PERCEPTIONS OF AGRICULTURAL EXTENSION PRACTITIONERS' TOWARDS INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS IN POLOKWANE LOCAL AGRICULTURAL OFFICE, LIMPOPO PROVINCE

by

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DECLARATION

I declare that the mini-dissertation “Perceptions of agricultural extension practitioners’ towards information and communication technology tools in Polokwane local agricultural office, Limpopo province hereby submitted to the University of Limpopo for the degree of Masters of Agricultural Extension has not previously been submitted by me for a degree at this or any other University, that it is my work in design and in execution, and that all material contained herein has been fully acknowledged.

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DEDICATION

This work is dedicated to my late mother Selina Khanukani Mabena.

LIST OF ACRONYMS

ACRONYM	NAME
ICT	Information Communication Technology
SPT	Smart Pen Technology
ESO	Extension Suite On-line
AEP	Agricultural Extension Practitioners
DAFF	Department of Agriculture, Fisheries and Forestry
ERP	Extension Recovery Program
SPSS	Statistical Package for the Social Sciences
MEC	Member of Executive Council
LDARD	Limpopo Department of Agriculture and Rural Development
NAADS	National Agricultural Advisory Services
NCRSC	North Central Rural Sociologists Committee

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ABSTRACT

The aim of the study was to investigate the perceptions of AEPs towards ICT tools to understand why AEPs are not using the ICT tools for their work as expected by the department of agriculture. The data was collected from AEPs by means of self-administered, semi-structured questionnaire in the Tshebela and Mankweng service centres of Polokwane Local Agricultural Office. The findings firstly, indicate that less than half of the respondents are unaware of the advantages of the ICT tools for their work. This means more than half of the respondents are aware of the advantages of using ICT tools for their extension work. Secondly, the results show that less than half of respondents are aware of the disadvantage of the ICT tools for their extension work. This also implies that more than half of the respondents are not aware of any disadvantages of the tools for their extension work. Furthermore, with regard to the research question about the prominence of four ICT tools used together, the findings indicate that respondents believe that the combined use of four ICT tools (laptop, smart phone, smart pen technology and ESO) is helping them to achieve their extension career goals compared with the use of smart phone and laptop only. The hypothesis test of the influence of selected variables on the number of ICT tools used by AEPs show that the socio-economic characteristics of AEPs such as age, lower income, lack of training in the use of laptop (compatibility), and relative advantages issues such as awareness of disadvantages of the ICT tools have a negative influence on the number of ICT tools used as expected. The test also shows that the other variables such as sex, education, ESO training, SPT training, Smartphone training, unawareness of advantages and prominence positively correlate with the dependent variable. These positive relationships notwithstanding, the test indicates that only training received in the use of smart phone makes a significant contribution to the number of ICT tools used by AEPs. There is evidence from the study findings to suggest that most AEPs are aware of the advantages compared with the disadvantages of ICT tools for their extension work. Furthermore, the positive views expressed by AEPs about the prominence of the use of the four ICT tools together in helping them to achieve their extension career goals over the use of two tools shows that AEPs are motivated to use these four tools together. The department of agriculture should invest more in training AEPs in the use of the four ICT tools because they influence their use. AEPs however,

highlighted challenges which hinder their use of the four ICT tools together and which need to be addressed by the department of agriculture to ensure that the four tools are used together. These include access to internet, non-supply of some of the tools by the employer, non-replacement of damaged ICT tools, inconvenient reimbursement structure which requires AEPs to use their own money upfront to purchase data bundle.

Keywords: Information Communication Technology, Agricultural Extension Practitioners, awareness of disadvantages, unawareness of advantages, prominence.

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Information and Communication Technology tools (ICTs) bring about development in agriculture and the field of agricultural extension through the application of ICTs for communication and dissemination or exchange of information. For example, through ICT tools, Agricultural Extension Practitioners (AEPs) can learn about commodity prices, weather conditions etc. and use that information to advice farmers (Okyere & Mekonnen, 2012). Furthermore, ICT tools are used in agricultural extension to promote and spread new and existing farming information and knowledge within agricultural sector. This is therefore crucial for facilitating agricultural and rural development (Mabe & Oladele, 2012).

In 2008 the Department of Agriculture, Forestry and Fisheries (DAFF), adopted the Extension Recovery Plan (ERP) as a strategy to revitalise the state of agricultural extension and advisory services in South Africa (DAFF, 2011). The implementation of the strategy started in 2008/2009 financial year through five pillars namely: ensuring visibility and accountability of extension, promoting professionalism and improving the image of extension and recruiting 1 000 personnel over the MTEF. The others are re-skilling and reorientation of extension and the last one which was investigated in this research was the provision of Information and Communication Technology and other resources.

In 2011 there were about 370 AEPs in Limpopo Province who were targeted for support but there were more AEPs (1250) who actually received the ICT equipment (DAFF, 2011). The difference between the targeted number and the number of AEPs who received the ICT toolls is explained according the evaluation report on the ERP (DAFF , 2012) I quote:

> According to the equipment distribution, the same official may get access to a laptop, 3G, phone, GPS, DSS software, and also use a smart pen. Thus the achieved target in terms of number of personnel with ICT equipment is based on personel who received ICT equipment in one form or another but not

cessarily the entire package. Furthermore, one officer is counted as one other officer every time he/she receives a different type of equipment.

In this study only four ICT tools were studied namely: Smart Pen Technology (SPT), smart phone, laptop and Extension Suite On-line (ESO) system.

In providing the ICT equipment to extension personnel, the Limpopo Department of Agriculture and Rural Development (LDARD) aimed to bring new ways of working in order to improve agricultural extension service delivery through facilitating report writing, giving relevant and diverse information at the right time and improving monitoring of the services (E Zwane 2015, personal communication, 29 January).

Information Communication Technology tools however, have their advantages and disadvantages and people may perceive them differently (Singh & Mehra, 2012). Central to the entire discipline of Agricultural Extension is the concept of perception. Studies on perception show the importance of the concept in the adoption of agricultural innovations (Düvel, 1991; Mabe & Oladele, 2012; Sobalaje et al., 2013).

The ICT tools investigated in this study are interrelated in a manner that one tool cannot function without the other even though they could work separately depending on what they are used for. For example; Extension Suite Online (ESO) is an internet-based agricultural information and intelligence system designed and aimed at assisting AEPs to access information relating to agriculture in order to render an improved service to farmers (Van der Linden, 2014). However, this system requires AEPs to have smart phones or laptops in order to access internet. In 2010 the Smart Pen Technology (SPT) was introduced to the LDARD (LDARD, 2014). SPT is an efficient writing and reporting tool if used properly; it monitors information on agricultural projects and reduce paper work for AEPs and other users (LDARD, 2013). Smart phones are generally used for communication purposes but in this case, they could be connected and be used by all these other tools to access the information.

Agricultural Extension Practitioners can work smarter if they use ICT tools distributed to them by the LDARD, because the ICT tools enable access of information everywhere, anytime and ease their work (V Mabunda, 2015, personal communication, 2 February).

1.2 PROBLEM STATEMENT

Agricultural Extension work is achieved by means of communication (Van den Ban & Hawkins, 1996). Communication tools such as ICT tools are therefore, important in extension work. In the bid to professionalize extension work in the province, the Member of Executive Council (MEC) of the Limpopo Department of Agriculture and Rural Development (LDARD) indicated in his 2013/14 budget speech that among others, the department had invested a lot of money in providing Information and Communication Technology (ICT) tools to the Agricultural Extension Practitioners (LDARD, 2013).

The provision of ICT tools in itself will not lead to the required outcome of improved production and profits for farmers as expected by the LDARD if AEPs are not using the tools. The problem investigated in this study was that the AEPs in Limpopo province are not using the ICT tools for their work as expected by the LDARD. According to (E Zwane, Extension Manager, 2015, personal communication, 29 January). This assertion of low use of ICT tools is backed by records from ESO hosting institution, Manstrat and Xcallibre that between 2014 and 2017, 41-50% of AEPs in Limpopo province who were registered for ESO were not using it (van Zyle, 2019).

Some studies have been conducted on this subject in South Africa; for example, the use and importance of ICT tools (Mabe & Oladele, 2012) and awareness level of the use of ICT tools among AEPs in the North-West Province of South Africa (Mabe & Oladele, 2012), effect on ICT on agricultural information access among AEPs (Oladele, 2015). Internationally, some work on AEPs perceptions of ICT tools have been done in Nigeria (Ajayi et al., 2013). Most of the ICT tools studied by Ajayi et al. (2013), are different from those being investigated in our study, though.

There is however, very little information on the AEPs perceptions on ICT tools supplied to AEPs in Limpopo Province. There could be a myriad of reasons why AEPs are not using the tools supplied to them. Adoption research tells us that amongst the important reasons for non-adoption of innovations is users' perceptions (Afful, 2012; Jayaratne, 2001). Situations differ and what appears to be a problem or its cause in one area may not be a problem in another or have the same underlying causes. For example, Benin et al. (2011) found a positive relationship between National Agricultural Advisory Services (NAADS) programme participation and length of the programme

implementation in one area in Uganda but found a negative relationship in another. It is therefore, apparent that literature gives general patterns, reasons or causes why situations exist; these causes may not be relevant or applicable in each and every situation

In view of the positive relationship between perception and the use of innovations, and the paucity of studies on AEPs in the LDARD views' on the ICT tools provided to them, it becomes important to understand this situation in order to introduce remedial action, where necessary. The study's focus therefore, was to identify the specific underlying perceptual causes of why AEPs in Limpopo Province were not using the ICT tools provided and/or was available to them for their Extension work. It is hoped that the findings would help fill some of the knowledge gap regarding the reasons for this problem.

1.3 AIM OF THE STUDY

The aim of the study was to investigate the perceptions of AEPs towards ICT tools to understand why AEPs are not using the ICT tools for their work as expected by the department of agriculture.

1.4 OBJECTIVES OF THE STUDY

The specific objectives of the study were to:

i. Identify the AEPs views on their unawareness of the advantages and their awareness of the disadvantages of using ICT tools for their work.

ii. Determine the prominence of the ICT tools to help the AEPs achieve their goals in their work.

iii. Determine the relationship between the number of ICT tools used and the socio-economic characteristics of AEPs

iv. Determine the relationship between the number of ICT tools used and respondents' views on relative advantages of ICT tools.

v. Determine the relationship between the number of ICT tools used and respondents' views on prominence of the ICT tools.

1.5 RESEARCH QUESTIONS

The research questions of this study were as follows:

i. What are the AEPs views on their unawareness of the advantages and awareness of the disadvantages of using ICT tools?

ii. What is the prominence of the ICT tools in helping the AEPs achieve their goals in their work?

iii. What is the relationship between the number of ICT tools used by respondents and the socio-economic characteristics of AEPs.

iv. What is the relationship between the number of ICT tools used and respondents' views on relative advantages of ICT tools ?

v. What is the relationship between the number of ICT tools used and respondents' views on prominence of the ICT tools.

1.6 RESEARCH HYPOTHESES

i. The number of ICT tools used by respondents is not significantly influenced by their socio-economic characteristics.

ii. The number of ICT tools used by respondents is not significantly influenced by their views on the relative advantage of ICT tools.

iii. The number of ICT tools used by respondents is not significantly influenced by their views on prominence of the ICT tools.

1.7 DEFINITION OF TERMS

Agricultural Extension Practitioner

Agricultural extension practitioners operate as facilitators and communicators, helping farmers in their decision-making and ensuring that appropriate knowledge is implemented to obtain the best production. They are constantly armed with the latest techniques and information related to agriculture and they relay this information to farmers and agricultural business (Saville, 1965).

Information and Communication Technology

Is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems. It also includes various services and applications associated with them, such as video-conferencing and distance learning (Mohamed, 2015).

Adoption

Rogers (2003) defined adoption as a decision of "full use of an innovation as the best course of action available" and rejection as a decision "not to adopt an innovation or a decision to make use of an innovation as the best course of action available.

Innovation

Rogers, (2003: 12) defined innovation as an idea, practice, or object that is perceived as new by an individual or other unit of adoption.

In this study, the object or technology is a particular ICT tool such as Smart pen.

Extension Recovery Plan

It is a strategy developed by the Department of Agriculture, Forestry and Fisheries (DAFF) in 2007 to revitalise the state of agricultural extension and advisory services in South Africa.

Smart Pen Technology

Is a high-tech efficient writing and a reporting tool which monitors information on agricultural projects and to reduce the paper work for Agricultural Extension Practitioners and other users (LDARD, 2013).

