of tangible benefits as presented in the previous paragraph.

Table 4.27: Ease of use*Perceived usefulness

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	4.637	3	1.546	2.029	.114
Within groups	85.329	112	.762		
Total	89.966	115			

Together with the above discussion, the key purpose of this section is to determine the extent to which the perceived economic usefulness (of using mobile phones) relate to the current rate of use in agriculture. A simple statistical analysis shows that 50% of respondents have a high rate of mobile phone use. This percentage is high compared to those who admit that their rate of use is low. The combined percentage of those who admit that their rate of use in economic activities is low is 10.3%. Table 4.28 provides additional results.

Table 4.28: The rate of mobile use in economic activities

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Very High	26	22.4	22.4	22.4
	High	32	27.6	27.6	50.0
	Moderate	46	39.7	39.7	89.7
	Low	10	8.6	8.6	98.3
	Very Low	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

Moreover, the study conducted an additional analysis to show how the categories of respondents (based on their perception of economic usefulness of mobile phone) relate to the rate of use. First, the study conducted the analysis through cross-tabulation. The results of the analysis show that about 76% of respondents who perceive that mobile phones are useful, have a high rate of using mobile phones in their activities. Besides, 50% of those who do not perceive the usefulness admit to have a high rate of mobile phone use in their activities.

Moreover, additional analysis was conducted to know whether the observed difference is significant. This was done through the One Way ANOVA Model. The results presented in Table 4.29 reveals a significant categorical relationship between the two groups. The observed P-Value is 0.005, which is less than 0.05, provided as a highest accepted value. The study by Ardjouman (2014) shares a pattern with these findings. The study recognises that the rate of people deciding to use a new technological tool in their economic activities is justified through the benefits attached with the use.

Table 4.29: Perceived economic usefulness vs the rate of mobile use in economic activities

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.038	2	5.019	5.576	.005
Within Groups	101.721	113	.900		
Total	111.759	115			

Moreover, the study determined whether the perceived level of economic usefulness determines the rate of using mobile phones in different economic activities by farmers. This part of the analysis used the Pearson Correlation Model. The result showed that the P-Value is 0.004. The results suggest a significant correlation between the two variables. The reported correlation value (r) is 0.267, which suggests that changes to the perceived usefulness contribute about 26.7% of changes to the rate of use. Table 4.30 presents more results.

Table 4.30: Mobile phone perceived usefulness vs the rate of use

		Mobile phone perceived usefulness	The rate of mobile use in economic activities
Mobile phone perceived usefulness	Pearson Correlation	1	.267**
	Sig. (2-tailed)		.004
	N	116	116
The rate of mobile use in economic activities	Pearson Correlation	.267**	1
	Sig. (2-tailed)	.004	
	N	116	116

** . Correlation is significant at the 0.01 level (2-tailed).

Given the results in Table 4.30, the study agrees with the literature which recommends that it is important to raise user awareness of the economic usefulness of mobile phones, in ensuring an effective adoption (Livingstone et al., 2011; Ramayah & Ignatius, 2014). This is the awareness of how to apply the tools and affiliated benefits.

Moreover, the use of mobile phones in different economic activities (other than agriculture) may differ from the use in agriculture. Therefore, the study decided to learn the use in agriculture, and how the perceived usefulness relate to it. The analysis revealed that 34.5% of respondents use mobile phones in agricultural activities. The observed percentage is lower than that of the general use, where 50% of respondents use mobile phones in different economic activities. Therefore, about 15.5% of respondents who admit that they use mobile phones in different economic activities do not use it in agriculture. Whether farmers use mobile phones in agriculture and fail to

acknowledge it or not, the study finds it necessary to acknowledge that mobile phones are not adequately embraced in uplifting the farming activities, as noted by other authors (Akudugu et al., 2012; Livingstone et al., 2011; Stienen et al., 2007). The interview revealed that one of the reasons is the lack of necessary knowledge about the wealth of attached mobile tools in boosting agriculture.

A further analysis showed that 80% and 60% of those who admit to have a high and low rate of using mobile phones in agriculture perceived the usefulness of mobile phones in agriculture. The observed difference is significant, given the P-Value for the One Way ANOVA is 0.023 (Table 4.31). Nevertheless, it is valuable to highlight that in the two categories, there were members who benefited from using mobile phones in agriculture, even though their use was of low rate.

Table 4.31: Perceived economic usefulness*Rate of use in agriculture

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	6.781	2	3.391	3.919	.023
Within groups	97.770	113	.865		
Total	104.552	115			

Furthermore, Table 4.32 shows the correlation between the two studied variables, that is, the rate of using mobile phones in agriculture and the perceived economic usefulness. The analysis suggests a significant correlation between the studied variables. The observed P-Value is 0.016. This value is within the accepted range. Moreover, the correlation value is 0.223. Therefore, the increase in perceived economic usefulness influences the rate of using mobile phones in agriculture. With the results provided in this section, the study rejects the null hypothesis which suggested that the extent to which farmers perceive economic usefulness on the use of mobile phones do not relate to their current rate of use in agriculture.

Table 4.32: Mobile phone contribution to economic usefulness vs rate of use in agriculture

		Perceived economic usefulness	The rate of mobile use in agriculture
Perceived economic usefulness	Pearson Correlation	1	.223*
	Sig. (2-tailed)		.016
	N	116	116
The rate of mobile use in agriculture	Pearson Correlation	.223*	1
	Sig. (2-tailed)	.016	
	N	116	116

*. Correlation is significant at the 0.05 level (2-tailed).

This study compared the current results with well-established theories of adoption of ICT tools. The position of the tested hypothesis corresponds with the relationship between the perceived usefulness of the technology and the actual system usage of the Motivational Model of Microcomputer Usage (Igarria et al., 1996; Teo et al., 1999). On the other hand, in the Combined TAM & TPB Model (C-TAM-TPB), the position of the hypothesis corresponds with the relationship between the perceived usefulness and the Behavioural Intention, where a positive correlation is depicted (Chuttur, 2009; Taylor & Todd, 1995).

4.5.1 An Overview of the Current Use of Mobile Phones in Agriculture

This sub-section provides an overview of uses of mobile phones in farming activities. A general perspective of the analysis is that 50% of respondents admit that they use mobile phones in facilitating different economic activities. Furthermore, 10.3% of respondents admit that they use (or are not using) mobile phones in different economic activities. The economic activities included in this part of the study may not necessarily include agriculture. On the other hand, 41.4% of respondents are specifically using mobile phones in agriculture. In the same category, respondents who admit that they are not using mobile phones in agriculture activities total 17.2%.

Additionally, the study determined how mobile phones were used in different farming activities. The purpose was to know areas where mobile phones were mostly used in aiding farming activities. The study observed that 22.4% of respondents admit using

mobile phones in searching for weather information. On the other hand, 31% admit to not using mobile phones to obtain weather information. The information is not necessarily obtained online, but even through professionals and other stakeholders in agriculture.

Moreover, 24.1% admit that they use mobile phones to receive farming tips or information about proper farming. On the contrary, about 26% of respondents do not use mobile phones for that purpose. Additionally, about 43.1% of respondents admit to be using mobile phones in seeking the market for their farm products. Moreover, about 22.4% do not use mobile phones for this purpose. The last studied element was the use of mobile phones in accessing the capital. This aspect recorded the highest frequency of users. About 44.3% of users admit that they use mobile phones in seeking capital. Arguably, most farmers are using mobile phones in seeking the capital and accessing the market for selling their products, and these results correspond with observations by other authors (Benard et al., 2014; Islam, 2011; Stolle, 2015). Although these uses are important, there will be low return to agriculture if users are not well-informed of the weather condition and other farming tips. It is necessary to enable farmers to engage in the use of mobile tools in all key areas (Akudugu et al., 2012).

4.6 Farmers' spending ability and the intention to learn new mobile features

In this section, there are two key variables. The first variable is farmers' spending ability in buying the airtime. In our conceptual framework, the spending ability is synonymously used as the perceived economic status. The study relates the spending ability with the call duration, text messages and the internet bundle that the farmer can afford to subscribe to on a regular basis. The spending ability of the farmer must not affect his/her other commitments. The study uses the spending ability to show the extent to which farmers can afford to use mobile phones in their day-to-day activities. Moreover, it is necessary to recall that this study considers the ability of the farmer to finance mobile phone expenditure, among the sources of influence (pressure) on adopting mobile tools.

In the mainland of Tanzania, Vodacom, Airtel and tiGO make up the largest share of the telecom market. It is important to note that the price difference of products offered by these companies is very small. However, Vodacom is superior with their market share of 31% (Tanzania Communications Regulatory Authority, 2016). For of this reason, the study adopted Vodacom as its case for study, throughout this section. Table 4.33 provides brief information about tariffs used by Vodacom Tanzania.

