

**UNIVERSITY OF KWAZULU-NATAL**

**THE PERSPECTIVES OF TECHNOLOGY IMPLEMENTERS  
ABOUT INFORMATION COMMUNICATION TECHNOLOGY  
DEPLOYMENT TO RURAL COMMUNITIES IN KWAZULU-NATAL**

By

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Submitted in fulfilment of  
The academic requirements for the degree of  
Master of Commerce in Information Systems and Technology

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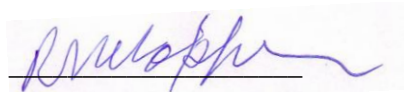
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December 2011

## **PERMISSION TO SUBMIT**

As Mr. N Jere's supervisor I certify that the conceptual content, ethical requirements, language usage and aesthetic presentation of his dissertation meets the standards set by the University of KwaZulu-Natal and hereby give him permission to submit his dissertation for examination.



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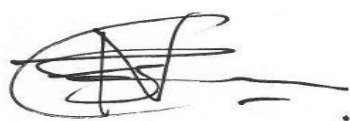
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## ABSTRACT

The purpose of this study was to explore the deployment of Information Communication Technology to rural communities of KwaZulu-Natal from the perspective of the State Information Technology Agency (SITA), the technology implementers of government. SITA's regional office in KwaZulu-Natal is relatively small, with a total of 52 employees who have a direct and indirect role to play with regards to ICT deployment.

A quantitative research methodology was utilised in this study. Data was gathered with the aid of a questionnaire. Fifty-two questionnaires were sent out to the targeted employees of SITA and forty-seven responses were received. The response rate was ninety percent.

The results of the survey revealed that sixty percent of respondents felt that rural communities in KwaZulu-Natal were not prepared to participate in e-government. When asked to indicate the importance of Information Communication Technology policy and regulatory frameworks that specifically address technology deployment to rural communities in KwaZulu-Natal, sixty percent of respondents acknowledged the importance. Over two thirds of respondents indicated that lack of infrastructure was a hindrance to technology deployment while less than one third did not know if this was a hindrance. The study also revealed that the main motivation for ICT deployment was social inclusion and to improve digital inclusiveness.

Based on the empirical evidence, the researcher recommends that government take these perspectives of the technology implementers into consideration when formulating Information Communication Technology policies and legislative frameworks that will be used as a basis for technology deployment to these rural communities. It is also recommended that government do more in terms of training and sensitizing technology implementers and end users, and developing support infrastructure, such as the electrification of rural communities in KwaZulu-Natal, in order to create an enabling environment for new ICT initiative deployment and to enable community members to be adequately prepared to participate in ICT initiatives such as e-governance, which was identified as a priority area. Due to the limitations of this study, particularly the fact that it is based on one province, KwaZulu-Natal, it is recommended that further research be carried out into deployment of ICT to rural communities.

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## ACKNOWLEDGEMENTS

I would like to express my sincere appreciation towards the following people and institutions:

My Lord and Almighty father for watching over me and giving me good health throughout this task and showering me with His unending wisdom.

Professor Rembrandt Klopper, for his never-ending guidance, patience and confidence in me throughout the course of my work, for being my beacon of hope when I was in doubt and for constant encouragement.

I wish to make special acknowledgement to my late mother, Susan Masuku Jere, for living my dream with me to further my education, and for her love, wisdom, patience and encouragement as I set out to pursue my studies. Mommy this is for you as you watch over me from the skies of heaven.

My younger brother, Kweze John Jere, for being very understanding, patient and encouraging as I undertook my studies.

My dad, John Jere, and elder brother, Max Jere.

My auntie, Monde Sifuniso, for her wisdom, guidance, and helping me walk the journey of my life.

Debbie Turrell, for editing my dissertation and catching all the grammatical errors that managed to slip by everybody else.

The State Information Technology Agency (SITA) for providing me unfettered access to information that assisted me in my research.

Finally, they say that one is only a giant because one is carried on the shoulders of others. I would therefore like to thank the discipline of Information Systems and Technology at the University of KwaZulu-Natal, and the colleagues and friends who assisted me in one way or another to complete my studies. The existence of this dissertation is an amazing achievement and it is due in no small part to help and cajoling from a large cast of friends and colleagues.

## **TERMS AND ABBREVIATIONS**

### **TERMS**

**Telecentre:** these are projects that are developed through government initiatives or through the private sector to provide services such as telephones, photocopying, faxing and information through internet connectivity.