Extension Suite Online

Is an internet based system designed for Agricultural Extension Practitioners to access information relating to agriculture (Van der Linden, 2014).

1.8 SIGNIFICANCE OF THE STUDY

Perceptions from the AEPs will be useful in assisting the LDARD to come to understanding why AEPs seem not to be keen in using the ICT tools distributed to them. With a better understanding of the problem of non-use of the ICT tools provided to the AEPs, the LDARD will be in better position to put in place strategies to increase the use of the tools by the AEPs. This should improve the technical competencies of

AEPs to deliver better extension farm management support to farmers; skills of both farmers and AEPs will be enhanced in Polokwane Local Agricultural Office in order to deal with increasing production and alleviating poverty.

1.9 OUTLINE OF DISSERTATION

The second chapter reviews the literature on innovation adoption models. Flowing from the critical analysis of these models a relevant framework which provides the variables for analysing the perceptions of AEPs is identified. Chapter three presents the methodology employed for the study with justifications for the various methods. The fourth chapter presents the findings of the study in relation to the research questions with discussions. The last chapter provides a summary and conclusion on the research questions and hypothesis as well as appropriate recommendations for management and future research.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses some models of adoption behaviour. The review culminates in the choice of an appropriate conceptual framework that provides the relevant variables to analyse the perception of the AEPs regarding the ICT tools under study.

2.2 SOME MODELS OF ADOPTION BEHAVIOUR

Human behaviour is complex and according to Msuya (2007), models of adoption behaviour help us to understand and predict human behaviour. Some models for adoption behaviour and therefore, for the adoption of ICT tools by AEPs are discussed in this section.

2.2.1 The classical five-stage adoption process

Following the introduction of the hybrid corn (Ryan & Gross, 1943) early research in rural sociology focused on identifying which farmers had the highest rates of adoption of hybrid corn and how the adoption process was diffused to other farmers. Thus in the 1960s, the North Central Rural Sociologists Committee (NCRSC) (1961) formulated the classical five-stage adoption process model that an individual passes through in the process of the adoption of an innovation (Düvel, 1991).

The NCRSC (1961) conceptualized the various stages in the adoption process as innovation awareness-interest-evaluation-trial-adoption. The main arguments against the classical 5-stage model include the fact that the process does not always begin with an awareness of an innovation, that evaluation can take place at various levels and that it does not always end with adoption in the process as it implies (Rogers & Shoemaker, 1971).

2.2.2 Innovation-Decision process

With the flaws of the classical five-stage model highlighted, rural sociologists built on it and conceived of the adoption process with new insights. In the 1970s Rogers and Shoemaker (1971) introduced the Innovation-Decision process model which was refined twelve years later (Rogers, 1983). According to Rogers (1983) the process consists of a series of actions and choices over time through which an individual or is

the process, through which an individual or other decision making unit passes, it does not occur immediately.

According to Rogers (1983) it is the process which consists of a series of actions and choices over time through which an individual or an organizational unit evaluates new idea and decides whether or not to incorporate the innovation into on-going practice. This behaviour consists of dealing with uncertainty that is involved in deciding about a new alternative relative to those that existed previously. The innovation-decision process model is illustrated in Figure 2.1.

Rogers (1983) model includes five stages that an individual or other decision making unit passes through in the adoption of innovation. The first stage is knowledge. It occurs when an individual is exposed to the innovation's existence and gains some understanding of how it functions. The second stage is persuasion, during which an individual (or other decision-making unit) mentally evaluates the innovation and forms favourable or unfavourable attitude toward the innovation.

The third stage is decision it occurs when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation. The fourth stage is implementation during which an individual (or other decision-making unit) puts an innovation into use. Lastly, there is a stage of confirmation which occurs when an individual (or other decision-making unit) seeks reinforcement of an innovation decision already made. At this stage individual (or other decision-making unit) may reverse this previous decision if exposed to conflicting messages about the innovation.

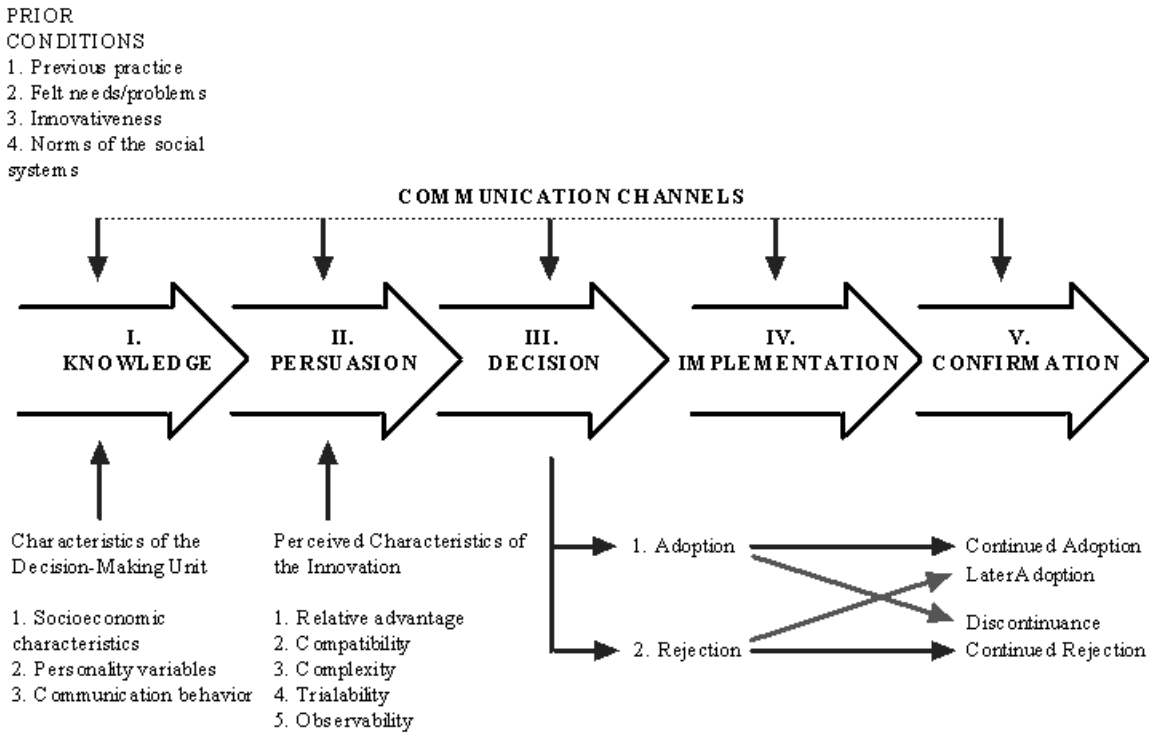

Figure 2.1: A model of stages in the innovation-decision process (Rogers, 1983)

Even though the model spells out the process of change it fails to accord needs or problem perception, the central place in the process. This is important in view of the critical role needs plays in behaviour change (Campbell, 1966). With regard to the relationship of technological attributes and adoption decision, there are perceived attributes of an innovation, which are crucial explanation of adoption of innovation. Rogers (1995) identified five perceived attributes these includes relative advantage, compatibility, complexity, trialability and observability. Rogers (1995) defines these characteristics as follows:

Relative advantage is the degree to which an innovation is perceived by users as better than the idea it supersedes. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is likely to be.

Compatibility is the degree to which an innovation is perceived as being consistent with the values, past experiences, and needs of potential adopters. An idea that is

incompatible with their values, norms or practices will not be adopted as rapidly as an innovation that is compatible.

Complexity is the degree to which an innovation is perceived as difficult to understand and use. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understanding.

Trialability is the degree to which an innovation can be experimented with on a limited basis. An innovation which an adopter can test or try on a small scale before even considering adopting it represents less uncertainty to the individual who is considering it.

Observability is always necessary to the adopters before they can adopt any new idea. It must be easier for them to see the results of the innovation; in that manner they more likely they are to adopt it. Visible results lower uncertainty and also stimulate peer discussion of a new idea (Rogers, 1995).

2.2.3 Innovation behaviour analysis model

Human behaviour is far more inconsistent and therefore less predictable (Berelson & Steiner, 1964) quoted by Msuya (2007). Tolman (1932) and Düvel (1994) quoted by Msuya (2007) believe that human behaviour is intentional, that is, behind the specific behaviour or action, there must be a reason or motive. Düvel (1994) built on the earlier adoption models such as the Lewin field theory (1951), Tolman (1967); and Rogers, (1983) introduced the behaviour analysis model as shown in Figure 2.3. The model attempts to reduce the numerous variables which were found to influence adoption behaviour to a few that are comprehensive enough to explain adoption behaviour.

Düvel (1994) introduced the mediating variable concept to replace Tolman's (1967), intervening variable which were many. They are conceptualized, as the immediate precursors of behaviour while the independent variables were seen to influence the dependent variables through the mediating variables (Düvel, 1991) as indicated in the framework (Figure 2.2). Düvel (1975) and Tolman (1951) quoted by Msuya (2007) defined independent variables as all initiating causes of the individual action which includes personal and environmental factors. The mediating variables are postulated as exploratory entities and are conceived to be connected by one set of casual functions to the independent factors of behaviour. This includes needs, perception and knowledge.

The dependent variables are defined as the interventions. Numerous studies have demonstrated the mediating variables to explain and largely contribute to adoption behaviour than the independent variables (Habtemariam, 2004; Msuya, 2007; Afful et al., 2013).

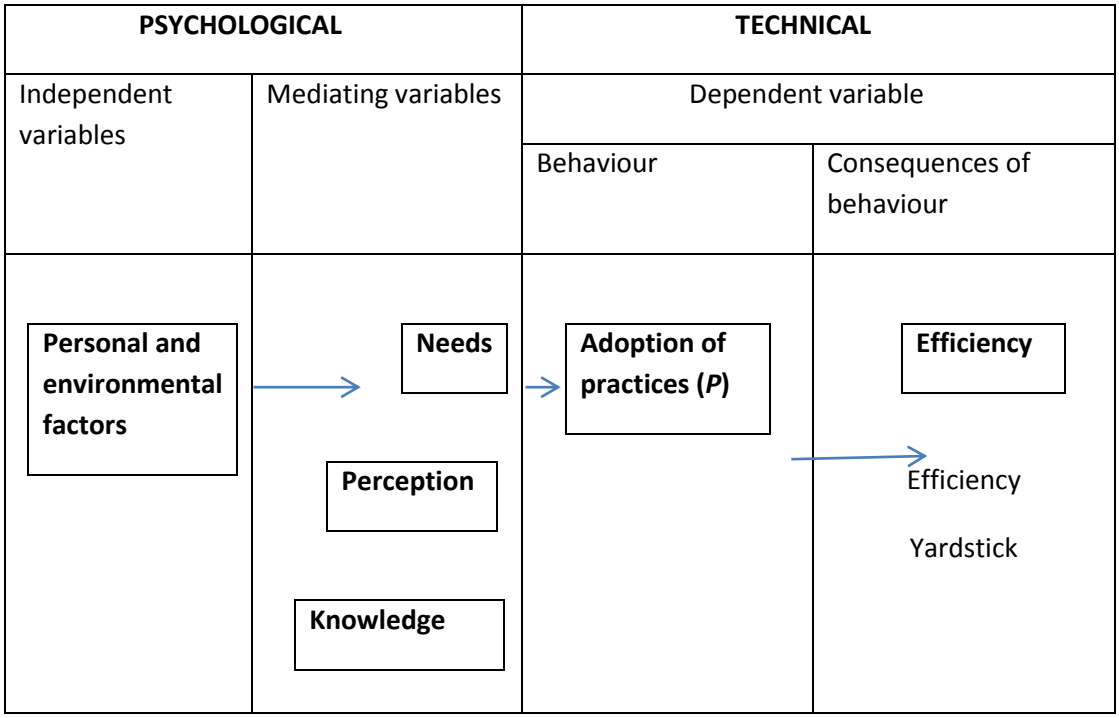

Figure 2.2: The Relationship between behaviour-determining variables in Agricultural Development (Düvel, 1991)

- **Perception**

Various definitions have been put forward to explain the concept 'perception' (Sargent & Williamson, 1955; Düvel, 1975; Pickens, 2005). Basically all these definitions see perception as a process of discrimination and organisation of sensory reception and the result of a dynamic interaction of sensory stimuli, feelings, emotions, values, attitudes, needs, motives previous experience and knowledge. Perception is thus seen as part and parcel of the concepts' attitudes, knowledge, aspirations etc.