Table 4.33: Mobile tariffs summary

Duration	Price	Minutes	SMS	Data(MB)	Validity
Daily	499	6	40	2	Midnight
	649	10	100	6	24 Hrs
	999	19	200	16	24 Hrs
Weekly	1,999	22	200	60	7 Days
	4,999	70	500	120	7 Days
	9,999	180	1000	120	7 Days
Monthly	9,999	125	1,000	100	30 Days
	14,999	200	1,500	500	30 Days
	19,999	330	2,000	500	30 Days
	29,999	550	3,000	500	30 Days
	49,999	1,000	10,000	500	30 Days

Source: Vodacom TZ (June, 2016)

Additionally, the intention to learn new mobile features is the second variable of the study. In this case, a new feature is any feature that could be useful to the farmer, but of which s/he is unaware. Users who have a high enthusiasm toward learning mobile features are the likely adopters (Yonazi et al., 2010). In this section, the study tested the hypothesis that farmers' spending ability does not relate to their willingness to learn about new mobile tools for managing agriculture. In addressing the hypothesis, the study began by analysing the spending ability of users based on four (4) categories, shown in Table 4.34.

Table 4.34: User Spending Ability

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Spending<=1500	74	63.8	63.8	63.8
	1500<Spending<=3000	24	20.7	20.7	84.5
	3000<Spending<=4500	10	8.6	8.6	93.1
	Spending>4500	8	6.9	6.9	100.0
	Total	116	100.0	100.0	

Key: 1 USD = 2184 TZS (Bank of Tanzania, 7 June2016)

According to results presented in Table 4.34, about 63.8% of respondents manage to spend an amount not exceeding 1500 TZS. This amount is for calls, text messages and the internet. With this information, most users can afford to buy less than 22 minutes, 60 MB and 200 text messages in a week (refer Table 4.33). The number of text messages is high and could be used positively, if the ordinary messages were relevant in accessing agriculture information from databases owned by telecommunication companies or other stakeholders. Nevertheless, the use of these messages is limited. They are useful in communications between individuals. Corporate services are accessible through special numbers, which require an extra token of the fee, different from that of ordinary texts. An investigation shows that the charged fee for these subscribed services is between 100 and 250 TZS per text message. Therefore, messages obtained through basic subscription are useful in facilitating agriculture, if communications are between individuals. This may limit farmers from getting specialised information from corporations, in the case where they need a fee for messaging, as also observed in studies by Benard et al. (2014) and Islam (2011).

Moreover, in this same category of subscription, the amount of data that can be accessed is 60 MB. Technically, this amount of data can access a significant number of typed pages, since one page comprises about 2.5 KB, without images. However, this could be a problem if the farmer needed to access a video or audio clips as these types of files are large. Additionally, it is important to acknowledge that most available e-agriculture services do not offer call services, therefore the airtime that farmers obtain through this category of subscription is limited to facilitating calls among

individuals. To address the challenge of failure to access e-agriculture services due to the affordability of the subscription fee, it is necessary for stakeholders to establish subsidised services (Bhavnani, Chiu, & Janakiram, 2008; Muzari et al., 2012; Stolle, 2015). Currently, the tiGO Telecommunication Company offers such services. However, such services lack the comprehensiveness of the agriculture kit, and engaging farmers in the design stage would be more useful (Stolle, 2015).

Traditionally, Tanzanian male citizens are more privileged with more economic opportunities than their female counterparts (Ngowi, 2009). Because of this, it was important for the study to understand whether the spending ability of farmers had a significant variation based on gender. Based on the results of the One Way ANOVA Model, the P-Value is 0.08 (refer table 4.35). Therefore, the difference in the spending ability among farmers of the two gender categories is statistically insignificant. The observed improvement is due to popular advocacy of economic equality (Duflo, 2012; Ngowi, 2009). Nevertheless, it is still important to make it clear that there is still a difference in their spending ability. For example, about 84% of the females and 57% of males are in the category of those with the spending ability below 1500 Tanzanian Shillings. This information is useful to researchers advocating economic equality among genders. Moreover, even the difference in age groups did not result in a significant difference in the spending ability of the studied population (P-Value=0.268). Collectively, the two demographic variables do not relate to the spending ability of the farmer.

Table 4.35: Gender*spending ability

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	2.599	1	2.599	3.168	.078
Within groups	93.538	114	.821		
Total	96.138	115			

Furthermore, the study analysed the perceived extent to which the spending ability of users affects their intention to learn to use the relevant mobile tools for agriculture.

Based on the results presented in Table 4.36, about 20.7% of respondents admit that the spending ability has a high influence on the intention to learn to use mobile phones. On the other hand, about 44.8% of respondents admit a low influence.

Table 4.36: The influence of spending ability on the intention to learn

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Very High	8	6.9	6.9	6.9
	High	16	13.8	13.8	20.7
	Moderate	40	34.5	34.5	55.2
	Low	32	27.6	27.6	82.8
	Very Low	20	17.2	17.2	100.0
Total		116	100.0	100.0	

In an additional analysis, the spending ability (refer Table 4.37) of users has a significant difference on their intention to learn new mobile tools. The One Way ANOVA P-Value is less than 0.05 ($P = 0.001$). In support of the results, studies by Tambotih, Manuputty and Banunaek (2015) and Silva, Ratnadiwakara and Zainudeen (2011) showed that users who have the ability to finance their mobile phone expenditures are more willing to learn to use new technologies than the counterpart.

Table 4.37: Spending ability*Intention to learn

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	21.014	3	7.005	6.267	.001
Within groups	125.193	112	1.118		
Total	146.207	115			

It is further important to note that respondents with the spending ability of less than 1500 TZS, and those in between 1500 and 3000 TZS, are the ones admitting that their desire to learn mobile tools for agriculture is influenced by their spending ability. There are 24% and 25% of those admitting an influence in each category, respectively. However, though the difference is insignificant, members of the first two low categories of the spending ability are more willing to admit that their spending ability influences the intention to learn, than those who can afford higher subscription fees.

Moreover, the study determined the correlation between the two key variables. The results of the analysis presented in Table 4.38 suggest a significant correlation between users' spending ability and the intention to learn. The Pearson Correlation value (r) is 0.21, and the observed P-Value is 0.026. The P-Value is within the acceptable range. A simple explanation for this observation is that: as the spending ability decrease the perceived influence towards learning new mobile tools does also decrease. The decrease of the influence is by 21%. Therefore, the intention to learn would increase if users were sure that they would manage the running cost. On the other hand, the increase of the spending ability increases the intention to learn new e-agriculture tools.

The observation on the influence of spending ability is supported by several studies. The study by Yu (2012) observed that the perceived financial cost is a determinant of the intention to learn to use a new application. Additionally, Yang (2009) admitted that the intention to use mobile services is affected by basic fee required to connect to such services. Moreover, Cruze et al. (2010) admitted that the cost burden affects the adoption rate, and Huili & Chungfung (2011) associated the intention to use with the cost of access to services.

Table 4.38: User Spending Ability * Intention to learn new tools – Correlations

		User spending ability	The influence of spending ability to the intention to learn
User Spending Ability	Pearson Correlation	1	.207*
	Sig. (2-tailed)		.026
	N	116	116
The Influence of Spending Ability to the Intention to Learn	Pearson Correlation	.207*	1
	Sig. (2-tailed)	.026	
	N	116	116

*. Correlation is significant at the 0.05 level (2-tailed).

The information in Table 4.38 is significant to e-agriculture stakeholders. It confirms that a large part of the farming community is affected by the low ability to pay subscription fees to access e-agriculture tools. This observation is further observed through the analysis of the relationship between the spending ability and the rate of using mobile tools in agriculture. The analysis found that about 30% of those with a spending ability of less than 1500 TZS admit to using mobile phones in facilitating their farming activities. On the other hand, about 43% of respondents with the spending ability above 1500 TZS admit to use mobile phones in their farming activities.

In addition, the difference in the spending ability is reflected by a significant difference in the use of mobile phones among farmers. The significance of this relationship is justified by the P-Value (of the One Way ANOVA Model), which is 0.02 (refer to Table 4.39). Arguably, a low spending ability results to a low intention to use, and similar results were observed by other studies such as Chian-son (2012), Cruze et al. (2010), and Yang (2009). In the current study, this is translated through a low number of farmers using mobile phones in agriculture among those with the low spending ability.

Table 4.39: Spending Ability*Rate of using mobile phones

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	8.205	3	2.735	3.179	.027
Within groups	96.347	112	.860		
Total	104.552	115			

4.7 A Recast to the Model

Objectively, the study planned to determine the influence of social factors to the intention and behaviour of farmers toward the use of mobile phones in their farming activities. Collectively, the discussion was guided by the following hypotheses: (1) the adoption of mobile phones on demand does not influence the perception of farmers of its usefulness; (2) the extent to which farmers perceive the economic usefulness of the

mobile phones does not relate to their current rate of use in agriculture; (3) the perception of farmers of the usefulness of mobile tools in managing agriculture does not relate with the way they associate the success of others with the use; and (4) farmers' spending ability (economic status) does not relate to their willingness to learn about new mobile tools for managing agriculture. The table below (Table 4.40) summarises the position of different relationships between variables involved in the study.