**MPCC:** these are structures where the provision of services mainly by government is brought under a single roof. These centres provide access to information and other services such as training.

### **ABBREVIATIONS**

DOI: Diffusion of Innovation

GUSA: Global Universal Service Access

ICT: Information and Communication Technology

ICT4D: Information Communications Technology for development

MDGs: Millennium Development Goals

SITA: State Information Technology Agency

TAM: Technology Acceptance Model

TRA: Theory of Reasoned Action

TPB: Theory of Planned Behaviour

DPSA: The Department of Public Service and Administration

DOC: Department of Communication

DOPW: Department of Public Works

USAASA: Universal Service and Access Agency of South Africa

UTAUT: Unified Theory of Acceptance and Use of Technology

UNECA: United Nations Economic Commission for Africa

# **CHAPTER 1**

## **PROBLEM STATEMENTS AND RESEARCH DESIGN**

### **1.1 INTRODUCTION**

In this section the researcher states the problems and aims of the research with regard to the perspectives of technology implementers on Information Communication Technology (ICT) deployment to rural communities in KwaZulu-Natal, and presents the research design that will be implemented to find solutions to these problems in order to meet the aims of research.

### **1.2 PROBLEM STATEMENTS**

According to Statistics Canada (2008) ICT is referred to as the combination of various technologies such as Internet technologies, computing devices, microelectronics and electronic communication technologies. Due to the use of ICT in development, these technologies have now risen in their importance. According to the World Bank (2009), ICTs provide a positive impact on socio-economic development.

The opportunity to use Information Communication Technology depends on various criteria, such as geographical location, socio-economic factors, political factors, culture, race and gender, even though ICT is now seen as a development instrument that can create opportunities for the four billion poor people all over the world. Hewitt de Alcantara (2001) believes in the potential of ICT to increase universal access to information and provide opportunities for local content development for various societies. He believes ICT can contribute towards development and alleviating poverty in communities.

While a lot of attention is placed on understanding the perceptions held by people in rural communities in developing countries, little attention has been focused on the perceptions held by the people who implement these technologies. The perspectives held by these professionals, who are the individuals who plan and carry out the actual technology implementation projects, are very important and need to be taken into account in the processes of policy formulation by government.

This study investigates Information Communication Technology deployment to rural communities in KwaZulu-Natal through the State Information Technology Agency (SITA), who are the technology implementers for government. The research seeks to identify and understand the best technologies, how they should be implemented and what knowledge levels are required for

people in these communities to use ICT. The study also aims to investigate current policy on ICT and its alignment with the technology implementers from SITA. It is of vital importance that the sentiments of the technologists who are deploying these technologies be taken into consideration for ICT deployment to rural communities in KwaZulu-Natal to be successful.

**Problem 1: At present it is uncertain what the perspectives of technology implementers are that affect to access to Information Communication Technology in rural communities in KwaZulu-Natal province**

The most recent general household survey conducted in 2010 reports that 10.2% of the population in the Republic of South Africa has access to the Internet at home (Statistics SA, 2010a). The population of South Africa currently stands at 49 004 031, with a recorded population of 4 420 000 people having access to the Internet (CIA, 2011). This therefore translates into an average of only one person out of fourteen having access to Internet services. This limited access to Information Communication Technology is what motivated government to embark on various technology initiatives to provide access to information for all.

**Problem 2: At present the importance of Information Communication Technology policy frameworks with regard to technology deployments to rural communities of KwaZulu-Natal is unknown**

Information Communication Technology deployment and its universal access is supported by policy frameworks. The government of the Republic of South Africa has formulated various policies aimed at meeting South Africa's objective of universal access for all, regardless of social status or location, that is, urban, semi-urban or rural communities. Previous research shows that there is a relationship between deployment of technology initiatives and supporting policy framework.

**Problem 3: It is presently unknown how relevant the current Information Communication Technology in rural communities of KwaZulu-Natal are for community members**

Relevance of Information Communication Technology to rural communities of KwaZulu-Natal is an important element in the deployment of technology initiatives in South Africa. Sustainability of the ICT Initiatives such as the telecentres projects is affected by the relevance of the technology being deployed to those communities. Hence there may be a need to address this issue in order to increase use of ICT in rural communities of KwaZulu-Natal.