The perception of the attributes of an innovation i.e. whether they are attractive (positive valency) or unattractive (negative valency), therefore, are particularly important regarding the adoption of innovations. The importance of perception as a powerful

means of determining the psychological field forces, in behaviour, and therefore, adoption behaviour has been acknowledged (Thomas & Znaniecki, 1927; Düvel, 1975).

Rogers (1983) suggested a list of innovation attributes important in adoption behaviour which are broad and of unspecific categories. To provide for a wider spectrum of specific forces, Düvel (1991) redefined these attributes by replacing Rogers (1983) relative advantage concept and introduced the concept of prominence. Düvel (1974) postulated that the attractiveness of a goal object to satisfy a need or solve a problem is related to its advantages and disadvantages. Perception can either be positive or negative towards an innovation; if an individual develops a negative perception it means that they are not willing to use that innovation and the causes may be because of the three factors that are discussed next:

- **Prominence**

Prominence by Düvel (1975) is synonymous with concept of relative advantage by Rogers (1983). This is the degree of excellence of a new idea relative to other alternatives. Similarly can refer to the degree to which an innovation is better than the one it replaces (Düvel, 1975). It is repetition of the previous statement.

- **Relative advantages**

The concept makes provision for the multitude of considerations which can contribute to adoption (commonly referred to as advantages (positive forces) and disadvantages (or negative forces). This statement concurs with Leeuwis and Van den Ban's (2004) comment on the relationship between farmer evaluation of advantages and disadvantages of an innovation and perception.

- **Incompatibility with situational aspects**

This is the relevancy of the innovation in the individual's specific situation e.g. personal, social, cultural, economic, communicability, etc. They represent the constraints *en route* to the goal and are negative forces that can prevent the adoption of innovations and therefore cannot bring about change even if they are compatible. They cannot be changed to positive forces and once these forces are overcome, they are no longer relevant. Most of the factors that make a farmer unable or incapable of adoption i.e.

personal/ environmental factors fall into this category of variables and are generally referred to as independent variables.

Considering the lack of use of the ICT tools among AEPs in the Limpopo Department of Agriculture and Rural Development, this study investigated perception of AEPs towards the ICT tools in their work. The researcher therefore expects that an analysis of perception as immediate forerunner to the behaviour will provide essential information deemed crucial for a systematic and purposeful analysis of AEPs views on the ICT tools for their work and achievement of their own aspirations with important implications for management intervention.

2.3 ICT TOOLS AND EXTENSION SERVICE DELIVERY

Agricultural extension service delivery in the 21st century requires the use of tools to improve its effectiveness and efficiency. The use of ICT tools is thus seen to enhance the achievement of these twin objectives. They help field-level extension practitioners to access current information and also transmit information e.g. about markets, to its clientele (Meera, Jhamtani, Rao, 2004; Salau & Saingbe, 2006; Richardson, 1997; Chapman Slaymaker, Young, 2004; Mcnamara, 2009; Aker, 2010). ICT tools helps to store and process information. The transmission of information to remote areas can take advantage of the current widespread use of mobile phones amongst rural people.

ICT do not always deliver their promise as expected. For example, Kaushik and Singh (2004) indicated that a lack of knowledge of best practices in IT usage as well as IT-related skill deficiencies in the workforce constrain the benefits from ICT. Furthermore, Structural problems such as internet access must be solved to make ICT-induced development more inclusive (Parayil, 2005).

The ICT tools investigated in this study are: laptop compurer, smartphone, SPT, were given to AEPs while ESO was made available to the AEPs for their extension work. and that they perform different useful duties. For example In 2010 DAFF studied the benefits of utilising such a system as ESO in order to improve service delivery by the AEP's to the farmers and found it most efficient (Van Zyl, 2014). Information from Manstrat and Xcallibre (van zyl 2019) shows that 2014 and 2017, 41-50% of AEPs in Limpopo province who were registered for ESO were not using it (van Zyle, 2019). However this system requires extension officers to have smartphones or laptops in

order to access internet. The SPT works work once the router installation is done; the smart phone will be required in order to access the internet (Router installation manual: A ESO,ndroid, 2011). Smart phones are generally used for communication purposes but in this case it could be connected to ESO, SPT and the laptop.

2.4 CONCEPTUAL FRAMEWORK

The conceptual framework adopted for a focussed analysis of AEPs perception of ICT tools was the Düvel (1991) model for adoption behaviour analysis (Figure 2.3) The perception variables for the analysis were the prominence of the ICT tools in helping respondents to achieve their goals, (insufficient prominence of the innovation, 2.1 in Figure 2.3), the relative advantages of the ICT tools (unawareness of advantages and a wareness of disadvantages, (2.2 and 2.3 respectively in Figure 2.3) and compatibility of the ICT tools with the AEP situational factors such as personal, economical, cultural, social etc. (2.4 in Figure 2.3). The framework guided the construction of the items in the items in the questionnaire for this study.

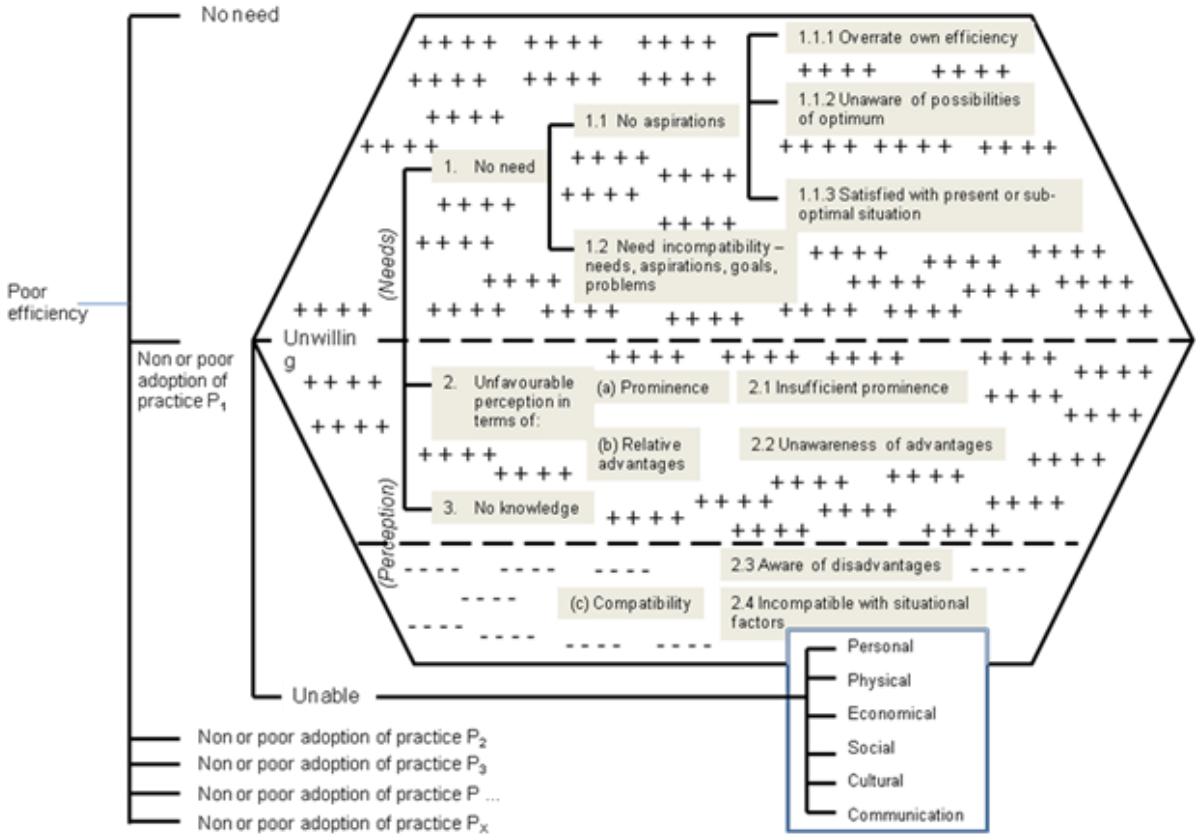

Figure 2.3: Model for Adoption Behaviour Analysis Düvel, (1991)

2.5 SUMMARY

The literature review of the adoption of new ideas or technologies over the years show that researchers have a common understanding that perception is very important. The main factor here is human and it cannot be ignored but to be dealt with in terms of critical factors of perceptions as have been identified by research.

The next chapter discusses the methodology employed in this study.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter describes the study area, research design, population, research instruments, data collection and lastly the data analysis.

3.2 DESCRIPTION OF STUDY AREA

The study was conducted in Limpopo Province within the Capricorn district of Polokwane Local Agricultural Office in service centres namely: Tshebela and Mankweng. These centres provide agricultural extension services to farmers. Mankweng service centre is about 30 km from Polokwane and the population of the area is 94% Northern Sotho speakers (Census, 2011).

The population is predominantly Sepedi speaking, also Xitsonga and Venda language speakers who settled in the area either for educational and or employment opportunities. Tshebela service centre office is located at Seshego village. It is dominated by Northern Sotho speakers about 91.6%, English 5.5% and other 2.9% (Census, 2011). The map (Fig. 3.1) show the two study areas.

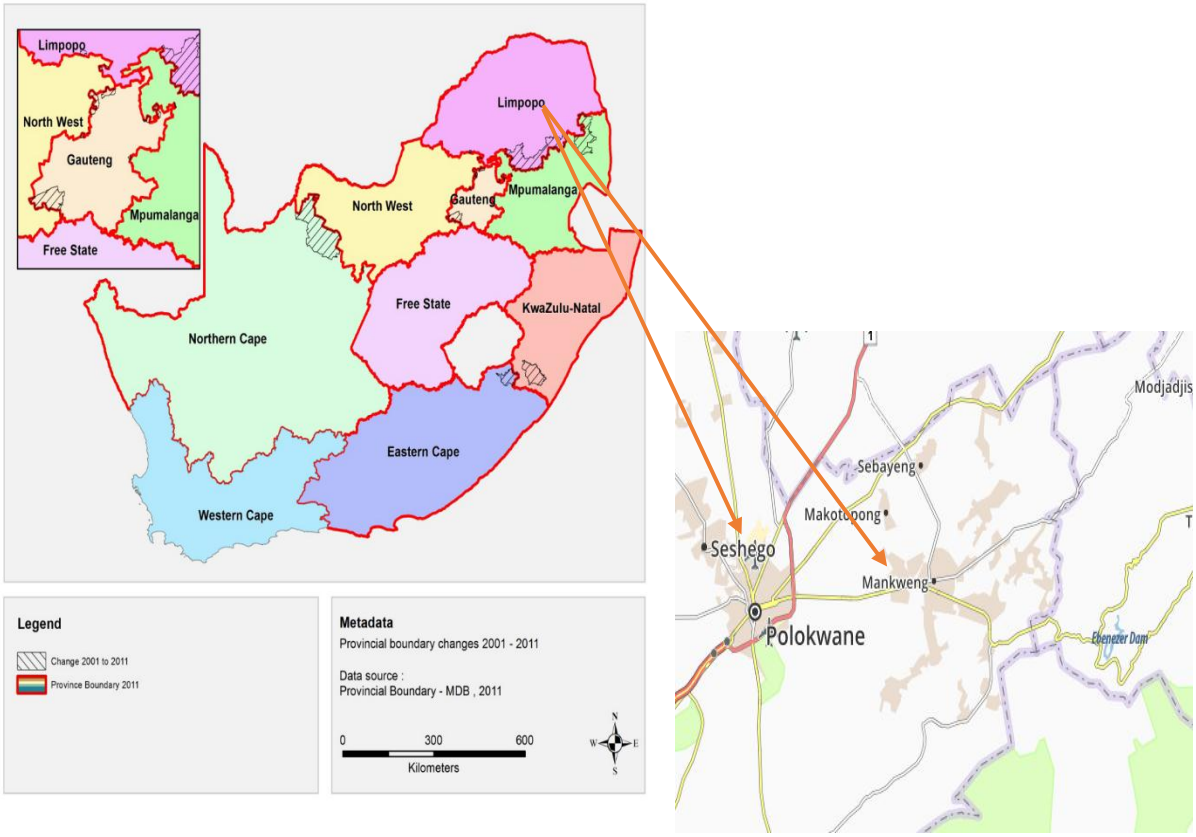

Figure 3.1: Maps representing the study areas (Source: Google maps, 2019)

3.3 RESEARCH DESIGN

The study adopted a descriptive design and the specific one used was the cross-sectional survey design. This was chosen because of its distinctive features which serve the purpose of this study: no time dimension; a reliance on existing differences among AEPs rather than change following intervention; and, AEPS are selected based on existing differences among them rather than random allocation. Furthermore, the cross-sectional design made it possible to measure differences among the AEPs at a point in time.