Table 4.40: Summarised results

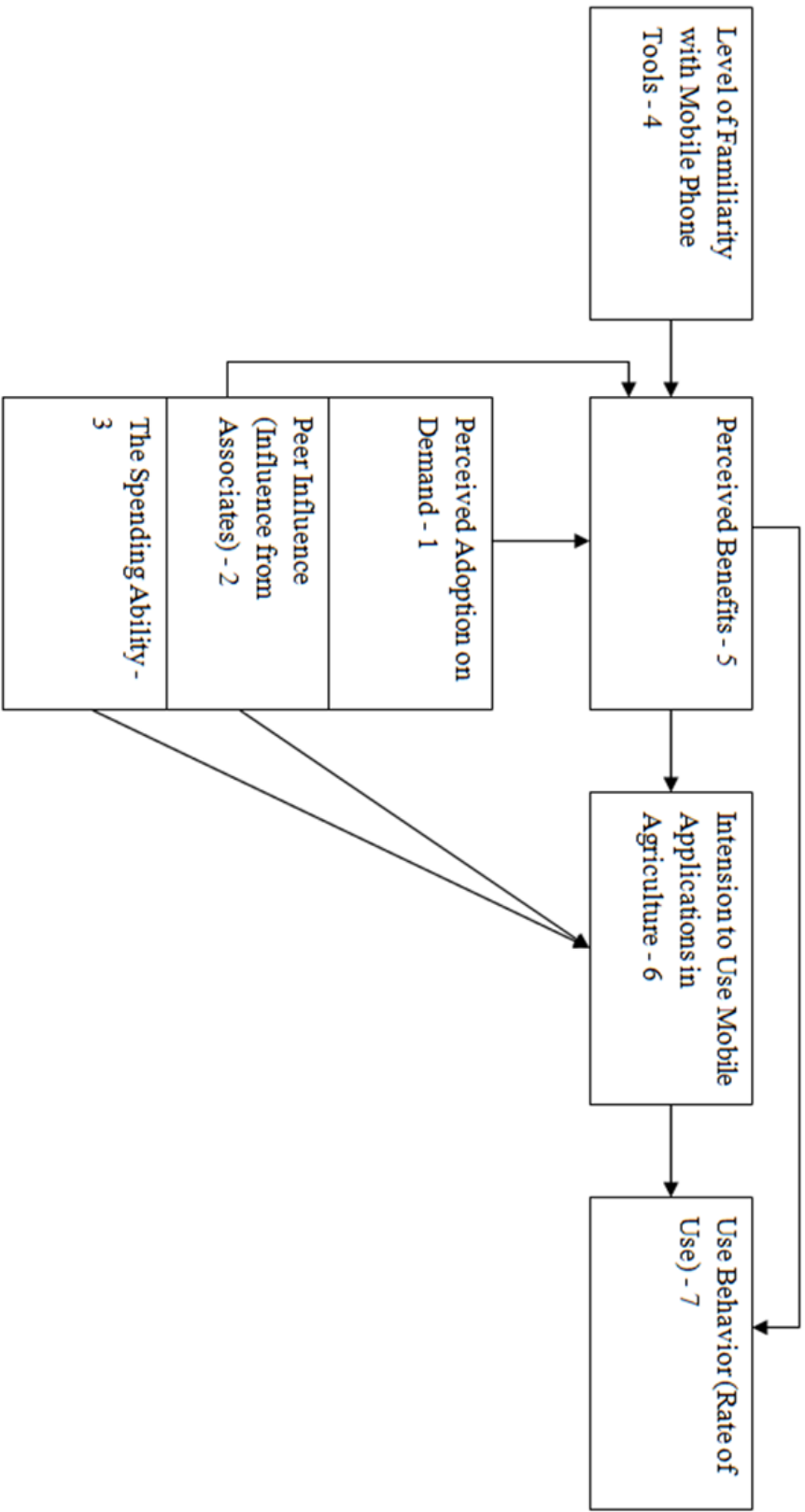
Independent Variable	Dependent Variable	Categorical Relationship (One Way ANOVA/Chi-Square)	Correlation (Pearson Correlation Model)
Age	Mobile Tools Familiarity	0.000*	NA
Education	Mobile Tools Familiarity	0.000*	NA
Age	Adoption on Demand	0.157	NA
Adoption on Demand	perceived usefulness	0.000*	0.000*
Gender	Peer Influence	0.0523	NA
Age	Peer Influence	0.002*	NA
Peer Influence	perceived usefulness	0.000*	0.000*
Gender	perceived usefulness	0.265	NA
Familiarity	perceived usefulness	0.005*	0.035*
Perceived Ease of Use	perceived usefulness	0.114	NA
perceived usefulness	Rate of Use	0.005*	0.004*
Spending Ability	Intention to Use	0.01*	0.000*

*=Confirmed Relationship

Generally, hypotheses used in this study were the product of variables presented in Table 4.40 above. The analysis of key variables of the study included the correlation model to know whether changes in the independent variable caused changes to the

dependent variable. The analysis of the variables was used to confirm the position of the conceptual framework used in this study, as established in section 2.5. Based on relationships established above, the conceptual model receives minor changes; the model adopted by the study is presented in Figure 4.2.

Figure 4.2: Resulting model



In Figure 4.2, Variables 1 (Adoption on Demand), 2 (Peer Influence) and 3 (Spending Ability) represent social variables. Both the adoption on demand and peer influence are proven to influence the perceived usefulness of mobile phones in economic activities by farmers. The age of respondents is the moderating factor of this relationship. If this study was to show how these results fit in existing theories, the Modified Technology Acceptance Model would be relevant. In this theory, subjective norms make a variable which corresponds with the social variables of the current study. Moreover, Venkatesh and Davis (2000) confirmed the impact of the perceived usefulness to the intention to adopt the new technology. Both the Modified Technology Acceptance Model and the current study agree with this aspect of the model by suggesting that social pressure (including subjective norms) determines the perceived usefulness (benefits) (Venkatesh & Davis, 2000; Chuttur, 2009; Basgoze, 2015).

Moreover, the model in Figure 4.2 shows that the perceived level of familiarity with mobile phone programs influences the perceived usefulness. Both the age and the level of education are the moderating factors of this relationship. The familiarity was simply an understanding of the mobile tools and their purpose.

On the other hand, the model shows that the peer influence impacts the intention of the user to apply mobile phones in economic activities, including agriculture. Another variable is the spending ability of the user. Collectively, the two variables are the social factors. The observed correlation (between the two social factors with the intention of users to apply mobile phones in their economic activities) does also agree with the modified Technology Acceptance Model. The Modified Technology Acceptance Model suggests a significant correlation between the social factors (subjective norms) with the intention to use the new technology (Venkatesh & Davis, 2000). The results also agree with one aspect of the UTAUT model, which established that social influence correlates with the behavioural intention (Davis et al., 2003).

The importance of the above results is that they are directly associated with social factors tested in this study. Nevertheless, the study acknowledges that there were other factors which yielded useful information to the adoption of mobile phones in the

farming community. First, the perceived usefulness correlates with the intention to use. Other studies confirmed the relationship between the two variables; such studies include those which were conducted by Ramayah & Ignatius (2014) and Roy et al. (2012). The perceived usefulness represents expectations of the user on the likelihood of the new technology to yield benefits. As the benefits increase, the intention to use is likely to increase (Ardjouman, 2014; Park, 2009; Peek et al., 2014). Moreover, the intention to use relates to the rate of use or use behaviour (refer to the discussion in section 4.5).

Collectively, the model in Figure 4.2 is an improvement on the conceptual framework presented in section 2.5. It can be recalled that the model was summarised through the Multiple Regression equation. Therefore, it is important to do the same, and see whether the developed model (framework) conforms to the Multiple Regression Model. The Analysis takes the two sets of information into account as shown below:

First Set

$$\text{Rate of Use} = f(\text{social factors, familiarity with mobile tools}) \dots \dots \dots (1)$$

The social factors are the adoption on demand, peer influence, and the spending ability. Table 4.41 presents the results of the analysis. The observed are: r-value = 0.328, the r-square = 0.108, and adjusted r-square=0.075. Arguably, the r-square value is small, and the variables do not collectively offer a strong variation between the variables. Therefore, the variables presented in equation 1 do not collectively fit well to the Multiple Regression Model proposed in section 2.6.1.

Moreover, a detailed analysis was conducted to know why the proposed equation did not fit the Multiple Regression Model. The analysis showed that the Adoption on demand and the Spending ability are the only variables with the accepted P-Value in the relationship. Their values are 0.04 and 0.05, respectively. The remaining variables do not meet the criteria for Multiple Regression. Therefore the equation becomes: Rate of Use = f(adoption on demand, spending ability). This observation agrees with other studies which observed varying impact of social factors to the behaviour of

respondents toward applying a certain technology (Chian-son, 2012; Chukwunonso & Tukur, 2012).

Table 4.41: Regression Model 1-Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.328 ^a	.108	.075	.148

a. Predictors: (Constant), The Familiarity With Mobile Phone Programs, Influence from Associates, User Spending Ability, Extent to which the User Agrees that s/he Adopted Mobile Phones on Demand

Second set

$$\text{Rate of Use} = f(\text{perceived usefulness, spending ability}) \dots\dots\dots(2)$$

In the second set of the equation, the analysis does not include three variables which have a direct influence to the perceived usefulness. The excluded variables are the familiarity with mobile tools, adoption on demand, and the peer influence. The results (table 4.42) are as follows: the r-value = 0.303, r-square value = 0.092 and the adjusted r-square value = 0.076. These values are very low, signifying an equivalent variation to the output variable, whenever the input variables change. Therefore, equation 2 does not adequately fit the Multiple Regression Model.