**Problem 4: It is presently unknown the factors that affect the successful deployment and use of Information Communication Technology in rural communities of KwaZulu-Natal are from the perspectives of technology implementers**

Other factors may exist that impact on the successful deployment of technology initiatives. These factors may range from social and economic factors to technical factors. The Department of Communication (DOC, 2011) has developed the Information Communication Technology Rural Development Strategy that is aimed at providing financial assistance for infrastructure development in rural areas. This may assist in ensuring access to ICT services, and the deployment of digital hubs as ICT centres.

The issue of information content may also be a factor worth considering for the successful deployment and sustainability of Information Communication Technology initiatives. Initiatives have to be set up to promote information that is relevant to those communities, thereby promoting the use of Information Communication Technologies, which are the tools that convey information to rural communities. Cairncross (2003) suggests that communities could view technological initiatives as having a negative impact on their traditional way of life that they have preserved over generations, and could consider exposure to Information Communication Technologies such as television or the Internet as threatening to dilute the cultural norms of that community, as there is a perception that the young especially will emulate what they are exposed to. Hence ICT initiatives may end up meeting resistance from these rural communities.

Education is also a factor that may be considered when determining the successful deployment of Information Communication Technology to rural communities and is worthy of further investigation. For one to be able to use ICT successfully, it is assumed that one needs to have a minimum level of educational exposure, bearing in mind that most forms of ICT are available in English. Rural communities are characterised by high levels of illiteracy (APF, 2008).

The aforementioned factors need to be examined, catalogued and brought to the attention of policy makers and technology implementers.

### **1.3 OBJECTIVES OF THE STUDY**

The study had the following objectives:

**Objective 1:**

To identify what the factors are that affect access to Information Communication Technology in KwaZulu-Natal province are.

**Objective 2:**

To evaluate to what extent Information Communication Technology policies are considered important in the deployment of ICT to rural communities in KwaZulu-Natal.

**Objective 3:**

To determine what present Information Communication Technologies in rural communities of KwaZulu-Natal are being used for.

**Objective 4:**

To investigate the issues that can affect the successful deployment of Information Communication Technology to rural communities of KwaZulu-Natal.

### **1.4 INTERIM RESEARCH QUESTIONS**

The intention of undertaking this study was for the purpose of answering the following questions that relate to the perspectives of Information Communication Technology implementers in the deployment of ICT to rural communities of KwaZulu-Natal:

**Question1:**

What are the factors that affect access to Information Communication Technology in rural communities of KwaZulu-Natal?

**Question 2:**

How important are Information Communication Technology policies with regard to deployment of technology initiatives to rural communities in KwaZulu-Natal?

**Question 3:**

What are the current Information Communication Technologies deployed in the rural communities of KwaZulu-Natal being used for?

**Question 4:**

How should Information Communication Technology be successfully deployed to rural communities of KwaZulu-Natal?

**1.5 RESEARCH DESIGN**

The research primarily involved a review of existing literature to determine which research problems have been addressed by other researchers. The researcher also reviewed literature on the most appropriate theoretical framework for evaluating the deployment of Information Communication Technology to rural communities in KwaZulu-Natal.

A structured questionnaire was used to collect a representative sample of respondents from SITA based both in Pietermaritzburg and Durban, these representing the KwaZulu-Natal province. Various statistical tests were applied (discussed in Chapter 4) on the data for validity and significance, such as Chi-square goodness of fit tests and Fisher's exact test due to small sample size.

The research undertaken followed a quantitative approach. It involved the construction of a questionnaire which consisted of check boxes and Likert-style questions. The questionnaire, together with the fieldwork protocols and analytical procedures, established an empirical basis for the results that were reported and also supported the quantitative nature of the research.

The research questions were assessed in relation to the data collected using the structured questionnaire, and in relation to the findings of the literature reviewed by the researcher.

Permission was sought from SITA to conduct the research, and was requested in writing by the researcher's supervisor.

In order to learn about the organisational structure and to ensure that the research targeted a representative sample of respondents, the researcher worked closely with the acting provincial manager, as he had the required knowledge regarding SITA staff necessary for providing responses to the research questions and objectives.



After SITA granted permission, data was collected by means of a structured questionnaire which was designed to gather respondents' perceptions of Information Communication Technology deployment to rural communities of KwaZulu-Natal. To maximize responses, the questionnaire was distributed both electronically and personally.