3.4 Population

The population of this study composed of the Agricultural Extension Practitioners from the two service centres of Mankweng and Tshebela. The study population consisted of 45 AEPs in the two study areas.

3.5 Sampling

The researcher used purposive sampling procedure and selected for interview's only AEPs who possessed one or more of the aforementioned ICT tools (William, 2006). The two service centres had a total population of 45 AEPs who fitted this description. For this reason, all 45 AEPs were selected for interviews. The final number of population size of AEPs who were interviewed were less than 45, because some AEPs were not available but were on leave during the time of interviews.

3.6 Data Collection

The particular survey technique used to cllect the data was the semi-structured questionnaire (Appendix 5). This made it possible to collect both qualitative and quantitative data to serve the purpose of this study. The questionnaire was self-administered. This allowed respondents to comment on issues that they feel strongly about based on their perceptions and therefore, helping to capture both the quantitative and qualitative aspects of an issue (Edwards & Holland, 2013). Furthermore this technique is not expensive while at the same time taking liitle time to collect the data.

The semi-structured questionnaire were distributed to individual AEPs in both two study areas to complete in 5 October, 2016. Due to lapses in return of the questionnaires by AEPs, follow-ups were made. The questionnaires were finally collected back in 12 June, 2017 from the AEPs. The whole data collection exercise took 6 months.

3.7 Measurement of variables

- **Generation of index for awareness of disadvantages of ICT tools**

The initial 3-point Likert scale to which respondents were asked to indicate whether they agree, undecided and disagree with statements on nine variables regarding disadvantages associated with the use of the four ICT tools was collapsed into a dichotomous response pattern easier analysis. Agree was equal to a 'yes' and was coded as 1 in SPSS while undecided or disagree was equal to a 'no' and was coded as

0 in SPSS. Individual respondent means on all nine variables were compared with total mean score for all 40 respondents (.356) and the associated standard deviation (.08). A respondent whose mean score was less than the total mean was given a code of 0 in SPSS. The opposite was the case when the individual's mean was equal to or higher than the mean score; such an individual was given a code of 1 in SPSS which means the individual sees the use of the ICT tool as a disadvantage to his or her work.

- **Generation of index for unawareness of advantages of ICT tools**

A similar procedure was used in this case to generate an index for a respondent's unawareness of the advantages of ICT tools for his or her work. In this instance the calculation was based on 15 variables regarding advantages associated with the use of the four ICT tools for a respondent's work. An individual respondent's mean score on all 15 variables was compared with the total mean score for all 40 respondents (.69) and the associated standard deviation of .07. An individual whose mean score was equal to or more than the total mean score was judged as being unaware of the advantages associated with using the ICT tools for his or her work and coded 1; the opposite was the case and the individual was coded 0.

- **Measurement of Prominence of the use of ICT tools**

This concept was measured by asking a respondent to compare using only the laptop and smart phone and how using the four ICT tools together (Extension Suite On-line, Laptop, Smart Pen Technology and Smartphone) can help him or her achieve his or her extension career goals in the next five years. Respondents' views were code 1= helps to achieve goal (based on respondents' view of strongly agree and agree); 0= does not help to achieve goal (based on respondents' views on strongly disagree, disagree and undecided).

3.8 Data Analysis

Data was subjected to descriptive and inferential analyses. Descriptive analysis included the use of means, percentages and standard deviation of selected variables.

The inferential analysis used linear multiple regression to determine the influence of selected variables on the number of ICT tools used by respondents.

- **Model Specification**

The linear Multiple Regression equation for the study based on the general linear regression equation was specified as follows:

$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + ei$

Where:

Y = dependent variable (number of ICT tools used)

'a' is the intercept

$b_1 – b_8$ = regression coefficients

$X_1 – X_8$ = independent variables

X_1 = Age of the respondent (years)
X_2 = Gender of the respondent (female or male)
X_3 = Level of education of the respondent (diploma, degree etc.)
X_4 = Income of the respondent (R)
X_5 = Training received in the use of ICT tools
X_6 = Unawareness of advantages of ICT tools
X_7 = Awareness of disadvantages of ICT tools
X_8 = Prominence of the ICT tools in relation to AEP goals
ei = error term

Data was analysed using the Statistical Package for the Social Sciences (SPSS) programme.

The variables (X's)' used in the regression analysis are further described in Table 3.1

Table 3.1: Variables used in the multiple regression model for the number of ICT tools used by respondents

Variable name	Definition	Type and unit of measurement	Prior expectations (+/-)
Dependent variable			
Number of ICT tools	Number of ICT tools used by respondent for extension work	Number of ICT tools	
Independent Variables			
Age	Age at last birthday	Years	+/-
Sex	Whether a household member is male or female	Dummy (1 = male, 0 otherwise	+/-
Income	Income per annum	Rand	+/-
Education	Highest level of education	Dummy (1=diploma, 2=Bachelor's degree, 3=Honours degree, 4=Master's degree, 5=Other)	+
ESO Training	Respondent receiving training in use of ESO	Dummy (1= Yes; 0= otherwise)	+
Laptop Training	Respondent receiving training in use of laptop	Dummy (1= Yes; 0= otherwise)	+
Smart pen Training	Respondent receiving training in use of smart pen technology	Dummy (1= Yes; 0= otherwise)	+
Smart phone Training	Respondent receiving training in use of smart phones	Dummy (1= Yes; 0= otherwise)	+
Mediating variables			
Unawareness of advantages	Respondent's unawareness of advantages of using ICT tools	Dummy (Yes=1, 0 otherwise)	+
Awareness of disadvantages	Respondent's awareness of disadvantages of	Dummy employed =1, 0 otherwise	-

	using ICT tools		
Prominence	Prominence of use of four ICT tools together over use of laptop and smart phone	Dummy employed =1, 0 otherwise	+

The data was tested for multicollinearity, independent errors, outliers and normality to ensure that the assumptions for multiple regression were not violated (Pallant, 2007). Multicollinearity occurs when the correlations among the predictor variables are strong/high (.7 or more) (Pallant, 2007). Two of the most commonly used cut-off points for determining the presence of multicollinearity are (tolerance values should not be less than .10, or variance inflationary factor (VIF) value of should not be above 10) Pallant , 2007). These values were used to assess the presence of multicollinearity among the predictor variables since they seem to be a more powerful way of showing the presence of multicollinearity than the bivariate correlation matrix. All selected variables did not show multicollinearity (Table 3.2.) and were subsequently entered into the regression analysis.

Furthermore, the Durbin-Watson test for correlations between errors, that is, assumption of independent errors produced a statistic of 2.303. This value is not less than one nor greater than three and thus is no cause for concern for violating this assumption. Outliers are defined as cases with standardized residual values above 3.3 (or less than -3.3) (Tabacnicck and Fidell: 2007 in Pallant, 2007). Multiple regressions are very sensitive to outliers (Pallant, 2007), according to whom one per cent of cases are expected to lie outside this range. The information concerning outliers or any

strange cases, if any, is presented in the SPSS output Case wise Diagnostics. In this output, no Case-wise Diagnostic table was produced because there were no outliers.

The normality and homoscedasticity assumptions were not violated either. This is seen from the Normality-Probability Plot and scatterplot. The Normal-Probability plot shows points which lie in a reasonably straight diagonal line from bottom left to top right (Appendix 1). The scatterplot of the standardised residuals produced a roughly rectangular distribution with a clear pattern of residual. (Appendix 2).

Table 3.2: Collinearity statistics of variables

Variable	Collinearity statistics	
	Tolerance	VIF
Age	.428	2.339
Sex	.475	2.103
Income	.340	2.944
Education	.580	1.723
Training ESO	.422	2.370
Training Laptop	.375	2.665
Training SPT	.309	3.233
Training Smartphone	.426	2.249
Advantages	.494	2.029
Disadvantages	.772	1.294
Prominence	.494	2.026

- **Ethical consideration**

Permission to carry out the study was sought from the Turfloop Research Ethics Committee (TREC) prior its commencement (Appendix 3).

Informed consent

The researcher informed the interviewees that the participation is voluntary and that they are free to withdraw from participation at any time if they don't feel comfortable. The interviewees were asked to sign a consent form to show that they agreed to partake in the study.

Confidentiality and anonymity

In this study confidentiality and anonymity of the participants was taken into consideration. The participant's real names will not be mentioned in the study and the information provided will only be used for research or study purposes. The researcher informed the participants before agreeing to participate in the study.

Protection from harm

The researcher protected the identities and privacy of the participants through anonymity.

Respect

The researcher will therefore respect all participants. Indigenous health practitioners' secrets traits were also respected in the process.

Furthermore, the researcher wrote a memorandum to the LDARD to inform the Department and communities alike of the extent, aims and methods of the research as well as the benefits of the study to them. The memorandum highlighted the researcher's commitment to protect participants' rights and their voluntary participation in the study. The LDARD extension agents then discussed all this information with the identified communities and asked for their cooperation to participate in the study. The memo sought approval from LDARD to approach individual community members to participate in the study. The approval from LDARD is attached to this report (Appendix 4).

3.9 SUMMARY

This chapter provided a description of the research methods used in the study. It started with the research process followed and finally data analysis techniques employed to test research hypotheses.

The next chapter reports the results and discussion of the results of the empirical investigation.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 INTRODUCTION

The aim of the study was to investigate the perceptions of Agricultural Extension Practitioners' towards Information and Communication Technology tools in Polokwane local agricultural office, Limpopo Province. The data was subjected to descriptive and inferential analyses. The descriptive analysis was used to describe respondents' work in the LDARD and issues related to the use of ICT tools. It further sought to describe respondents' views on the mediating factors outlined in the study, conceptual framework that affect the use of ICT tools and to help answer the research questions. The analysis also described the respondents' personal and environmental variables, normally referred to as independent variables to provide the researcher with a better insight into, and an understanding of the nature and type respondents in the study, and therefore, their actions and reactions regarding the issue under study.

The inferential analysis involved the use of linear multiple regression to test the research hypothesis in order to determine the influence of selected variables on the number of ICT tools used by participants.

The findings were assessed in relation to the extent of the literature and the chapter ended with a summary to explain what the study has identified.

4.2 RESPONDENTS' SOCIO- ECONOMIC CHARACTERISTICS AND USE OF ICT TOOLS FOR EXTENSION SERVICE DELIVERY

The socio- economic characteristics of the respondents that were investigated comprises variables such as age, gender, level of education, income, and training received. A summary of descriptive statistics of some of respondents' socio-economic and other variables related to the use of ICT tools is presented in Table 4.1.

4.2.1 Age

Table 4.1 shows that there were young extension agents (29 years old) and very few were over 58 years. The median age was 39 years amongst the respondents. There

was a positive skewness of .378 which was caused by relatively few high scores such as the maximum of 60 years of age found in this data.

All the 40 respondents were of mixed ages ranging from youth, middle-aged and older age group. This age grouping is according to Statistics SA (2014) which defines youth in South Africa, as anyone in the age bracket of 18 to 35 years; the middle aged group are people between 36 and 55 while anyone over 56 is said to be within the older aged group

Table 4.1: A summary of selected socio-economic characteristics of respondents and number of years using ICT tools

Variable	Min	Max	Median	Skewness
Age (Years) (N=40)	29	60	39	.378
Number of years working in LDARD (N=40)	2	36	10.50	.854
Number of years using ESO (n=17)	1	6	3.00	.316
Number of years using Laptop (n=38)	2	13	7.00	-.010
Number of years using Smart Pen Technology (n= 30)	1	11	4.50	.808
Number of years using Smartphone (n= 32)	1	12	6.00	.083
Number of ICT tools used for extension work (N=40)	1	4	2.50	-.073

The findings of this study indicate that the youth is represented by 27.5% of the respondents in the 25-35 age bracket (Table 4.2). Most AEPs were in the middle- aged group which represents about 70% of the respondents. The good picture was that a tiny fraction of few AEPs (2.5%) were in the older aged group. The dominance of the youth and middle aged in the field of agricultural extension is thus good because these groups are more familiar with new technologies and therefore are more likely to embrace them for their work compared with the older respondents.