An additional analysis through the Coefficients table showed the following: First, the Spending Ability had the P-Value greater than 0.05. The observed P-Value was 0.116. Nevertheless, the P-Value recorded by the Perceived usefulness was 0.008. Arguably, the failure of one variable to yield a significant relationship was the reason for the equation to fail to meet the Multiple Regression Model standards. This component of the study agrees with an assertion provided in equation 1, which said that social factors have a varying impact toward the use behaviour of the new technology. Moreover, the study agrees with the assertion that human behaviours are difficult to predict; therefore their relationships are characterised by small values (Lin, Wu, & Caovalitwongsec, 2014).

Table 4.42: Regression Analysis 2 – Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.303 ^a	.092	.076	.148

a. Predictors: (Constant), Mobile Phone Contribution to Economic usefulness, User Spending Ability

In Figure 4.2, the intention to use the technology shows a more direct relationship with predictor variables than that shown by the dependent variable (rate of use). Therefore, additional analysis was conducted to determine whether the variable (intention to use) offers a better relationship with its independent variables, based on the Multiple Regression Model. If “the rate of use” in equation '1' is replaced with “the intention to use”, and then tested through the use of the Multiple Regression Model, the following results are observed:

According to results in Table 4.43, the following other values were observed: $r = 0.475$, $r\text{-square} = 0.226$, and the adjusted $r\text{-square} = 0.198$. Additional results described these values. First, two variables showed a significant correlation within the model. The variables are: Peer Influence ($p = 0.000$), and the user spending ability ($p = 0.008$). This relationship is more visible where a positive contribution to the income is expected (Bhavnani et al., 2008; Yonazi et al., 2010). On the other hand, the two other variables of the same equation showed a poor relationship with the intention to use mobile tools. Their $p\text{-value}$ is greater than 0.05. The variables are the adoption on demand ($P=0.606$), and the familiarity with mobile tools ($p = 0.801$). The fact that the two last variables provided the $P\text{-Value}$ greater than the threshold suggests that the equations do not collectively fit to the Regression Model. Therefore equation '3' below is adopted for this relationship.

$$\textit{Intention to Use} = f(\textit{peer influence, spending ability}) \dots\dots\dots(3)$$

Table 4.43: Regression Analysis 3-Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476 ^a	.226	.198	.155

a. Predictors: (Constant), The Familiarity With Mobile Phone Programs, Influence from Associates, User Spending Ability, Extent to which the User Agrees that s/he Adopted Mobile Phones on Demand

The analysis replaced “the rate of use” in equation (2) with “the intention to use”. Therefore, the independent variables are the perceived usefulness and the spending ability; the intention to use is the dependent variable. Based on the results of the Regression Model (Table 4.44), the r-value = 0.427, r-square = 0.183, and adjusted r-square = 0.183. An additional analysis shows that the two independent variables constituted a significant relationship to the model. According to the summarised Coefficients of the model, the P-Values for independent variables are as follows: the spending ability (0.020), and the perceived usefulness (0.000). These suggest a significant contribution. Collectively, all independent variables contribute significantly to the intention to use.

According to the relationships shown in Figure 4.2, the perceived usefulness receive influences from two social factors: Peer Influence and Adoption on Demand. Generally, the relationship between perceived usefulness and the intention to use is supported by the modified Technology Acceptance Model. The model suggests that the increase in the usefulness of the technology in addressing challenges faced by the user influences the intention to adopt (Venkatesh & Davis, 2000). Similar observations are shared by studies by Ardjouman (2014) and Peek et al. (2014,) who conducted their studies on the adoption of technology in economic activities.

The relationship between the spending ability and the intention to use mobile phones in agriculture shown in the analysis is supported by that of the Unified Theory of Acceptance and Use of Technology (UTAUT). The key aspect of the UTAUT is that

which admits a relationship between social influence and Behavioural Intention (UTAUT). This simply means that the positive increase of social influence increases the intention to use (Al-Qeisi, 2009; Thomas et al., 2013). In this study, the spending ability is a socioeconomic variable (Ngowi, 2009); hence, the relationship is approved. The two variables fit in the Regression Model proposed by the study. In this case, the spending ability represents a social factor. Hence, the equation becomes:

$$\text{Intention to Use} = f(\text{perceived usefulness, spending ability}) \dots \dots \dots (4)$$

Table 4.44: Regression Analysis 4- Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.427 ^a	.183	.168	.169

a. Predictors: (Constant), Mobile Phone Contribution to Economic Usefulness, User Spending Ability

4.8 Chapter Summary

This chapter presented, analysed, and discussed the results of the study. It began with the introduction that highlighted important themes and sections of the chapter. The section that followed presented demographic characteristics. The chapter addressed different demographic variables, which included the age, gender, marital status and education. Other variables incorporated in this section are the familiarity of mobile programs by farmers and the type of mobile phone used. The variables were included (in the demographic discussion) because they were thought to influence the propositions of the study.

Section 4.3 of the study determined whether the adoption of mobile tools on demand influenced the perception of the users about the benefits of mobile services. The section based its discussion on the hypothesis which suggested that the adoption of mobile phones on demand does not influence the perception of farmers on its benefits. The results of the analysis suggested two important relationships between the

variables. First, the study confirmed a categorical relationship, where categories of users who admit to adopting mobile tools on demand perceived more benefits than those who learned to use the tools before the demand was raised. Furthermore, the study observed a significant correlation between the extent to which users admit to having adopted mobile tools on demand and the extent to which they perceive the benefits upon using mobile tools in their day-to-day farming activities. With this observation, the study rejected the null hypothesis.

Moreover, in section 4.4 of this chapter, the study tested the hypothesis that the perceived usefulness of using mobile tools in managing agriculture, does not relate to the extent to which farmers link the success of their peers with the use. First, the study looked at the categorical relationship. The findings of this study proved that there is a categorical relationship between the two variables. The more the farmer links the success of her/his peers who succeeded through using mobile tools, the more s/he is likely to perceive the tool as beneficial. Moreover, the analysis detected a correlation between the two variables. When the farmer witnesses more people succeeding, and links such success with the use of mobile phones; his/her perception of benefits of the used tools does also increase. With these observations, the study rejects the null hypothesis.

The third hypothesis of the study suggested that the extent to which farmers perceive the economic usefulness of mobile phones does not relate to their current rate of using mobile phones in agriculture. The key theme was to establish the categorical relationship between the variables. The results confirmed that farmers, who perceived more benefits on mobile tools, had a higher rate of use than their counterparts. This observation supported the alternative hypothesis of the study. It was further observed that the increase of user perception about the usefulness of mobile tools influences their rate of use.

The last hypothesis of the study was discussed in section 4.6. The discussion used two variables: Farmers' spending ability and the intention to learn new features of mobile phones. The results suggested that there is no categorical relationship between the

variables. However, the study confirmed the correlation between the variables. Generally, the study adopts the conceptual framework (Figure 4.3) as the model summarising the study.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This is the last chapter of the study and provides the conclusion and recommendations of the study. Section 5.2 provides the general summary and conclusion based on research hypotheses. Section 5.3 provides the implication of the study to practice. This includes the recommended ways of enhancing the adoption of mobile phones in the farming community, while considering social pressure. Section 5.4 discusses the limitations of the study, and section 5.5 proposes areas that need further research. The last section of the chapter concludes by providing the chapter summary.

5.2 Research Summary and Conclusions

Overall, this study was about ‘Social Patterns Influencing the Adoption of Mobile Phones in the Farming Community’. The motivation for the study was the desire to establish the influence of social factors toward using mobile phone services in the rural farming community of Tanzania. This is in details in section 1.3. Specifically, the purpose was to find the extent to which social factors influence the intention of farmers to use mobile phones, to find the relationship between social factors and the behaviour of farmers in using mobile phones, and to determine the degree to which social factors determine the perception of farmers of the usefulness of mobile phones in their day-to-day activities.

To address the objectives of the study with the required level of specificity, it was necessary to extract variables from the literature and propose their relationship through a conceptual framework presented in section 2.5. The key variables are: Familiarity with technology, social factors, the perceived usefulness, the intention to use, and the use behaviour. Equally, it is valuable to acknowledge that the variables feature in different theories of the study, for example the relationship between social factors and the intention to use features in the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology. The following relationships feature in the Modified Technology Acceptance Model: the relationship between social factors

(norms) with the perceived usefulness, between the perceived usefulness with the intention to use, between familiarity with the perceived usefulness, and between the intention to use with the use behaviour, feature in the modified Technology Acceptance Model (Davis et al., 2003; Venkatesh & Davis, 2000). Generally, the study used a resultant model, where variables from different models were combined. It is not a complete image of any previous model.

Below is the summary of the results based on the stated aims, with the aid of the hypotheses of the study.

***Objective One:** To determine the extent to which social factors influence the intention of farmers to use mobile phones*

The study engaged social factors relevant to the rural farming community in the African setting. The economic status of farmers is one of the factors for the study, because the lives of farmers are characterised by a low income (Ngowi, 2009). Moreover, many farmers do not understand their actual income, because success in agriculture depends on many factors (Food and Agriculture Organization of the United Nations, 2014; Stienen et al., 2007). To meet the requirement of this hypothesis, the study used farmers' ability to finance their mobile phone expenses as a reflection of their financial ability. This offers a true reflection of their ability to finance their mobile phones for agriculture. The same approach was adopted by previous studies on mobile adoption such as Asongu (2013) and Kiseol and Forney (2013).