Appropriate statistical sampling techniques were applied (Gay & Airasian, 2003) to ensure that a representative sampling frame was identified and that the research results were valid.

### **1.5.1 Data analysis**

The statistical tool SPSS 19.0 was used to help analyse the data. Firstly, bar graphs and frequency tables were developed. This allowed the researcher develop an overview of the perspectives of respondents with respect to the deployment of Information Communication Technology to rural communities in KwaZulu-Natal. The descriptive statistics calculated also included the mean, mode, median and standard deviation. These descriptive statistics were used to provide a summary of the sampling frame. This type of analysis helped to identify potential trends in the data and/or whether the perceptions of respondents were skewed towards a particular response.

The Kolmogorov-Smirnov test was used to assess whether the data within each of the questions came from a Normal distribution or not. The reason for this was that certain statistical tests require the assumption of normality while others do not. The use of this test helped the researcher determine therefore whether to use parametric tests such as the independent sample t-test or non-parametric tests if the data did not come from a Normal distribution such as the Chi-square goodness of fit test and Mann-Whitney U tests.

Hypothesis testing was aided by the use of the Chi-square test. The purpose of conducting this test was to determine whether the perspectives of the technology implementers were key drivers in the successful deployment of Information Communication Technology initiatives to rural communities of KwaZulu-Natal or not, based on the distribution of the responses within the question categories. The one-sample t-test was also used for assessing if the mean scores were above or below the neutral value (3.5) for the questions that used the Likert-scale. This enabled us to ascertain any trends towards a particular category of choice. Furthermore, relevant cross-tabulations were examined and tested to ascertain whether a relationship existed between the two variables in the cross-tabulation. This was done by applying the Chi-square test of independence. Under the null hypothesis it was assumed that no relationship exists between variable 1 and variable 2 (i.e. the two variables are independent of each other). Cross-tabulations were performed with the demographic variables and the rest of the questions pertaining to the deployment of ICT in rural communities in KwaZulu-Natal.

The Mann-Whitney U test helped analyse if there was a significant difference in scores. This test was used on those questions with an ordinal response (Q1, Q3 – 6, Q10). Due to the sample sizes for the categories being so different and the fact that the data is not interval scale, it was better not to use the t-test, and this was further confirmed by the Kolmogorov-Smirnov test. For three or more categories the Kruskal-Wallis test was used (equivalent to ANOVA and used for Likertscale or ordinal data).

Validity and reliability determined the quality of the data and hence had a bearing on the integrity of the research methodology that was used. The integrity was determined by using the Cronbach's Alpha test for questions with the same scales. Consistency and reliability were considered to be good if a value of 0.7 or higher was obtained.

## **1.6 PREVIEW OF THE THESIS**

The following section presents a breakdown of the contents of each chapter in this thesis.

### **Chapter 1**

This chapter has presented the problem statements that the research study is based on. The chapter has advanced a rationale as to why the research study was carried out. The chapter has also outlined the research objectives and interim questions. Finally, the chapter has provided an outline of what the reader will encounter in the subsequent chapters.

### **Chapter 2**

This chapter will review related literature on the research problem by means of key terms to group schools of thought by various authors. Various theoretical frameworks are also discussed and the final framework that underpins this study is chosen. The researcher will also look at the extent to which fellow researchers have attempted to answer these interim research questions. At the end of the literature review the final research questions that the research will seek to answer are declared.

### **Chapter 3**

Methodological issues are presented in this chapter. It will also discuss the fieldwork undertaken during the study, the philosophy used, the approach, the strategy, the choice, the time horizon and the procedures followed. The chapter also discusses the questionnaire development, the sample design, sampling frame and ethical issues. The chapter also discusses the use of SPSS 19.0 as the analytical tool.

## **Chapter 4**

The researcher in this chapter will present the results of the fieldwork conducted and an analysis of the data, and will present the data using graphs and tables. The chapter presents the findings based on the application of the tests mentioned under section 1.4.3 (Data analysis) in Chapter 1. The total number of questionnaires returned was 47 out of an identified population of 52 SITA employees in SITA KwaZulu-Natal offices. A discussion then follows regarding the results of the analysis and the theoretical framework used to underpin the study.

## **Chapter 5**

This chapter will discuss the findings in terms of the literature review and will identify the limitations of the study. It also will seek to provide answers to the critical questions that were proposed in Chapter 1. Finally, the chapter will provide recommendations based on these conclusions.