Table 4.2: Age distribution of respondents according to age groups

Age group	Frequency	%
25-35	11	27.5
36-46	16	40.0
47-57	12	30.0
58+	01	2.5
Total	40	100

Similar findings were made by the study of Agwu et al. (2008) in Nigeria where a small percentage (5%) of AEP's were older age group, the remaining percentage were youth and the dominating group was the middle aged group. The findings of this study however, contradicts with that of Samansiri & Wanigasundera (2014) conducted in Sri Lanka where they found that the youth was less involved in the field of agricultural extension than the older age group.

4.2.2 Number of years working in Limpopo Department of Agriculture and Rural Development

Table 4.1 results reveal inexperience among some of the AEPs who have worked in their positions for less than 10 years. The positive skewness in the number of years AEPs who have worked in their positions is a reflection of the few older AEPs who have worked in the Department for over 30 years. This study is further supported by Dube (1993) in Swaziland stated similar results to this study that the extension workers who

worked for over 30 years were few (4.7%) but reflects the majority (50%) of extension workers who have experience of less than 10 years. Our finding suggests that the working experience of AEPs in South Africa compares closely to that of AEPs in other parts of Africa.

4.2.3 Number of years using ESO

Extension Suite Online (ESO) was introduced in the LDOA in 2010. The respondents were therefore, asked to indicate the number of years they had been using ESO at the time of the survey in 2016. The findings (Table 4.1) show that the distribution of respondents who responded to this question was 17 and the number of years of using ESO is posively skewed; the minimum and maximum number of years' agents have been using ESO were one and six respectively. The number of years a respondent had been using ESO was calculated as 2016 minus the year when the respondent started using ESO. With the median number of years of use at three (Table 4.1) it was found eight respodents had been usig ESO for three to six years (47%, N=17). The study conducted by Zwane et al. (2012) in Limpopo, South Africa revealed that in Capricorn and Vhembe districts 4.8% and 8.3% respectively AEPs were using ESO. In Sekhukhune district, however, no AEPs (0%) was using ESO, while in Waterberg and Mopani 16.6% and 27.6% respectively AEPs were using ESO. The above figures reported in the Limpopo's district municipalities show that very few AEPs used ESO. The reasons raised by AEPs for the poor use of ESO in Limpopo province, were the lack of connectivity at their work stations (Zwane et al., 2012).

4.2.4 Number of years using Laptop

According to the results in Table 4.1, 95% (N= 40) of the respondents answered the question about the number of years they have used a laptop. The number of years a respondent had been using Laptop was also calculated as 2016 minus the year when the respondent started using the Laptop for Extension work. The median number of years of using the Laptop for Extension work was seven. It shows a negative skewness because of the very few respondents who have used it for a few (2).years. This indicates that most respondents have been using it longer and are familiar with a laptop. It looks like other studies have not looked at this particular issue due to the lack

of literature on it. However, Mabe & Oladele (2012) investigated AEP's satisfaction with the use of laptops and the finding was positive.

Internationally the study conducted by Samansiri & Wanigasundera (2014) in Sri Lanka it was discovered that all the AEP were well aware about the most common computers software's such as MS Word, MS Excel and MS Power Point. These are the most crucial basics of using a laptop. These findings concur with the results of this study and are an indication AEPs, locally and internationally, are familiar with laptops.

4.2.5 Number of years using Smart Pen Technology

The respondents were asked to indicate the number of years of using the Smart Pen Technology (SPT) in their extension work. Similarly, the number of years a respondent had been using the STP was calculated as 2016 minus the year when the respondent started using the STP for Extension work. The results show that 75% (N= 40) responded to this question (Table 4.1) and the median number of years of using the SPT was 4.5. This indicates that on the whole, most AEPs have not been using it for long to do their extension work considering the fact that it was only introduced in LDARD in 2010 (LDARD, 2014).

According to the study by Zwane et al. (2012), even though Smart Pen Technology was made available to AEPs in the Capricorn district, Limpopo province of South Africa, not all AEPs received it. This might explain the gap in respondents who did not respond (25%) to this question and the fact that they might not have it. The SPT is an efficient writing and reporting tool that monitors information on agricultural projects and reduce paper work for the respondents requires skill to use (LDARD, 2013). It might not be easy for older respondents who might be in the 25% non-respondents to use it compared with the middle-aged group and the youth. The distribution of the responses shows a positive skewness of .808. This indicates that a few respondents have been using SPT for much longer.

Comparing the utilisation of SPT in the nine provinces of South Africa, Western Cape, seems to be one province where the use of the SPT is fully operational in the Provincial Department of Agriculture. It is reported that only SPT reports are approved and no paper work reports are allowed (V Mabunda, 2015, personal communication, 2 February).

4.2.6 Number of years using Smartphone

Most respondents answered 80% (N= 40) the question requiring them to indicate how long they have been using Smartphones for their extension work (Table 4.1). Again, the number of years a respondent had been using Smartphone was calculated as 2016 minus the year when the respondent started using the Smartphone for Extension work. The large percentage of responses shows that most AEPs have smart phones. The distribution of responses regarding number of years using the Smartphone shows a slight positive skew indicating that a few respondents have been using much longer. The median number of years of using the smart phone was six. Mabe & Oladele (2012) in North West, South Africa reported that mobile phones were the prominent information communication technologies used by AEP's.

4.2.7 Number of ICT tools used for extension work

The AEPs response to the question about the number of ICT tools they are using for their extension work are summarized in Table 1 and further elaborated on, in Figure 4.1. The findings show a negatively skewed distribution of the minimum number of ICT tools used by AEPs with one as the minimum and four as the highest number used. Figure 4.1 reveals that only 35% of AEPs were using all the four ICT tools as well as the ESO (Figure 4.1). Similar findings by Mabe and Oladele (2012) in North West, South Africa stated that majority of the ICT tools studied were used by most AEPs. It is however, worrisome that 40% of AEPs had only one to two of the ICT tools needed to do their work. This has serious implications for effective and efficient service delivery to their clients.

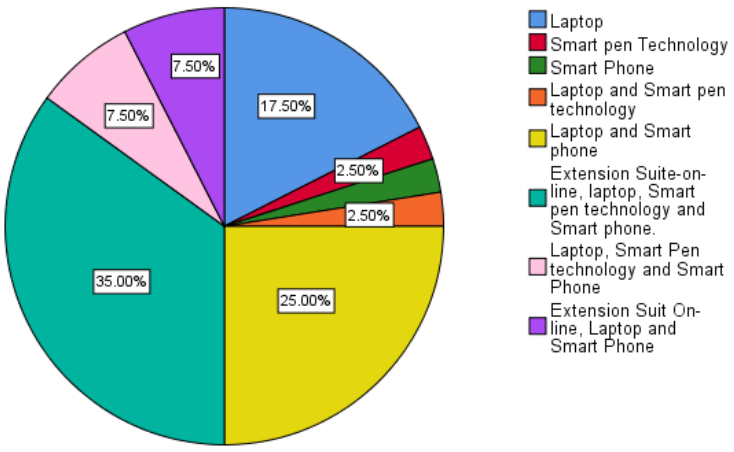

Figure 4.1: Number of ICT tools used for extension work (N= 40)

4.2.8 Frequency of use of ICT tools

The respondents were asked to indicate how often they use the ICT tools for their extension work. The results reveal that most AEPs (70%) used their ICT tools daily (Figure 4.2). This indicates a positive perception towards the use of ICT tools by AEP's in their extension work. This number of people should increase because all 40 AEPs should be working every day.

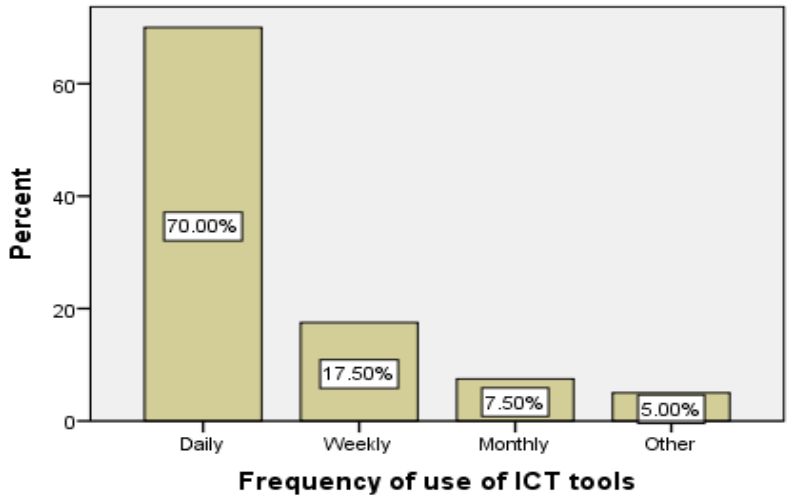

Figure 4.2: Percentage distribution of respondents according to frequency of use of ICT tools

4.2.9 Respondents reasons for not possessing all four ICT tools

The respondents were asked to indicate the reasons for not possessing all the ICT tools (Laptop, Smart phone, ESO and Smart Pen Technology) and their reasons are summarised in Figure 4.3. Various reasons were given but the most common one provided by just over 40% of respondents were that the LDARD did not actually supply them with all the tools. The second most popular reason given by just over 10% of the respondents was that their ICT tool got damaged.

The other reasons ranged from the fact that they did not know about the Extension Suite On-line (ESO), challenges associated with by internet connection, inconvenience in paying for cell phones and lack of training in ICT tool usage etc.

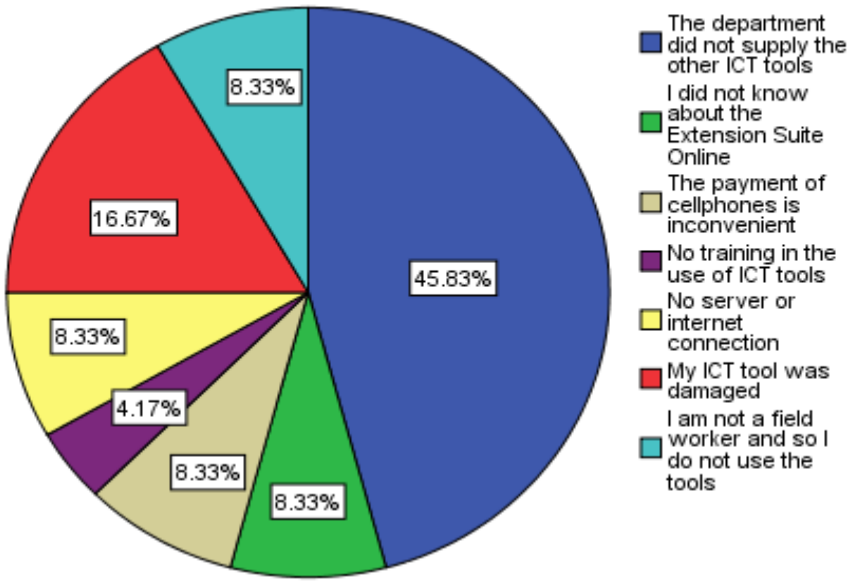

Figure 4.3: Percentage distribution of respondents and reasons for not possessing all four ICT tools

4.2.10 Access to the internet

According to Figure 4.4 only a small number of AEPs (20%) always had access to internet. The majority either sometimes had access (62.50%) while less than 20% had no access at all. This lack or infrequent access to internet makes it difficult for AEPs to access ESO, use a smart phone with a smart pen technology or even a laptop in the field which negatively impacts on effective extension service delivery to farmers. This finding is similar to that by Sebeho (2016) in Free State Province, South Africa which also indicated that AEPs who were dissatisfied because they did not have access to internet and therefore could not use their ICT tools.