The hypothesis tested meeting the requirements of this objective was that: farmers' spending ability does not relate to their willingness to learn about new mobile tools for managing agriculture. The results of the analysis showed the presence of the categorical relationship between the variables. Moreover, a significant correlation was confirmed. On this basis, the alternative hypothesis was adopted. The adoption of the alternative hypothesis is supported by the studies by Islam (2011) and Stolle (2015), who observed that the economic status of the user is a good determinant of his/her likelihood to adopt a new tool. A possible explanation for this position is that users

would not opt to learn something that brings new financial obligations, knowing that they have limited resources.

Why is the economic status a determinant? In urban areas, land ownership is a good indicator of a better economic status; however, this is different to the rural society of Africa, and Tanzania in particular (Anriquez, 2007; Livingstone et al., 2011). Land ownership is not a true indicator of the ability of the rural citizen to have good purchasing power, because their economic activities revolve around small farming. In most cases, farming is seasonal and is originally meant for sustaining the family through offering mandatory basic needs (Chauvin et al., 2012). Farmers who have commercialised agriculture (even at the low level) are in a better position to finance the use of mobile phones in activities which support agriculture (Akudugu et al., 2012; Hosman & Fife, 2012; Stienen et al., 2007). Categorically, the study confirms that they are the one who are more willing to learn about new mobile tools relating to agriculture.

Another tested relationship in this category was that between the peer influence and the intention to use (learn) the new technology. Peer influence was adopted, knowing its importance in the African community. For example, the Tanzanian society was founded under the socialistic ideology, and a large part of the community embraces the associated values (Mduma, 2014; Mwamakimbula, 2014). The analysis confirmed a correlation between the variables. Therefore, the increase of the positive peer influence does also increase the intention to use mobile tools in agriculture, and vice versa. This relationship is supported by the modified Technology Acceptance Model, where it admits that subjective norms influence the intention to use (Davis et al., 2003; Venkatesh & Davis, 2000). Social ties and dependences feature under subjective norms.

The study by Anriquez (2007) suggested that many people would prefer not to take risks in a new adventure. Alternatively, they are more willing to adopt something new if it is clear that there are obvious benefits attached to it. In the case of adopting mobile phones, the tool that comes with obvious benefits is more likely to be adopted (Astrid

et al., 2008; Ramayah & Ignatius, 2014). This was the case in the introduction of mobile money services, where many of the rural community members had to adopt mobile phone use due to benefits demonstrated to them through those they trust (Osah, 2015). In communities which are socially connected, this social influence is difficult to avoid; therefore, the implementation of mobile services to agriculture needs to consider how social ties can be used to enhance technological tools in supporting agriculture.

Objective Two: To determine the relationship between social factors and the behaviour of farmers in using mobile phones

Based on the discussion provided in section 4.7, several variables were used in testing the social factors influencing the behaviour of farmers in using mobile phones. The first social factor was the adoption of mobile phones on demand. This adoption was due to social needs, especially those related to farming activities. The hypothesis tested suggested that the adoption on demand does not influence the behaviour of use. In particular, the studied behaviour of use was the rate to which farmers apply mobile phones in their activities.

The Motivation Model of Microcomputer Usage is among theories which addressed this relationship. The model suggests that social factors relate to the use of the studied technological system (Igarria et al., 1996). In this respect the adoption on social demands is the social factor. The results confirmed that the adoption of mobile phones on demand relates to the use behaviour (rate). A simple explanation is that when users adopt a new technology to access certain services, their successful experience influences their rate of use (Kimberley et al., 2012).

Another relationship was between the spending ability and the use behaviour. The relationship between these socioeconomic factors with the rate of use was confirmed. This leads to adopting the alternative hypothesis. The information reveals that farmers with a high ability to spend on airtime are the ones admitting a high rate of use, rather than their counterparts. This makes it necessary for telecom companies to lower the

cost of their farming products, to allow more engagement of farmers in the use (Chukwunonso & Tukur, 2012).

Peer influence was another variable tested against the rate of use. This relationship was not confirmed; therefore, the null hypothesis was accepted. The hypothesis was that peer influence does not influence use behaviour. This is likely because in economic activities, tangible benefits provide a key element for users to increase the interest to continue using the product (Ngowi, 2009). Another relationship which was not confirmed was between the familiarity with the tools and the use behaviour. In this case, the level at which respondents were familiar with mobile tools (other than those for calls and text messages) did not necessarily confirm that farmers perceived the usefulness upon the use (Benard et al., 2014; Ngowi, 2009). Section 4.7 provided details.

In addition to social factors, the testing conducted in section 4.5 (of this study) determined the extent to which farmers perceive that the economic usefulness of mobile phones relates to their current rate of use in agriculture. The analysis confirmed that the increase in the perceived usefulness increases the rate of use. This is more likely to happen if the use of mobile phones is in economic activities (Al-Qeisi, 2009; Truong, 2009). The perceived economic usefulness form the basis for the expressed rate of use (Reuben, 2008; Silva et al., 2011).

***Objective Three:** To establish the degree to which social factors determine the perception of farmers on the benefits of mobile phones in their day-to-day activities.*

This objective was addressed in section 4.4. The objective was addressed through testing the hypothesis which suggested that the extent to which farmers link the success of their peers with the use of mobile phones does not increase their perception toward the usefulness (benefits) of using mobile tools in managing agriculture. The hypothesis was adopted because the rural Tanzanian communities were established under socialist ideologies, where social ties are important in defining their economic development within the society (Ngowi, 2009). Some of these communities are still

defined through such ideologies, and it was the assumption of the study that they may affect farmers' decisions to adopt mobile technologies in agriculture (Lubua, 2015; Ngowi, 2009). The results of the analysis showed that social factors significantly determine the perceived usefulness of mobile phones in agriculture. Therefore, the study rejected its hypothesis. The literature agrees with the observation of the study by suggesting that in societies with strong social ties, positive peer influences enhance the perceived usefulness of mobile phones (Bhavnani et al., 2008; Tambotoh et al., 2015).

5.3 Theoretical contribution

The operationalisation of this study followed positivist epistemological principles, and realism as its ontological stance. Therefore, it applied available theories to establish its basis. According to section 2.3, the theories discussed were: the Motivational Model of Microcomputer Usage, the Model Combining the Technology Acceptance Model and the Theory of Planned Behaviour, and the Unified Theory of Acceptance and Use of Technology. All these theories were essential to form the basis for this study. Based on inputs from these theories, the conceptual model was formulated, and presented in section 2.6. The model provided variables operationalised through hypotheses tested in the current study. Therefore, this section provides the position of the conceptual framework introduced by this study and the contribution to the theoretical part of studies about the adoption of mobile technologies in agriculture.

The conceptual framework introduced four (4) categories of variables: social factors, the perceived usefulness, intention to use, and the use behaviour (refer figure 2.6). The category of social factors discussed the following: peer influence, the use on demand, and the spending ability. The study also included the level of familiarity in its analysis. Based on findings of the study the conceptual framework was adopted with minor modifications. The modifications were caused by the observed positive relationship between the familiarity of users with mobile tools and the perceived usefulness. However, not all social factors provided a positive relationship with the perceived usefulness and the intention to use.

Based on the results, peer influence was the only variable which showed a positive relationship with the perceived usefulness and the intention to use. The adoption on demand related to the perceived usefulness but not the intention to use. Another variable that showed a positive relationship with the perceived usefulness was the level of familiarity with mobile tools, the intention to use and the use behaviour. On the other hand, the spending ability related to the intention to use mobile phones, but not the perceived usefulness. Lastly, the intention to use showed a positive relationship with the use behaviour. In conclusion, this study affirms the model provided in Figure 4.3, as its contribution to relevant theories. It will be useful in setting a basis for future studies, and understanding the adoption of mobile phone tools in agriculture.

5.4 Limitations of the study

The focus of the study was on social factors and the adoption of mobile phone technologies within the farming community. Understandably, there are many factors influencing our social communities. Because of the diversified nature of the social factors, the study considered few selected factors as cases for study; the purpose was to make the study manageable (Dulock, 1993; Frankfort-Nachmias & Nachimias, 1996). The selection of the factors and their inclusion in hypotheses was influenced by the conducted pilot study; these are the factors which are likely to be more relevant to societies which have settings similar to those of the rural Tanzania.

Moreover, it is important to acknowledge that the social science research field presents different methods for testing the validity and reliability of extracted data. The purpose is to win the confidence of research stakeholders toward the relevance of research results in decision making (Saunders, Lewis, & Thornhill, 2012). In this study, two validity methods were used: the content validity and the face validity. The study by Bhattacharjee (2012) proposes statistical methods to confirm the internal validity between the variables. Methodologically, this statistical validity (convergent and discriminatory) is highly demanding in terms of the researcher' time and effort

(Kassahun & Molla, 2013; Bhattacharjee, 2012). Therefore, it would not be adequately accommodated given the research schedule and knowledge at the researcher's disposal. With this regard, the study used the face and content validities to validate sources of data. Moreover the Cronbach Alpha was used to test the internal reliability.