## **1.7 CONCLUSION**

This chapter has presented the problem statements for the study, and the interim research questions that the researcher seeks to answer using literature and empirical evidence. It also has provided a brief overview of the tests to be applied and a roadmap for this empirical study. In the next chapter the researcher presents a review of literature regarding the research problems discussed in this section. In the literature review the researcher will discuss key terms such as deployment of Information Communication Technology and development in rural communities. Chapter 2 will also discuss the theoretical framework that underpins this study.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This literature review aims to bring to light pertinent issues associated with the effective deployment of Information Communication Technology at the community level. To accomplish this, the researcher discusses various issues that affect the success of the deployment of ICT, such as poverty, development and national policy. In order to examine the integration of ICT with developmental agendas, the researcher discusses four major perspectives on the deployment and implementation of ICT and how they are related to development. Providing universal access to all people is the main reason for ICT deployment to rural communities in South Africa.

These technologies are increasingly being recognised as catalysts for social and economic development. Torero & Braun (2006) argue that Information and Communication Technology has increased in importance due to its ability to have a positive impact on poverty.

A number of Information Communication Technology initiatives in the developing countries of Africa and Asia have attempted to address social, economic, technical, cultural, rural and community developmental issues. These initiatives vary from telecentres to multipurpose community centres and information kiosks (Harris, 2005), situated in rural communities. Unfortunately, many ICT initiatives at the community level have not achieved the expected level of successful implementation or sustainability.

#### **2.2 THE CONCEPT OF INFORMATION COMMUNICATION TECHNOLOGY AND ITS IMPACT ON POVERTY**

Information Communication Technology is increasingly being considered as an important aspect when it comes to development and poverty alleviation (Statistics SA, 2010c). Based on their impact “Information technology dramatically increases the amount and timeliness of information available to economic agents — and the productivity of processes to organise, process, communicate, store, and retrieve information . . . [and this] has major implications for developing countries, as producers and users of this technology” (Hanna, 1994).

According to the Department of Education (2004), Information Communication Technology deployment initiatives have had a huge impact on communities all over the world. ICT has greatly improved the accessibility and success of development initiatives, has improved the delivery of services to citizens, and has improved citizen participation in governance. The importance of ICT is so much so that it has been included as part of the millennium development goals (MDGs), and is stipulated under target 18 of goal 8 that focuses on providing access to Information Communication Technologies (Statistics SA, 2010c). Rambowan, Lubbe & Klopper (2005) classify the benefits of access to electronic information for a community as possessing either private or public elements. The private benefits of access are measured by the utility received by individuals as a result of connecting to the network (e.g. to facilitate business transactions, to minimise transport costs and to contact family and friends) while the public benefit of access to electronic information to a community is the ability to improve living standards in communities by providing important commercial, social and educational benefits.

For the purposes of this literature review it is important to define ICT. The United Nations Economic Commission for Africa (UNECA) defines ICT as consisting of a variety of technologies and services such as computing equipment, telecommunication and broadcasting equipment, resource centres, networks and the Internet (UNECA, 1999). This is a rather open definition, but the European Commission gives a more authoritative definition, according to which ICT consists of

“a wide range of services, applications and technologies, using various types of equipment and software, often running over telecommunications networks. The European Commission sums it up all adequately by stating that Information Communication Technology are enabling and facilitating technologies. Individuals, community groups, business or government departments with access to affordable communications and computers can use them to save time and money and improve the quality of their work or home lives” (European Commission, 2001:36).

The Department of Education in its White Paper on e-education offers a more simplified definition of Information Communication Technology as a term used for “a combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge”.

### **2.2.1 The relationship between Information Communication Technology and poverty**

Pigato (2001) analyses the relationship between Information Communication Technology and poverty. The research examines patterns of utilisation, ownership and the affordability of ICT in countries in sub-Saharan Africa and South Asia. It goes further to recommend the use of ICT in reducing poverty. Pigato (2001) identifies countries in the sub-Saharan region of Africa and South Asia as having the lowest rate of ICT access, and identifies the urban/rural and rich/poor divides within these countries. The author highlights the use of ICT as a vehicle for development, and examines the higher success rates in the deployment of private initiatives compared to government ones.