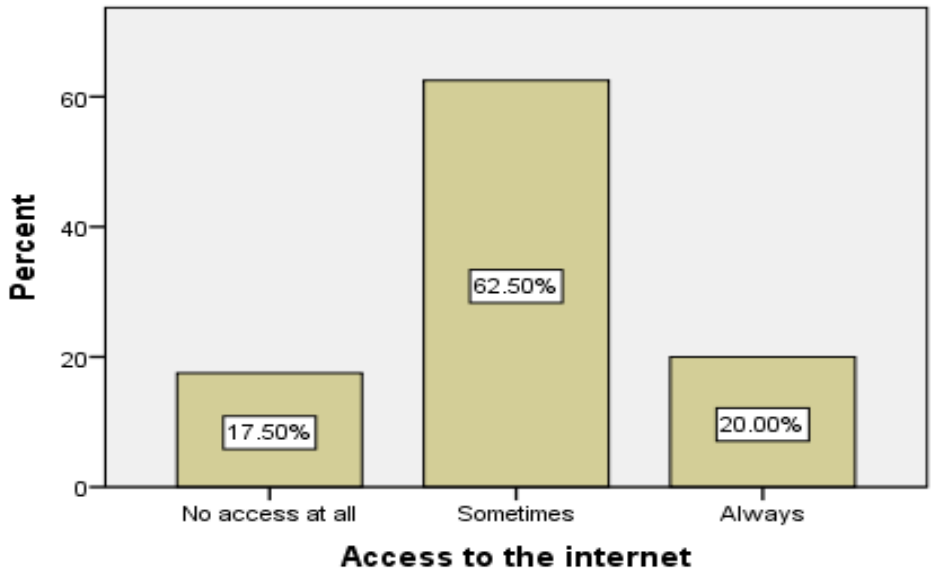

Figure 4.4: Percentage distribution of respondents according to access to internet

4.2.11 Respondents reasons for no internet access

The respondents were asked to give reasons why they did not have access to internet at all. The results are summarised in Figure 4.5. The findings reveal that a vast majority of them (88.89%) indicated that there was no internet connection in their area of work. The rest (11.11%) however, said that their cell phones were not compatible with access to the internet.

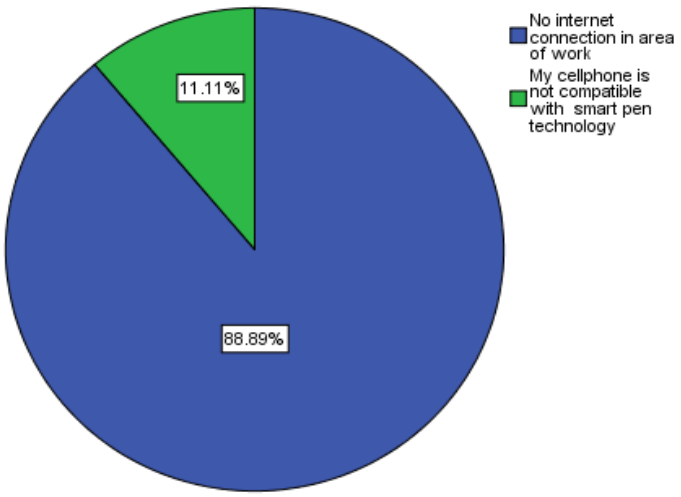

Figure 4.5: Percentage distribution of respondents and reasons for no internet access

4.2.12 Respondents training received for ICT tools usage

Table 4.3 provides a summary of responses by respondents to the question whether they received training in the use of ICT tools. The findings indicate that over 50-60% said they did not receive training. Most respondents (70%) however, mentioned receiving training in the use of the laptop. This lack of training negatively impacts on their ability to use the tools for effective extension service delivery.

Table 4.3: Percentage distribution of respondents and training received for ICT tools usage

	Response	Frequency	Percentage
ESO	Yes	17	42.5
	No	23	57.5
Laptop	Yes	28	70.0
	No	12	30.0
Smart Pen Technology	Yes	17	42.5
	No	23	57.5
Smart phone	Yes	16	40.0
	No	24	60.0

4.2.13 Sex of respondents

Figure 4.6 shows the sex of all respondents in the survey. The findings reveal equal percentages for both sexes (Figure 4.6). However, other studies done on AEP's such as the study by Ajayi et al. (2013) in Nigeria, Mabe and Oladele (2012) in North West Province, South Africa revealed that the majority of AEP's are males.

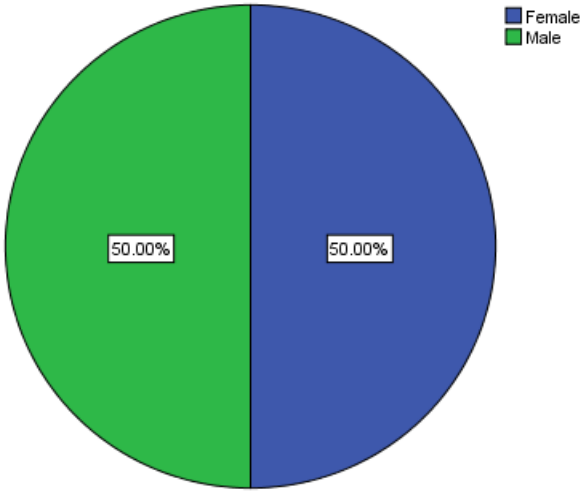

Figure 4.6: Percentage distribution sex of the respondents

4.2.14 Income of respondents

The rationale behind finding out about AEPs annual income was to have some indication about a possible influence on their ability to pay for smart phone air-time which is reimbursed by the employer, albeit at a later time. According to the responses to this question, only a small number of respondents (5%) earned less than R250, 000 per annum (Figure 4.7). The rest earned more than that. The income of the Agricultural Extension Practitioners (AEPs) might or might not be a significant factor that negatively influences the use of ICT tools especially, smart phones. A study by Ajayi et al. (2013) in Nigeria supports the above statement but found that 74% of AEPs earn less or equal to 100.000 Naira per annum and further stated that the use of ICT tools may be affected by income earned.

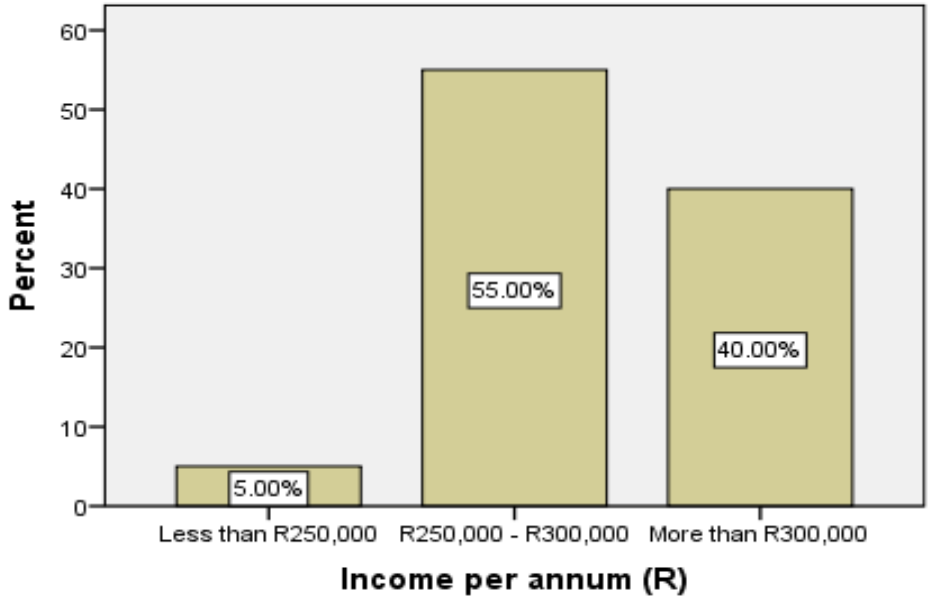

Figure 4.7: Percentage distribution of respondents and their income per annum

4.2.15 Highest level of education

The level of education of respondents (Figure 4.8) indicates that most respondents had at least, a bachelor's degree and only a small number had a diploma qualification (10%) and a master's degree (17.50%). Majority (57.50%) of AEPs had an honours degree. This finding is similar to that of Mugwisi (2013) in Kwazulu Natal, South Africa which also indicated that most AEP's had a bachelor's degree (45.6%) and a few with a master's degree (10.5%). In 2008 Agwu et.al. conducted a study in Enugu State, Nigeria and the findings however, contradict this study. They indicated that the majority of AEPs have Diploma qualification and a small percentage with master's degree. These differences between the findings in Nigeria and South Africa, might be due to the fact that the South African government made an investment in the qualification upgrade of AEPs for those with a diploma qualification. Improved levels of education of AEPs bodes well for the use of scientific knowledge and adoption of modern and advanced technology by AEPs; the latter invariably leads to effective and efficient service delivery to farmers. Findings by Tata & McNamara (2016) in Southern Africa showed that AEPs with advanced degrees faced less technical challenges using internet based systems than their less- educated colleagues.

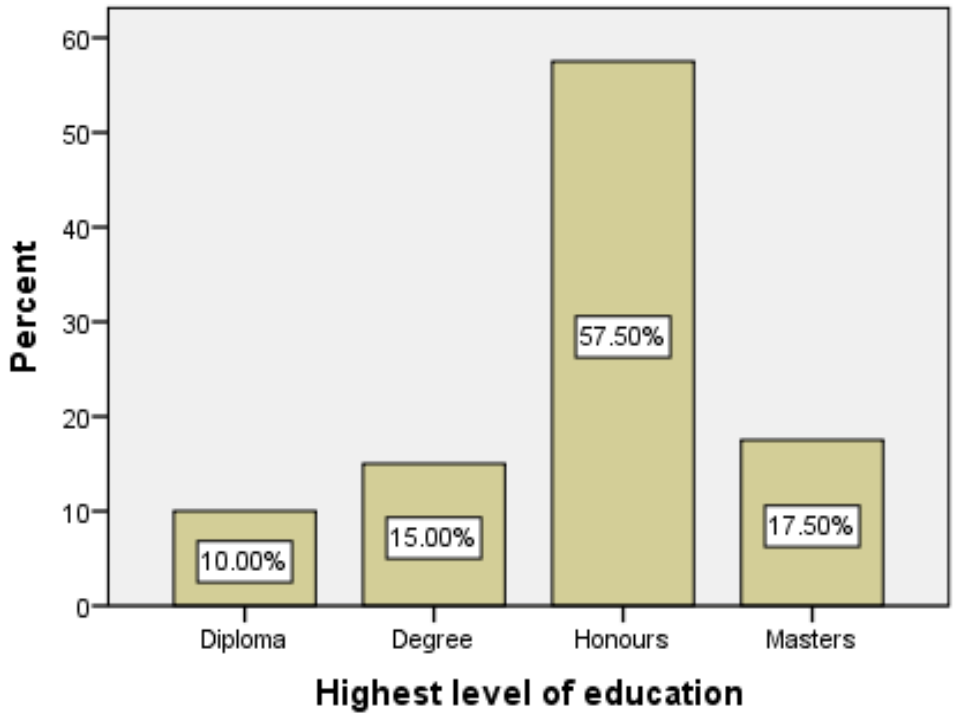

Figure 4.8: Percentage distribution of respondents according to highest educational qualification

4.3 RESPONDENTS' VIEWS ON AWARENESS OF DISADVANTAGES OF USING ICT TOOLS

This section provides a summary of respondents' views on the disadvantages of the use of ICT tools for their work (Figure 4.9). The findings indicate that most agents disagreed with the research question that ICT tools have more disadvantages compared to advantages for their extension work. Put differently to answer the second part of research question i, less than half of respondents were aware of the disadvantage of the ICT tools for their extension work. This finding concurs with that of Akuku et. al. (2014) in Kenya in which it was indicated that AEPs and the farmers agree that the use of ICT tools bring a lot of change in agricultural extension work and have the potential in improving rural livelihoods and poverty eradication.

Also Agwu et al. (2008) conducted a study about AEPs level of awareness to ICT facilities and found that majority of researchers and extension workers had high level of awareness of major ICT tools. In view of the evidence in the literature, that awareness of the disadvantages of the innovation has a negative influence on the adoption of the

innovation (Afful, Obi & Lategan, 2013), the finding in this study bodes well for AEPs adoption and continued use of ICT tools for their extension work.