Accordingly, the study was keen on addressing two types of relationships: the categorical relationship, and the influence of one variable to the other. The key models were the Pearson Correlation Model, Chi Square and the One Way ANOVA Model. The choice of these models was influenced by factors discussed in section 3.6 of the data analysis method. However, the study understands the presence of other models, which are equally useful and could further the scope of the results and its interpretations (Sobh et al., 2006).

Furthermore, the study was limited to chosen geographical areas in the Kilimanjaro Region of Tanzania. Also, the population involved peasant farmers, and it was trimmed to match the available resources. Therefore, these results are generalisable to communities sharing similar characteristics with the studied group (Frankfort-Nachmias & Nachmias, 1996; Harris & Brown, 2010; Sobh et al., 2006). To be confident with the generalisation of the study to large farmers (commercial), the study requires an extension.

On the other hand, it is necessary to recall that section 2.6 introduced a conceptual framework which was tested and resulted to the framework presented in Figure 4.3. The framework through Figure 4.3 was the result of hypotheses tested throughout Chapter 4. Basically, the framework presented through Figures 2.6 and 4.3 are guided by the Multiple Regression Analysis Model. However, different combinations of variables (as dictated by the model presented in Figure 4.3) did not completely fit the Multiple Regression Model. Only one combination fitted. Based on the literature, this is likely to happen because human behaviour is difficult to predict (Lin, Wu, & Caovalitwongsec, 2014).

Below is the summary of the combination:

- i.) The first combination consisted of the adoption on demand, peer influence, and the spending ability, and the familiarity with mobile phones. Collectively, these variables predicted the rate of use (use behaviour). Nevertheless, adoption on demand and the spending ability are the only variables which produced a recommended influence.
- ii.) The second combination had the following independent variables: the perceived usefulness and the spending ability. The two variables were to determine the rate of use. Nevertheless, the “perceived usefulness” was the only variable with a positive relationship. Therefore, the equation did not fit to the Multiple Regression Model.
- iii.) The combination tested the adoption on demand, peer influence, and the spending ability, and the familiarity with mobile phones against the intention to use. The peer influence and the spending ability were the only variables with a positive relationship. Therefore, the variable did not describe the Multiple Regression Model adequately.
- iv.) The last combination used the perceived usefulness and the spending ability as the independent variables. These were tested against the intention to use. The two variables provided a significant test to the model.

5.5 Future Work

This study provides room for future work in the following areas: First, more social factors may be explored. In this study, three (3) key social factors were studied, excluding demographic characteristics. However, the study acknowledges that social factors are many, and they range from socioeconomic, demographic to cultural factors (National Bureau of Statistics, 2012; Silva et al., 2011; Tambotoh et al., 2015). Each category of these social factors has variables, which could offer additional description to farmers’ relationships with the adoption of mobile phones in agriculture. To identify additional social factors within the farming society, a study that would approach the context with subjectivity is likely to discover more social features to be tested (Kura,

2012; Marshall & Rossman, 1995). Therefore, this study proposes the use of qualitative research methods to understand the features, before subjecting them to quantitative methods for testing.

Moreover, it would be more valuable if future studies were to engage Interpretivism philosophies, to have a detailed qualitative perspective of the results. This is because the qualitative approach is useful in describing observable features of the study (Krauss, 2005). This is necessary to those patterns of the study which lack adequate information from the literature. Moreover, it is equally relevant where additional descriptions emerging from the studied cases are mandatory to validate the study (Marshall & Rossman, 1995). This study used the description obtained through both the literature and interviews in explaining observed relationships; however, a qualitative study could use the same elements in forming the basis for the study.

Furthermore, a similar study may be conducted among commercial farmers to understand their perspective of social pressure for adopting mobile technologies in agriculture. Commercial farmers operate their activities in a different landscape, when compared to peasant farmers who make up a large part of the Tanzanian community (Benard et al., 2014; Mduma, 2014). Commercial farmers have more capital and knowledge of agriculture than peasants. Regardless of their outperformed number, it is arguable that commercial farmers have a significant impact on agriculture production (Livingstone et al., 2011). Understanding social factors affecting the adoption of mobile technologies among commercial farmers would complement the current knowledge in the area.

Besides, the extension of the analytical models would broaden the results. This study used the Pearson Correlation, One Way ANOVA, and the Chi Square Model. However, econometric present diversified models for analysing relationships (Sobh et al., 2006). With the aid of specialists in analytical models, it is possible that more relationships could be discovered from the current study. Moreover, it is important to observe each social factor independently, to know whether they all contribute

significantly to the general Multiple Regression Model. This is the model combining variables of the conceptual framework.

5.6 Chapter Summary

The main purpose of this chapter was to conclude this study. This was completed through summarising important themes of the findings, before conclusions were made. Generally, it is concluded that social factors significantly impact the adoption of mobile technologies by the rural farming community. Moreover, the chapter suggested the following factors to limit the study: the first factor is the limited number of social variables which were studied, and the second was the fact that the study was based on the categorical relationship and the correlation between the variables. Additionally, the following areas of study were proposed: the study of commercial farmers, the study to enhance the scope of variables, the study based on qualitative approach, and the study which extends the use of analytical models.

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APPENDIX 1: ENGLISH SURVEY QUESTIONNAIRE WITH THE CONSENT LETTER



University of Cape Town
Department of Information Systems
Leslie Commerce Building
Upper Campus Or Private Bag, Rondebosch, 7701
Cape Town
Tel: 650-2261
Fax No. (021) 650-2280

Re: Participation in Data Collection Process

This letter requests your participation in the data collection process for the study entitled Social Patterns Influencing the Adoption of Mobile phones in the Farming Community. The completion of the study is the requirement leading to the award of the MCom. Information Systems. The following are the objectives of the study: To determine the extent to which social factors influence the intention of farmers to use mobile phones, to determine the relationship between social factors and the behaviour of farmers in using mobile phones, to determine the degree to which social factors determine the perception of farmers on the usefulness of mobile phones in their day to day activities.

Kindly be assured that this study is approved by the ethical committee of the University of Cape Town, before your involvement. *Your participation is voluntary, and you may terminate the survey process in case you are uncomfortable with any part of the questionnaire.* Moreover, you are not required to submit any identifiable information.

Averagely, the survey is expected to take about 10 minutes. If you opt to participate in this study, please fill in the consent form below.

Consent form Agreement

By signing this Participant Consent Form, you are agreeing to participate in a research project entitled, “Social Patterns Influencing the Use of ICTs in the Farming Community”, conducted by Edison Lubua of the University of Cape Town. The study process guarantees confidentiality and anonymity of your response in this study. All comments and details will be treated in strict confidence and will be used strictly for the sole purpose of the aforementioned dissertation research project

Signature_____

Date_____

If you have any questions, kindly be free to contact: Edison Lubua (elubua@yahoo.com) or Prof. Michael Kyobe (Michael.kyobe@uct.ac.za)

Questionnaire

Instruction: Choose the most collect answer in each question, and write the letter representing it in the space provided through brackets

1	<i>Gender</i> a.) Male b.) Female
2	<i>Marital Status</i> a.) Single b.) Married c.) Divorced []
3	<i>Age</i> a.) Age below 30 Years b.) Between 31 and 45 Years c.) 46 and Above []
4	<i>Education</i> a.) Informal Education b.) Primary Education c.) Secondary Education d.) Post-Secondary Education []

5	<p><i>How do you rate your familiarity with the use of different mobile tools</i></p> <p>a.) Very Familiar b.) Familiar c.) Moderate d.) Unfamiliar e.) Very Unfamiliar []</p>
6	<p><i>To what extent do you agree that you have adequate knowledge toward the use of mobile tools supporting your activities?</i></p> <p>a.) Highly agree b.) Agree c.) Moderate d.) Disagree e.) Highly disagree []</p>
7	<p><i>After, trying to learn to use mobile tools other than for sending text messages and making calls, to what extent do you agree that the learning process is effortless?</i></p> <p>a.) Highly agree b.) Agree c.) Moderate d.) Disagree e.) Highly disagree []</p>
8	<p><i>There are people who happen to use mobile tools (services), because it is the only way to get what they desire. To what extent do you agree that your decision to use mobile tools (other than those for communications) was compelled by the importance of meeting a certain urgent need?</i></p> <p>a.) Highly agree b.) Agree c.) Moderate d.) Disagree e.) Highly disagree []</p>
9	<p><i>Assume the following scenario: First, you learn to use a certain mobile service because of the urgent need that you must meet (think of mobile money), or you learn the use out of convenience. Provided, that the benefits are the same, to what extent do you agree that learning to use a certain mobile service to meet your current demand enhances your perception toward its benefits, than learning to use out of convenience?</i></p> <p>a.) Highly agree b.) Agree c.) Moderate d.) Disagree e.) Highly disagree []</p>
10	<p><i>How do you rate the extent to which mobile phones contributes to your economic benefits in your daily activities?</i></p> <p>a.) Highly Beneficial b.) Beneficial c.) Moderate d.) Not Beneficial e.) Highly Not Beneficial []</p>