### **2.2.2 Information Communication Technology and collective access points**

Adebgola (1998) states that special measures ought to be taken when deploying Information Communication Technology to rural areas and that without the creation of a favourable environment for the deployment of ICT the digital divide will only worsen. Adebgola suggests the use of telecentres in the context of poor or non-existent infrastructure. Butcher (1998) focuses on development by emphasising education. The author states that community centres should be used as a way to maximise the benefits of ICT. This viewpoint is shared by other authors such as Benjamin, Stavrou, Burton & McCarthy (2000). Poor infrastructure is a critical impediment in providing individual households in rural areas with access to information. As it is not feasible to provide all households in these “under-serviced areas” with universal access, research has suggested the use of community access points such as telecentres and multi-purpose community centres.

Ernberg (1997) investigates the possibility of achieving universal access through Multipurpose Community Telecentres and their viability for business. This was before the use of telecentres became common place in developing countries.

Anderson (1999) argues that there has been a lack of guidelines for Information Communication Technology utilization due to the rush to connect developing countries. The author advances the argument that processes should be the focal point and not the technology used to make those processes work. Also the author argues that it is because of such haphazard deployments that there is a lack of documentary reflection on past initiatives and their performance.

### **2.2.3 Old Information Communication Technology**

Over the years since its discovery, there have been numerous authors who have continued to advocate the benefits of the radio and its potential to spread information and educate the poor in rural communities. Kenny (2002) is one such author who has continued to argue the benefits of radio. The biggest disadvantage of the use of radio is that it only provides a one-way type of communication and does not allow users to participate by giving their opinion.

The telephone is another form of ICT that has also enjoyed huge attention as a tool to spread information and provide connectivity (Canning, 2000).

### **2.2.4 New Information Communication Technology**

The advancement of technology has seen the advent of new ICTs that now are computer-based. The Internet and mobile phones have brought about many benefits. The benefits these technologies bring are discussed by Kling (1996). The author identifies benefits such as cost savings, improved efficiency and increased productivity. These new technologies have also allowed communities to use them directly without having to start from the older technology, which in most cases is more expensive, a concept known as leapfrogging. This offers a reason in part as to why the mobile phone, which is a relatively new technology, is more widespread than the older fixed-line telephones in rural areas (CIA, 2011). The development of underwater fibre-optic cables connecting continents and regions of the world has also contributed to the diffusion of Information Communication Technologies such as the Internet.

## **2.3 ADOPTION AND DEPLOYMENT OF INFORMATION COMMUNICATION TECHNOLOGY IN DEVELOPING COUNTRIES**

### **2.3.1 The digital divide**

James (2007:284) defines the digital divide as “the differential extent to which rich countries and poor countries benefit from various forms of IT”. The author refers to the technological differences that exist. These differences are not restricted to countries but can exist even within a country, such as between urban and rural areas. Infrastructural issues such as telephone lines are identified (James, 2007).

Langa, Zakes, Conradie & Roberts (2006) explain that South Africa ranks very highly in terms of inequality amongst its people, while Pressly (2009) agrees with this assertion by stating that South Africa can be considered to be the country that has the most unequal spread of economic wealth distribution amongst its people compared to other countries in the world. South

Africa's Gini coefficient is 0.679, the highest in the world ratings (Pressly 2009). The Gini coefficient is a number from 0 to 1 that represents income equality. 0 means that everyone has the same income and 1 is a situation where one person has all the income and everyone else has zero. Blignaut (2009) states that socio-economic factors form a large part of one's ability to access the Internet. Computing equipment, employment status, income, geographical location, education, race and culture have been identified as factors that could lead to differences in Information Communication Technology access within a country (Billon, Margarita, Marco, & Lera-Lopez, 2009; bridges.org, 2001; Fuchs, 2009).

Van (2005) argues that Information Communication Technology access is determined by inherent factors, such as age, ethnicity and personality or by external factors such as influence from society or economic ability. It was through using some of these factors (particularly age and gender) that the researcher aimed to apply the Diffusion of Innovation (DOI) model to assist in assessing the deployment strategies for ICT to rural communities in KwaZulu-Natal.

### **2.3.2 Digital inclusiveness**

Likkanen (2003) views digital inclusiveness as being able to use Information Communication Technology to bring together all people, irrespective of their social and economic status through the provision of information to everyone.

The McConnell Institute (2001) believes that government has a responsibility to create an e-society by providing access to technology that will bridge the digital divide. The McConnell Institute states that e-readiness can be assessed by the level of seriousness with which governments declare this a national priority and by the ability of governments to create quality partnership with business leaders.