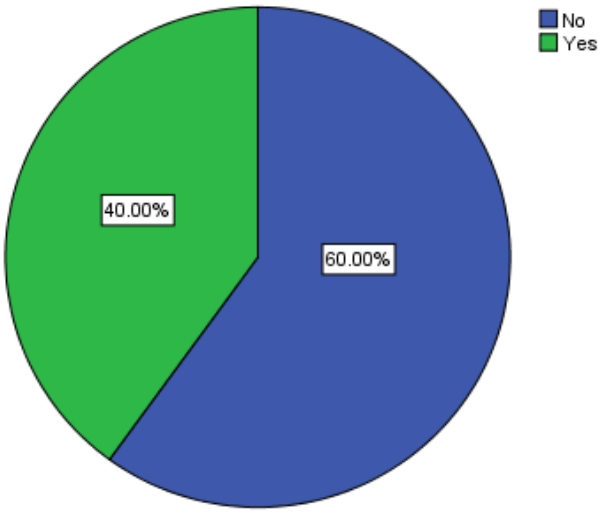

Figure 4.9: Percentage distribution of respondents' views on disadvantages of ICT tools

4.4 RESPONDENTS' VIEWS ON UNAWARENESS OF ADVANTAGES OF USING ICT TOOLS

This section also summarizes respondents' views on the advantages of the use of ICT tools for their work (Figure 4.10). The findings indicate that over half of the respondents were aware of the advantages of ICT tools and less than half of the respondents were unaware of the advantages for their work and this answers the first part of research question (i) posed for this study. A study by Samansiri & Wanigasundera (2014) in Sri Lanka similarly indicated that most (67.7%) of AEPs are familiar with the usefulness of ICT tools to access information necessary for their extension activities. Again, in view of the evidence in the literature regarding the positive relationship between unawareness of the disadvantage of an innovation and its adoption (Afful, Obi & Lategan, 2013; Hudson & Hite, 2003) the finding in this study bodes well for AEPs adoption and continued use of ICT tools for their extension work.

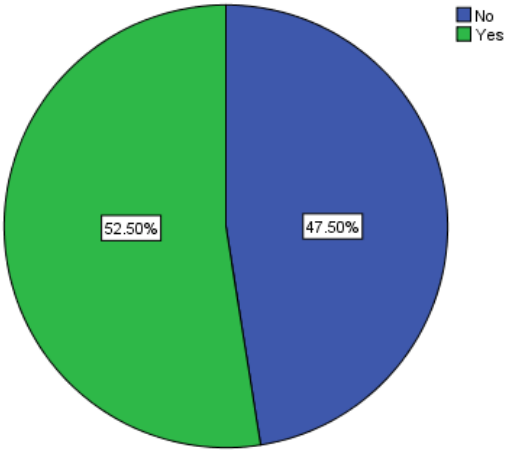

Figure 4.10: Percentage distribution of respondents' views on advantages of ICT tools

4.5 RESPONDENTS' VIEWS ON PROMINENCE OF ICT TOOLS

By means of a 5-point Likert scale ranging from strongly agree to strongly disagree, the prominence of the ICT tools was assessed by requesting respondents to indicate their agreement with the study question that the use of the four ICT tools together (laptop, smart phone, smart pen technology and ESO) helps one to achieve one's extension career goal compared with the use of smart phone and laptop. The 5-point scale was then later collapsed into 'yes' coded as 1 in SPSS to cover strongly agree and agree and 'no' coded as 0 to cover strongly disagree, disagree and undecided. The findings (Figure 4.11) indicate that extension practitioners' viewed the combined use of four ICT tools (laptop, smart phone, smart pen technology and ESO) as helping them to achieve their extension career goal compare with the use of smart phone and laptop only and thus positively answers research question ii. This finding is important because it means agents will continue to use the four tools together for their extension work provided constraints to their use are addressed. The literature on the positive relationship between the prominence of an innovation and its adoption (Afful, Obi & Lategan, 2013; Msuya 2016) supports our finding.

In responding to this question on prominence of ICT tools, some extension practitioners stated some reasons why it is prominent in their extension work. Some of the reasons were that before ESO they struggled to find information, but now they have quick and easy access to information. Another reason was the access to new and updated

information rather than information from books which is sometimes old and outdated. According to the Manstrat Agricultural Intelligence presentation by Van der Linden (2014) in South Africa, ESO has made a profound impact on the lives of agricultural extension practitioners and that it has improved the relationship between agricultural extension practitioners and farmers in South Africa.

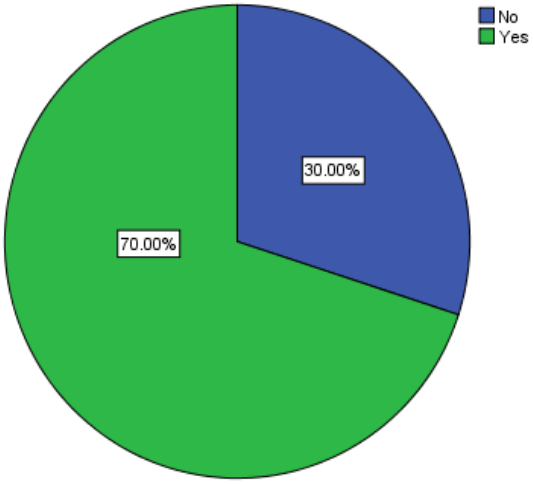

Figure 4.11: Percentage distribution of respondents' views on prominence of ICT Tools and goal achievement

4.6 CONTRIBUTIONS OF SELECTED VARIABLES TO VARIANCE IN NUMBER OF ICT TOOLS USED

A standard multiple regression was used to assess the null hypothesis that the number of ICT tools used by respondents is not significantly influenced by their socio-economic characteristics, their views on the advantages, disadvantages and the prominence of the ICT tools. Preliminary analyses were conducted to ensure that the assumptions of normality, linearity, multicollinearity and independent and identical distribution of the errors of prediction were not violated in using multiple regression as an analytical technique.

The results of the multiple regression analysis which tested the research hypothesis and answered research question (iii), are presented in Table 4.4. The findings show that age of respondent, awareness of disadvantages, lack of training in the use of laptop and lower income had a negative influence on the number of ICT tools used as expected. On the other hand, all the remaining seven variables positively correlated with the number of ICT tools used. However, only training received in the use of smart

phone made a significant contribution to respondents' use of most of ICT tools provided by the Limpopo Department of Agriculture and Rural Development.

Again, training in the use of smart phone had the largest beta value and this suggests that this variable makes the strongest unique contribution to explaining the number of ICT tools used when other variables are controlled for. Together, all the variables explained 74.3% of the variation in the number of ICT tools used by extension practitioners. The model's ability to predict the number of ICT tools used by respondents is indicated by the Anova reading (F= 7.111; df= 11; p= .000). This finding suggests that the null hypothesis is rejected and the research hypothesis that the variables in the model together have a significant influence on the number of ICT tools used by AEPs is accepted. This finding has noteworthy implications for extension managers and AEPs in the use of ICT tools for effective and efficient extension service delivery to clients.

Table 4.4 Multiple regression estimates of the effects of selected variables on the number of ICT used by respondents (N= 40)

Variable	Beta	T	P
Constant		3.047	.005
Sex	.193	1.362	.184
Income	-.055	-.328	.746
Age	-.261	-1.750	.092
Education	.037	.287	.776
Training ESO	.199	1.323	.197
Training Laptop	-.204	-1.280	.211
Training SPT	.179	1.002	.316
Training Smartphone	.398	2.663	.013
Unawareness of Advantages	.141	1.014	.320
Awareness of Disadvantages	-.127	-1.146	.262
Prominence	.099	.713	.482

R^2 = 74.3

4.7 SUMMARY

This chapter presented and discussed the results of the study and their implications for extension service delivery. This study focused on the perceptions of AEPs towards ICT tools. The results with respect to the research questions clearly indicate that the AEPs understand the positive influence of the use of the ICT tools on their extension work. They also have a positive view of the use of the ICT tools, especially, the combined use of the four tools on their own goal achievement. The potential is there for the widespread use of these tools by all AEPs in the province once the identified challenges are addressed. This will invariably have a positive influence on extension service delivery. The positive relationship between the dependent variable and those independent variables tested in the regression analysis also show that extension managers should pay attention to these tools to ensure the continued use of the four ICT tools together. The significant relationship between training in the use of smart phones and the use of the four ICT tools shows that this training is vital for the use of the four ICT tools and should be continued.

These positive findings notwithstanding, there are challenges to the use of the four ICT tools together which need resolution in view of the findings of this study. It is a positive finding that most respondents have at least a bachelor's degree (90%) which make it easier for them to learn the use of the tools easily; most respondents (70%) also use the tools daily however, only 35% use all four tools together. The single most mentioned reason for not using the four tools is that the Department did not provide them (46%), non-replacement of damaged ICT tools (17%), inconvenient reimbursement structure which requires AEPs to use their own money upfront to purchase data bundle (8%) and for most respondents (63%), access to the internet is occasional.

The next chapter will present the summary, conclusions and recommendations of this study.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter provides concluding remarks about the findings of the hypotheses tested in this study. Study recommendations flowing from the study are presented to indicate the implications of the findings for extension management. The chapter organization begins with summary of the findings related to the study questions, followed by concluding statements about the study research objectives, hypothesis and the implications of the findings for extension practice and theory. The chapter ends with recommendations including areas of further research.

5.2 SUMMARY

The problem investigated in this study relates to the lack of evaluation findings on the views of AEPs on the minimal use of ICT tools in the Polokwane Local Agricultural Office. The research questions were:

i. What are the views of the AEPs on the advantages and disadvantages of using ICT tools?

ii. What is the prominence of the ICT tools in helping the AEPs to achieve their goals in their work?

iii. What is the relationship between the number of ICT tools used by respondents and the socio-economic characteristics of AEPs (compatibility)?

iv. What is the relationship between the number of ICT tools used and their views on relative advantages of ICT tools and prominence of the ICT tools?

v. What is the relationship between the number of ICT tools used and their views on prominence of the ICT tools?

The findings around the research questions and the hypothesis test are as follows:

The answer to the first part of research question (i), is that the study finding shows that less than half of the respondents are unaware of the advantages of the ICT tools for

their work. This means that more than half of the respondents are aware of the advantages of using ICT tools for their extension work.

With regard to the second part of research question (i), the study finding shows that less than half of respondents are aware of the disadvantage of the ICT tools for their extension work. This also implies that more than half of the respondents are not aware of any disadvantages of the tools for their extension work.

With regard to the research question (ii) about the prominence of four ICT tools used together , the findings indicate that the respondents believe that the combined use of four ICT tools (laptop, smart phone, smart pen technology and ESO) is helping them to achieve their extension career goals as compared with the use of smart phone and laptop only.

The hypothesis test based on research question (i, ii and iii,)) was: The number of ICT tools used by respondents is not significantly influenced by their socio-economic characteristics, their views on the advantages, disadvantages and the prominence of the ICT tools.

- The influence of selected variables on the number of ICT tools used by AEPs was tested and the linear multiple regression results show that socio-economic characteristics of AEPs such as age, lower income, lack of training in the use of laptop (compatibility), and relative advantages issues such as awareness of disadvantages of the ICT tools have a negative influence on the number of ICT tools used as expected.
- The other variables such as sex, education, ESO training, SPT training, smartphone training, unawareness of advantages and prominence positively correlate with the dependent variable. However, only training received in the use of smart phone makes a significant contribution to the number of ICT tools used by AEPs as provided by the Limpopo Department of Agriculture and Rural Development.
- Associated with agents' views on ICT tools for their work, AEPs also indicated that there were challenges that hinder the use of all four ICT tools for their work. These include access to internet, non-supply of some of the tools by the employer, non-replacement of damaged ICT tools, inconvenient reimbursement

structure which requires AEPs to use their own money upfront to purchase data bundle.

5.3 CONCLUSIONS

5.3.1 About the problem investigated

There is evidence from the study findings to suggest that most AEPs are aware of the advantages compared with the disadvantages of ICT tools for their extension work. Furthermore, the positive views expressed by AEPs about the prominence of the use of the four ICT tools in helping them to achieve their extension career goals over the use of two tools shows that AEPs are motivated to use these four tools together. These findings corroborate literature regarding the usefulness of ICT tools for extension work (Aker, 2010).

The hypothesis test revealed that sex of respondent, education, ESO training, SPT training, smartphone training, unawareness of advantages, prominence, positively correlate with the dependent variable. However, only training received in the use of smart phone makes a significant contribution to the number of ICT tools used by AEPs as provided by the Limpopo Department of Agriculture and Rural Development.

The structural issues such as internet access, provision of ICT tools by employer etc. mentioned by AEPs need resolution to ensure the use of tools as expected by the employer. These findings find support in literature that these structural challenges hamper the widespread use of the ICT tools (Parayil, 2005).

5.3.2 About theory

The study's conceptual framework was based on the Düvel (1991) model for adoption behaviour analysis. The constructs used in this study to determine the AEPs awareness of the disadvantages, unawareness of the advantages, prominence and compatibility of AEPs personal and environmental factors in relation to the number of ICT tools used for their extension work, have been widely tested in different time periods (Düvel, 1975; Louw and Düvel, 1993) and some of the latest work include (Afful, Obi and Lategan, 2013; Msuya, 2016). These studies have yielded consistent results regarding the influence of these constructs as mediating variables of adoption behaviour analysis.