11	<p><i>What is the rate of incidents, which influenced you to decide to adopt mobile services because you learned through the success of someone associated to you?</i></p> <p>a.) Very High b.) High c.) Moderate d.) Low e.) Very Low []</p>
12	<p><i>To what extent would the success of your associates, which is contributed by the use of a certain mobile service in managing their activities, positively influence your decision to adopt?</i></p> <p>a.) Highly Influence b.) Influence c.) Moderate d.) Less Influence e.) Least Influence []</p>
13	<p><i>Based on your income, how much can you comfortably afford to spend on buying the airtime for your phone in one week (7 days)?</i></p> <p>a.) 1500 and Below b.) Between 1501 and 3000 c.) Between 3001 and 4500 d.) Above 4501 []</p>
14	<p><i>To what extent does the ability to spend on the air time (for your mobile phone) affects your intention to learn to use new mobile tools including those for agriculture management?</i></p> <p>a.) Highly Affect b.) Affect c.) Moderate d.) Less Affect e.) Least Affect []</p>
15	<p><i>How do you rate your general use of mobile phones in your day today economic activities?</i></p> <p>a.) Very High b.) High c.) Moderate d.) Low e.) Very Low []</p>

16	<p><i>How would you rate your current use of mobile phones to obtain the information that supports your agricultural activities? Such information includes the weather report, seed, fertilizer, pesticides and fund.</i></p> <p>a.) Very High b.) High c.) Moderate d.) Low e.) Very Low []</p>
17	<p>Generally, to what extent are you willing to use mobile tools provided by your providers in managing your farming activities?</p> <p>a.) Highly Willing b.) Willing c.) Moderate d.) Unwilling e.) Highly Unwilling []</p>
18	<p>Kindly use the brackets to rate your current use of mobile phones in obtaining services (i-) below. The key for rating is: a.) Very High b.) High c.) Moderate d.) Low e.) Very Low</p> <p>i.) To obtain the weather information []</p> <p>ii.) Obtain agriculture Tips []</p> <p>iii.) Access the market for harvests []</p> <p>iv.) Access farming Fund []</p>

APPENDIX 2: SWAHILI SURVEY QUESTIONNAIRE WITH THE CONSENT LETTER



Chuo Kikuu Cha Cape Town
Idara ya Mifumo ya Habari,
Jengo la Biashara la Leslie,
Sanduku Binafsi, RondeBosch, 77001,
Cape Town.
Simu: 650-2261
Nukushi Na. (021) 650-2280

Re: Ushiriki Katika Kukusanya Takwimu

Barua hii inaomba ushiriki wako katika zoezi la kukusanya takwimu kwa ajili ya tafiti yenye kichwa cha habari - Mambo ya Kijamii yanayochochea matumizi ta simu za mkononi kwa Jamii ya Wakulima. Kumaliza kwa zoezi hili, tutamfanya mtafiti aweze kutimiza sehemu ya masharti ya kupata shahada ya uzamili katika mifumo ya habari. Yfuatayo ni malengo ya tafiti hii: Kufahamu kiwango ambacho mambo ya kichamii yanashawishi watu kunuia kutumia huduma fulani za simu, kufahamu mahusiano kati ta mambo ya kijamii na namna watu wanavyotumia simu zao, na kufahamu kiwango ambacho mambo ya kijamii yanasababisha mabadiliko ya mtizamo wa watumiaji wa simu kuhusu faida za simu katika shughuli za kila siku. Nipende kukufahamisha ya kua, uko huru kushiriki au kujitoa mda wowote wa kati wa zoezi. Pia hakuna namna yeyote ambapo, taarifa ulizotoa zitajulikana kua zimetoka kwako. Hivyo kua huru.

Fomu ya Kuridhia Kushiriki

Kwa kusaini hapa, umekubali kushiriki katika tafiti hii yenye kichwa kisemacho “Mambo ya Kijamii yanayochochea matumizi ya simu za mkononi kwa watu wa jamii ya wakulima”, inayofanywa na Edison Lubua wa Chuo Kikuu Cha Cape Town. Hatua zote za tafiti hizi zina usiri wa hali ya juu. Habari zote zitatumika tu kwenye tafiti hii na si vinginevyo.

Sahihi _____

Tarehe _____

Ikiwa una swali lolote, tafadhali kua huru kuuliza kupitia Edison Lubua (elubua@yahoo.com, 0768583848), au Prof. Michael Kyobe (Michael.kyobe@uct.ac.za)

Dodoso la Kiswahili

1	<i>Jinsia</i> a.) Mume b.) Mke []
2	<i>Majukumu ya ndoa</i> a.) Sina ndoa b.) Nina ndoa c.) Nimetaliki []
3	<i>Umri</i> a.) Miaka 30 au Pungufu b.) Miaka kati ya 31 na 45 c.) Miaka 46 au zaidi []
4	<i>Elimu na Mafunzo</i> a.) Elimu isiyo rasmi b.) Elimu ya Msingi c.) Elimu ya Sekondari d.) Elimu ya Chuo []
5	<i>Je, unaukadiriaje uelewa wako wa matumizi mbalimbali ya programu za simu za mkononi?</i> a.) Wa juu sana b.) Wa juu c.) Wastani d.) Wa chini e.) Wa chini sana []
6	<i>Ni kwa kiwango gani unakubaliana na wazo kua una ufahamu wa kutosha kwa ajili ya kutumia vitendea kazi vya simu, vinavyoleta ufanisi kwenye kazi zako?</i>

	a.) Nakubali sana b.) Nakubali c.) Wastani d.) Sikubali e.) Sikubali kabisa []
7	<i>Baada ya kufanya jitihada za kujifunza kutumia dhana (programu) mbalimbali za simu (achilia mbali kupiga simu na kutuma jumbe), ni kwa kiwango gani unakubali kua huhitaji jitihada kubwa kujifunza?</i> a.) Nakubali sana b.) Nakubali c.) Wastani d.) Sikubali e.) Sikubali kabisa []
8	<i>Wapo watu ambao hujikuta wanatumia programu fulani za simu, kwa kua ni njia pekee ya kupata huduma wanayohitaji. Ni kwakiwango gani unakubali kua maamuzi yako ya kutumia programu za simu (nje ya zile za mawasiliano) ulisukumwa na hitaji fulani la haraka na lazima?</i> a.) Nakubali sana b.) Nakubali c.) Wastani d.) Sikubali e.) Sikubali kabisa []
9	<i>Fikiri hali Ifuatayo: Kwanza, unajifunza kupata huduma fulani kwa njia ya simu kwasababu ya hitaji la lazima ulilonalo (mfano, kupata fedha), au unajifunza kupata huduma hiyo hiyo kabla ya kua na hitaji la lazima likusukumalo. Ukizingatia kua faida ya huduma ni ile ile, Ni kwa kiwango gani unakubali kua kujifunza kutumia huduma za simu ili kukudhi haja zikusukumazo kwa sasa inakufanya kuboresha mtizamo wako juu ya faida za huduma uipatayo, kuliko wakati ambapo unajifunza matumizi bila msukumo wa mahitaji kwa wakati huo?</i> a.) Nakubali sana b.) Nakubali c.) Wastani d.) Sikubali e.) Sikubali kabisa []
10	<i>Je, unakikadiriaje mchango wa matumizi ya huduma za simu katika kuleta faida za kiuchumi katika utendaji wako wa kila siku?</i> a.) Huchangia sana b.) Huchangia c.) Wastani d.) Haichangii e.) Haichangii kabisa []
11	<i>Je, unakadiriaje uzito wa ushawishi uliowahi kupata hadi kuamua kutumia huduma fulani za simu za mkononi; ushawishi unaohusiana na wewe kua shuhuda wa mafanikio ya mtu flani aliyetumia huduma hizo za simu?</i>

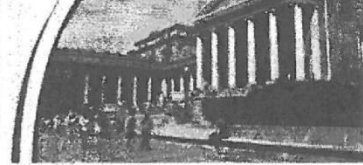
	a.) Mkubwa Mno b.) Mkubwa c.) Wastani d.) Mdogo e.) Mdogo Mno []
12	<i>Ni kwa kiwango gani, mafanikio ya wadau wako, ambayo yamechangiwa na matumizi chanya ya huduma za simu na teknolojia ya kisasa, yamewahi kukushawishi kutumia huduma hiz?</i> a.) Kikubwa Sana b.) Kikubwa c.) Wastani d.) Kidogo e.) Kidogo Sana []
13	<i>Kulingana na kipato chako, bila kuathiri majukumu yako mengine, ni kiwango gani unaweza kutumia kununua muda wa maongezi ndani ya wiki moja (siku 7)?</i> a.) 1500 au Pungufu b.) Kati ya 1501 na 3000 c.) Kari ya 3001 na 4500 d.) Zaidi ya 4501 []
14	<i>Ni kwa kiwango gani uwezo wako wa kununua muda wa maongezi, unaathiria yako ya kujifunza kutumia huduma mpya za simu, ikiwepo zile za kusimamia shughuli za kilimo?</i> a.) Huathiri sana b.) Huathiri c.) Wastani d.) Haiathiri e.) Haiathiri Kabisa []
15	<i>Ujumla, unakadiriaje umuhimu wa matumizi yako ya huduma za simu ya mtoni, kama dhana katika shughuli zako za kiuchumi kila siku?</i> a.) Wa juu Mno b.) Wa juu c.) Wastani d.) Wa Chini e.) Wa Chini Mno []
16	<i>Unakadiriaje matumizi yako ya huduma za simu kwa sasa, ili kupata taarifa zitakazoboresha shughuli zako za kilimo? Taarifa hizo ni kama zile za hali ya hewa, mbegu, mbolea, dawa na hata za kupata mitaji.</i> a.) Ya Juu Sana b.) Ya juu c.) Wastani d.) Ya Chini e.) Ya Chini Sana []
17	<i>Kwa ujumla, ni kwa kiwango gani unania kutumia programu za simu zipatikanazo kupitia mtandao wako (Voda, Tigo, Airtel nk.), katika kusimamia kazi zako za kilimo?</i>