Quaynor (2002) states that the e-Africa agenda that is being promoted by the e-Africa Commission on Africa's Digital Rights, is a programme that can facilitate the idea of digital inclusiveness. Quaynor identifies rural communities as part of a group of people he calls "at risk groups" that lack Information Communication Technology, and discusses how the e-Africa agenda includes the role of developing initiatives to provide access to ICT for these marginalised groups.

Guerhazi (2003) proposes a transformation of the manner in which building access to information technology is carried out in order to narrow the digital divide in underdeveloped countries in southern Africa. Guerhazi identifies the unequal distribution of global telecommunication and information resources as a source of the digital divide, and supports the newly proposed Global Universal Service Access (GUSA) regime as a useful means of deploying Information



Communication Technology in developing countries. GUSA is an international support mechanism to ensure universal access to information and communication resources, and targets countries and areas that are independently unable under normal market conditions to reach these goals. Guermazi argues that GUSA involves access to both traditional telecommunications and newer technologies, and that in this era of convergence of networks and services, developing countries cannot afford to focus on the universal approach of the past. She also identifies policy frameworks as being inadequate to respond to the enormous technological needs of the developing countries. Guermazi (2003) argues that the legal foundations of GUSA are based on a human rights approach, that policy should therefore treat development using ICT as a human right, and that facilitating access to education, health and political participation is crucial in achieving these rights.

### **2.3.3 Diffusion Of Innovation**

This theory investigates factors that influence the rate of diffusion. It is considered to be the methods by which technological innovations are deployed to an environment. Rogers (1983) identifies a number of determinants used in the diffusion of an innovation that are necessary before a society can adopt and successfully deploy technology. The diffusion of innovation (DOI) theory is discussed further in sections 2.15.5 and 2.16.1 of this chapter.

### **2.3.4 Information Communication Technology and development**

Rambowan, et al., (2005) assert that some of the potential benefits of universal access to Information Communication Technology could include the following:

- Significantly increasing the speed of achieving development;
- Impacting positively on the reduction of poverty globally;
- Providing users with worldwide opportunities to buy and sell goods and services;
- Providing an opportunity for people to obtain information and participate in government decision making.

According to Negroponte, the provision of access to Information Communication Technology services is currently seen as key to accelerating development in a community.

The literature on ICT and development is divided into two schools of thought. There is an optimistic viewpoint that considers ICT as a medium through which development can be achieved. Public access points such as telecentres provide an opportunity for the communities in which they are deployed to access information that without telecentres would be very difficult to gather. These telecentres also bring with them other benefits such as telemedicine, improved

education by allowing students to access a vast array of information, and also economic benefits such as providing market prices for goods. The second viewpoint is a pessimistic viewpoint that shows little confidence in the ability of ICT to lead to national development in developing countries. Researchers from this school of thought base their opinion on the underlying factors of poverty, poor telecommunication infrastructure and lack of Information Technology investment in developing countries.

Heeks (2005a) proposes that in order to implement ICT projects successfully, an Information Chain model should be considered. This model provides a mechanism to access data from the appropriate sources, assess the data relevance, apply the relevant data to a specific decision and act upon the decision.

Heeks (2005b) identifies four different types of resources essential for humans to process information. These are data, economic, social and action resources. Heeks (2005b) emphasises the necessity of following the entire information chain in Information Communication Technology-related initiatives in order to establish access to ICT and facilitate development.

Measuring the benefits of ICT initiatives is not an easy task, but despite the various challenges identified in the deployment of ICT, these initiatives have brought various developments to the communities in which they have been deployed. Success stories range from examples such as Mozambique, where the provision of Internet access (Beira and Tete telecentres) has provided access to improved basic services such as e-governance, e-health and e-banking (Etta & Wamahiu, 2003). However, despite the availability of Internet access there is no tangible evidence of e-commerce activity taking place in Beira (Etta & Wamahiu, 2003). It is also important to analyse critically the impact of telecentres in their communities based on the specific goals they intend to achieve. The table below shows an analysis of developmental goals extracted from policies against the progress achieved by two telecentres in KwaZulu-Natal, namely Khayelitsha and Bhamshela (Parkinson, 2005). This analytical approach provides a clearer analysis of the developmental impact of ICT initiatives, as different communities have different needs.