The findings in our study add to such findings and thus enrich the theory of extension adoption behaviour analysis.

5.4 RECOMMENDATIONS

The research makes the following recommendations based on the core findings of the study:

- There is a need for LDARD to provide the AEPs with the ICT tools needed to function effectively and efficiently to achieve their Extension goals and also timeously replace any reported damaged tools.
- Manstrat, the hosting institution of ESO should work with the department in introducing ESO to all the AEPs. This will motivate the AEPs to use ESO..
- The LDARD must ensure that AEPs have secure internet connectivity in their various places of work.
- The LDARD must ensure that training is provided for the AEPs in the use of the ICT tools after supplying them with these ICT tools.
- The reimbursement of AEPs for money they spend for data bundles associated with use of ICT tools should be done timeously.
- Future studies could look into whether there is a change in the situation regarding the problems identified in this study such as the supply of all four ICT tools to all AEPs, internet connectivity in AEPs places of work and essential training associated with the use of the four ICT tools (ESO, laptop, SPT and smart phone). Replacement of damaged ICT tools and a better arrangement regarding reimbursing AEPs for the money they spend to buy data bundles should be a part of such a study.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

This questionnaire consists of four sections. Section A is based on situational incompatibility. Section B is about the agent's unawareness of the advantages of the ICT tools. Section C is based on agent's awareness of the disadvantages of the ICT tools and finally section D is based on prominence of the ICT tools.

The following acronyms are used in this questionnaire: Agricultural Extension Practitioners (AEPs), Information Communication Technology (ICT), Extension Suite On-line (ESO), Smart Pen Technology (SPT)

PERCEPTIONS OF AGRICULTURAL EXTENSION PRACTITIONERS' TOWARDS THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY TOOLS IN POLOKWANE LOCAL AGRICULTURAL OFFICE, LIMPOPO PROVINCE

1. Name and Surname of the participant (OPTIONAL)	
2. Questionnaire no.	
3. Name of the Service Centre	
4. Date	
5. Contact Details (Needed in case there is need for follow-ups)	

SECTION A: SITUATIONAL INCOMPATIBILITY

1. Age (in years at your last birthday) ……

Please circle the number that corresponds to your choice

2. Gender

Male	1
Female	2

3. Income (per annum)

Less than R250,000	1
R250,000 - R300,000	2
More than R300,000	3

4. Highest Level of education

Diploma	1
Degree	2
Honours	3
Masters	4
Other (Specify) ……..	5

5. Number of years you have worked in the Department of Agriculture ……

6. Which of the following ICT tools supplied by the Limpopo Department of Agriculture do you possess that you use for your extension work?

Extension Suite On-line	1

Laptop	2
Smart Pen Technology	3
Smart Phone	4

7. How often do you use these ICT tools?

Daily	1
Weekly	2
Monthly	3
Other (Specify) ……..	4

8. If you do not have **ALL** the ICT tools listed in Question number 6, give reason(s) why. ***(Can be answered only by those who do not possess ALL the four ICT tool(s)***

_____
_____
_____
_____

9. In which year did you receive the ICT tool(s) that you possess? ***(Write the year next to the ICT tool(s) possessed)***

1. Extension Suite On-line _____
2. Laptop _____
3. Smart Pen Technology _____
4. Smart Phone _____

10. Tell us about your access to the internet connection using the ICT tools mentioned in Question number 6 ***(Referring only to the ICT tool(s) possessed)***

No access at all (Go to Question. 11)	0
Sometimes	1
Always	2

11. Give reason(s) for not accessing the internet connection at all.

_____

_____

_____

_____

12. Did you receive training in the use of ICT tools provided?

	No	Yes
Extension Suite On-line	0	1
Laptop	0	1
Smart Pen Technology	0	1
Smart Phone	0	1

13. Do you know where to find information on ESO to increase you knowledge and competence in extension work

Yes	1
No	2

14. Are you able to use the SPT to capture pictures and monitor information on your work?

Yes	1
No	2

15. How many of these tools do you always use for your extension work?

Extension Suite On-line	1
Laptop	2
Smart Pen Technology	3
Smart Phone	4

SECTION B: AGENTS UNAWARENESS OF THE ADVANTAGES OF USING THE ICT TOOLS

Rate the following statements on the use of the four ICT tools using the following 3 point Likert scale

Agree= 1 **Undecided= 2** **Disagree= 3**

Extension Suite On-line	**Agree**	**Undecided**	**Disagree**
16. ESO is easy to use	**1**	**2**	**3**
17. ESO allows me to approach my work easily	**1**	**2**	**3**
18. ESO gives me more information and it helps to upgrade my knowledge in my work	**1**	**2**	**3**
19. ESO allows me to access plant, animal and regional data for my work anytime, anywhere.	**1**	**2**	**3**
20. Other	**1**	**2**	**3**
Laptop			
21. A laptop allows me to organize my documents and pictures for service delivery	**1**	**2**	**3**
22. A laptop is portable for office and field extension work	**1**	**2**	**3**
23. Other	**1**	**2**	**3**
Smart Pen Technology (SPT)			
24. SPT helps to capture and monitor information on field extension work	**1**	**2**	**3**
25. SPT captures important and useful pictures in my extension work	**1**	**2**	**3**
26. SPT reduce paper work for my extension work	**1**	**2**	**3**

27. Other	**1**	**2**	**3**
Smart Phone			
28. Smart phone helps me to access the information on agricultural extension	**1**	**2**	**3**
29. Smart phone is useful in taking photos and share with clients (farmers) via Bluetooth	**1**	**2**	**3**
30. Smart phone does similar activities like laptop in my work	**1**	**2**	**3**
31. Smart phones allow me to pay for purchases (work related and personal)	**1**	**2**	**3**
32. Other	**1**	**2**	**3**

SECTION C: AGENTS AWARENESS OF THE DISADVANTAGES OF THE ICT TOOLS

Rate the following statements on the use of the four ICT tools using the following 3 point Likert scale

Agree= 1 **Undecided= 2** **Disagree= 3**

Extension Suite On-line	**Agree**	**Undecided**	**Disagree**
33. ESO is not easy to access for my extension work e.g. it requires on-line registration	**1**	**2**	**3**
34. ESO does not offer relevant and updated information that is immediately available	**1**	**2**	**3**
35. Other	**1**	**2**	**3**
Laptop			

36. A laptop is complicated to use	**1**	**2**	**3**
37. Other	**1**	**2**	**3**
Smart Pen Technology (SPT)			
38. SPT makes it difficult to record the conversations spoken for work purposes	**1**	**2**	**3**
39. Other	**1**	**2**	**3**
40. Smart phones use a bunch of data bundles	**1**	**2**	**3**
41. Smart phones change frequently and one always needs to buy newer models	**1**	**2**	**3**
42. Most smart phones are sensitive; they need to be handled with care	**1**	**2**	**3**
43. Smart phone is a complicated device	**1**	**2**	**3**
44. It is hard to connect to the internet using a smart phone especially if in the field	**1**	**2**	**3**
45. Other	**1**	**2**	**3**

SECTION D: PROMINENCE OF THE ICT TOOLS

46. Consider the way you used to do your extension work (using only your laptop and smart phone) before the Department of Agriculture introduced ESO and Smart Pen Technology so that now you have to use these four ICT tools together (Laptop, Smart phone, ESO and Smart

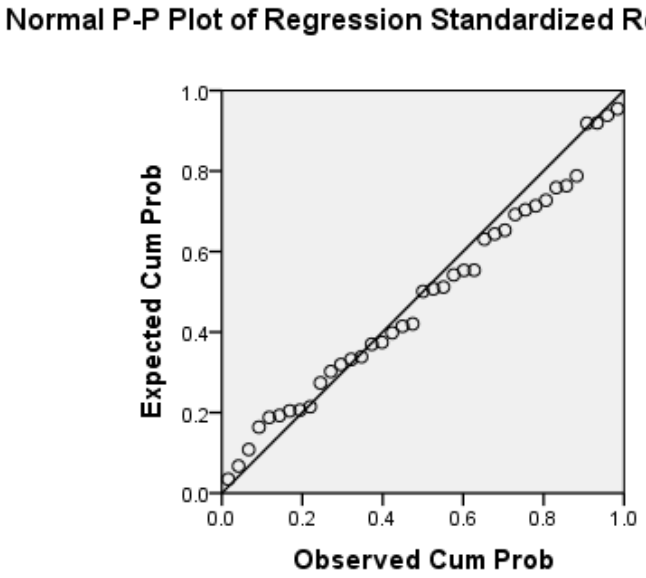
Pen Technology) **and** indicate whether you agree that the use of these four ICT tools together is better than using only the laptop and the smart phone for your extension work.

Circle your response

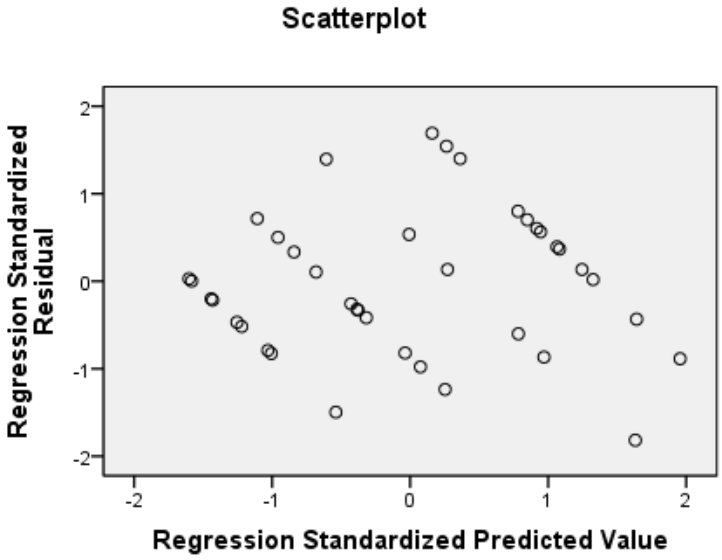
Strongly disagree	1
Disagree	2
Undecided	3
Agree	4
Strongly agree	5

THANK YOU FOR PARTICIPATING IN THIS STUDY!

APPENDIX 2: MULTIPLE REGRESSION FOR GOAL ACHIEVEMENT



APPENDIX 3: MULTIPLE REGRESSION FOR GOAL ACHIEVEMENT



APPENDIX 4: UNIVERSITY OF LIMPOPO ETHICAL CLEARANCE APPROVAL

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2212, Fax: (015) 268 2306, Email:noko.monene@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING: 03 November 2016

PROJECT NUMBER: TREC/228/2016: PG

PROJECT:

Title: Perceptions of agricultural extension practitioners towards the use of information and communication technology tools in Polokwane Local Agricultural Office, Limpopo Province

Researchers: Ms PP Mabena
Supervisor: Dr DB Afful
Co-Supervisor: Dr EM Zwane
School: Agriculture and Environmental Sciences
Degree: Masters in Agriculture

PROF TAB MASHEGO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:
i) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.**
ii) **The budget for the research will be considered separately from the protocol.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

APPENDIX 5: LETTER FROM LDARD GRANTING PERMISSION TO CONDUCT A STUDY IN THE MUNICIPALITY

RESTRICTED

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
AGRICULTURE AND RURAL DEVELOPMENT

Ref: 12R

Enquiries: R.R Ramugondo

29 October 2015

Ms. Phindile Precious Mabena

University of Limpopo

LIMPOPO PROVINCE

Re: Permission to conduct Research on Perceptions of Agricultural Extension Practitioners' towards the use of Information and Communication Technology tools in Polokwane Local Agricultural Office, Limpopo Province

1. Your letter dated 20/07/2015 of request for permission to do research has reference.
2. Kindly take note that your request to conduct Research in Capricorn District has been approved with the following conditions, you are required to visit the Office of the Senior Manager for Capricorn district before you start with your work. The department is prepared to embark on any activity which could assist our extension officers to see the benefit of using tools provided by the department to better the livelihoods of our farmers.
3. Kindly take note that you will be expected to hand over a copy of your final report to the Department for record purposes as well as for reporting. You may also be invited to share your findings in the Research Forum.
4. Hoping that you will find this in order.

Kind regards

Masindeni

29/10/2015

Dr. D.R Masindeni

Date

Acting Senior Manager- Research Services

67/69 Biccard Street, POLOKWANE, 0700, Private Bag X9487, Polokwane, 0700

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