	a.) Nia ya Juu b.) Nania c.) Wastani d.) Sinii e.) Sinii kabisa []
18	<p><i>Tafadhali, tumia mabano (hapo chini) kukadiria matumizi yako ya sasa ya Simu katika kupata huduma mbalimbali. Ufunguo kwa ajili ya makadirio hayo ni a.) Ya Juu Sana b.) Ya Juu c.) Ya Kawaida d.) Ya Chini e.) Ya Chini Sana</i></p> <p>i.) Kupata taarifa za Hali ya Hewa []</p> <p>ii.) Kupata dokezo za kilimo bora []</p> <p>iii.) Kupata Masoko []</p> <p>iv.) Kupata Mtaji []</p>

APPENDIX 3: ETHICAL CLEARANCE FORM



UNIVERSITY OF CAPE TOWN
FACULTY OF COMMERCE
 Igniting Knowledge and Opportunity



Commerce Faculty Ethics in Research Application Form

Any person planning to undertake research in the Faculty of Commerce at the University of Cape Town is required to complete this form **before collecting or analysing data**. If any of the questions below have been answered YES, and the applicant is NOT an Honours student, the form it should be submitted to the supervisor (where applicable) and from there for approval by the Faculty EIR committee: Ms Samantha Alexander (samantha.alexander@uct.ac.za).

It is assumed that the researcher has read the UCT Code for Research involving Human Subjects (Available at <http://web.uct.ac.za/depts/educate/download/uctcodeforresearchinvolvinghumansubjects.pdf>) in order to be able to answer the questions in this form.

Students must include a copy of the completed form with the dissertation/thesis when it is submitted for examination.

1. PROJECT DETAILS		
Project title: <i>Social Patterns Influencing the Adoption of ICTs in the Farming Community</i>		
Principal Researcher/s: <i>Edison Nazvel Lubua</i>	Email address(es):	<i>elubua@yahoo.com</i>
Research Supervisor: <i>Prof Michael Kyobe</i>	Email address(es):	<i>michael.kyobe@uct.ac.za</i>
Co-researcher(s):	Email address(es):	
Department: <i>Department of Information Systems</i>		
Brief description of the project: <i>This study establishes the influence of social patterns of the farming community to their behavior and intention to use ICTs. In particular, the study concentrates at the use of mobile tools in agriculture.</i>		
Data collection: (please select) <input type="checkbox"/> Interviews <input checked="" type="checkbox"/> Questionnaire <input type="checkbox"/> Experiment <input type="checkbox"/> Secondary data <input type="checkbox"/> Observation <input type="checkbox"/> Other (please specify): _____		
Have you attached a research proposal OR a literature review with research methodology? (please select) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

2. PARTICIPANTS

2.1 Does the research discriminate against participation by individuals, or differentiate between participants, on the grounds of gender, race or ethnic group, age range, religion, income, handicap, illness or any similar classification?	YES	NO /
2.2 Does the research require the participation of socially or physically vulnerable people (children, aged, disabled, etc.) or legally restricted groups?	YES	NO /
2.3 Will you be able to secure the informed consent of all participants in the research? (In the case of children, will you be able to obtain the consent of their guardians or parents?)	YES	NO /
2.4 Will any confidential data be collected or will identifiable records of individuals be kept?	YES	NO /
2.5 In reporting on this research is there any possibility that you will not be able to keep the identities of the individuals involved anonymous?	YES	NO /
2.6 Are there any foreseeable risks of physical, psychological or social harm to participants that might occur in the course of the research?	YES	NO /
2.7 Does the research include making payments or giving gifts to any participants?	YES	NO /

If you have answered **YES** to any of these questions, please describe how you plan to address these issues (append to form):

Affiliations of participants: (please select)

- Company employees
 Hospital employees
 General public
 Military staff
 Farm workers
 Students
 Other (please specify): _____

Race / Ethnicity:

Are you asking a question about race/ethnicity in your questionnaire?

- Yes
 No

Which race categories have been used?

Have you included the option: "Prefer not to answer" as part of your race/ethnicity question?

3. PROVISION OF SERVICES

Does your research involve the participation of or provision of services to communities?

If your answer is YES, please complete below:

3.1 Is the community expected to make decisions for, during or based on the research?	YES	NO
3.2 At the end of the research will any economic or social process be terminated or left unsupported, or equipment or facilities used in the research be recovered from the participants or community?	YES	NO
3.3 Will any service be provided at a level below the generally accepted standards?	YES	NO

If you answered YES to any of these questions, please describe below how you plan to address these issues.

3. ORGANISATIONAL PERMISSION

If your research is being conducted within a specific organisation, please state how organisational permission has been/will be obtained:

Have you attached the letter from the organisation granting permission? (please select)

Yes No, but this **will be** obtained before commencing the research Not applicable

Are you making use of **UCT students** as respondents for your research? (please select)

Yes No

If yes, have you contacted Executive Director: Student Affairs for permission? (please select)

Yes No

Was approval granted? (please select)

Yes No Awaiting a response

Are you making use of **UCT staff** as respondents for your research? (please select)

Yes No

If yes, have you contacted Executive Director: Human Resources for permission? (please select)

Yes No

Was approval granted? (please select)

Yes No Awaiting a response

Contact Emails: Executive Director: Human Resources (Miriam.Hoosain@uct.ac.za)
Executive Director: Student Affairs (Moonira.Khan@uct.ac.za)

4. INFORMED CONSENT

What type of consent will be obtained from study participants?

- Oral Consent
 Written Consent
 Anonymous survey questionnaire (covering letter required, no consent form needed)
 Other (please specify)

How and where will consent/permission be recorded?

through respondent's signature

Have you attached an informed consent form to your application? Yes No

5. SPONSORSHIP OF RESEARCH

If your research is sponsored, is there any potential for conflicts of interest?

If your answer is YES, please complete below

4.1 Is there any existing or potential conflict of interest between a research sponsor, academic supervisor, other researchers or participants?	YES	NO /
4.2 Will information that reveals the identity of participants be supplied to a research sponsor, other than with the permission of the individuals?	YES	NO /
4.3 Does the proposed research potentially conflict with the research of any other individual or group within the University?	YES	NO /

If you have answered **YES** to any of these questions, please describe how you plan to address these issues (append to form)

6. RISK TO PARTICIPANTS

Does the proposed research pose any physical, psychological, social, legal, economic, or other risks to study participants you can foresee, both immediate and long range? (please select)

Yes No

If yes, answer the following questions:

1. Describe in detail the nature and extent of the risk and provide the rationale for the necessity of such risks
2. Outline any alternative approaches that were or will be considered and why alternatives may not be feasible in the study
3. Outline whether and why you feel that the value of information to be gained outweighs the risks

1.

2.

3.

I certify that I have read the the Commerce Faculty Ethics in Research policy
(<http://www.commerce.uct.ac.za/Pages/ComFac-Downloads>)

I hereby undertake to carry out my research in such a way that


- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

Signed by:

	Full name and signature	Date
Principal Researcher/Student:	Edison Wazoel Lubna	4/11/2015

This application is approved by:

Supervisor	Kyobe m	6/11/15
HOD (or delegated nominee – for all Honours Projects):		
Chair: Faculty EIR Committee (only for postgraduate research at Master and PhD level)		12.01.2015

CHECKLIST	SELECT
A full copy of a research proposal or a literature review with methodology is attached in a separate file	<input checked="" type="checkbox"/>
Interview schedules / cover letters / questionnaires / forms and other materials used in the study are attached in separate files	<input checked="" type="checkbox"/>
Organisational consent letter / UCT student or staff approval letter	<input checked="" type="checkbox"/>
<p>On your cover letter to your questionnaire have you included the following?</p> <p>1. The following UCT Logo </p> <p>2. A sentence explaining the aim of the research</p> <p>3. Sentences of a similar nature to below must be included in the cover letter or consent form:</p> <p>This research has been approved by the Commerce Faculty Ethics in Research Committee.</p> <p>Your participation in this research is voluntary. You can choose to withdraw from the research at any time.</p> <p>The questionnaire will take approximately X minutes to complete</p> <p>You will not be requested to supply any identifiable information, ensuring anonymity of your responses.</p> <p>Due to the nature of the study you will need to provide the researchers with some form of identifiable information however, all responses will be confidential and used for the purposes of this research only.</p> <p>Should you have any questions regarding the research please feel free to contact the researcher (insert contact details).</p> <p>4. Have you scanned in your signature for the last section of the form?</p>	<p>NA <input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p>OR</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>