Goal	Progress in Case Study Communities
Universal access to telecom service, redressing historic inequalities	<b>Khayelitsha:</b> Good progress in telephone: combination of public and private phone services accommodates over 90% of the population. Internet penetration and use are extremely limited.
	<b>Bhamshela:</b> Phone accessibility has improved greatly, although cost and geography remain barriers. Access to other ICTs remains low because of limited awareness, high costs and no clear relevance to most people's needs.
Delivery of government services including social services such as e-health and e-education	<b>Khayelitsha:</b> Government social services have improved greatly in Khayelitsha, although ICTs are not an important delivery mechanism. There is one public information terminal (PIT), reportedly underutilised.
	<b>Bhamshela:</b> The MPCC is delivering a range of locally relevant government services, although ICT use is not a central component of delivery at this time.
Improvement of communication between government and citizens	<b>Khayelitsha:</b> This has not occurred via the ICT services reviewed in this research. If effective, the PIT provides a one-way (government-to-people) flow of information. No evident demand for this from the community.
	<b>Bhamshela:</b> The multi-purpose community centre was too new to assess but there is potential for ICTs to support its operations.
Democratisation, diversification of media and expression	<b>Khayelitsha:</b> Radio Zibonele, the local community radio station, is widely listened to and appreciated. Some computer secretarial services offered limited desktop publishing capacity; this was used to produce items such as funeral and wedding programmes.
	<b>Bhamshela:</b> None of the ICT-related facilities in Bhamshela are related to media or local information production.
Supporting local development through information provision	<b>Khayelitsha:</b> NGOs were doing this in the context of a larger advocacy role. However, this was not linked to their ICT services. Other NGO activities such as the LoveLife social marketing campaign provided information targeted at social change in the face of AIDS. Links between these and ICT access were not evident in the case studies.
	<b>Bhamshela:</b> The MPCC has this as part of its mandate.
Supporting SMMEs and job development	<b>Khayelitsha:</b> Public phone services were a strong area of entrepreneurial activity. Selling connection time and cell phone accessories, as well as repairing cell phones, radios and TVs, was also popular small-enterprise activities. Since there are relatively few job opportunities within Khayelitsha, the amount of activity in this sector appeared significant.
	<b>Bhamshela:</b> The Department of Labour has a presence at the MPCC and offers related services. The Vodacom container

	provided two local jobs, and the computer training at the telecentre had helped at least three local people find work. Paid and volunteer positions at the telecentre also allowed several people to gain experience and improve their employability, although the centre itself proved a poor employer. Other ICT services such as fax and photocopying nominally offer business support services, although there was little local demand for these.
Creating a South African information society	<b>Khayelitsha:</b> Most residents use radio and phone but have little awareness of or opportunity to access digital ICTs such as computers and the Internet. People see these digital ICTs as important for increasing their job prospects.
	<b>Bhamshela:</b> Phone services have eased communication in and out of Bhamshela considerably. Other ICTs are not part of the daily life of the vast majority. Interest in computers is widespread despite low awareness, both for employment opportunities and because people understand them as a part of the modern world.

**Table 2.1 Development goals versus actual progress (Source: Parkinson, 2005)**

A success example closer to home is the Inhlazuka Thusong Service Centre. Information Communication Technology services were introduced with the support of a partnership between local decision makers and the University of KwaZulu-Natal's information technology experts.

Integral to the deployment of ICT initiatives to rural communities is the concept of development. For the purposes of this study the researcher refers to development as initiatives taken to improve standards of living. Gillwald (2005) associates rural development with improving the standard of living, the provision of health services, good education, skills training and employment.

ICT initiatives aid development by providing the much required communication channels and a vehicle to exchange information. With a reliable communications channel available, development in sectors like tourism can flourish as people are able to communicate with previously isolated communities to obtain the required information (eBario, 1998). Ursula Schaefer-Preuss, the Asian Development Bank vice president, acknowledged in a speech at the ICT Week, Manila, Philippines on 15 April 2010, that the bank had recognised the impact of ICT on the growth of the economy. The bank further rendered support for projects such as distance learning for the skills development of rural community members, for telemedicine and for agriculture information services in order to provide crop prices, weather statistics, and information

on farming techniques that lead to improved financial benefits for rural communities (Asia Development Bank, 2010).

Mulonga (2006) argues that the provision of ICT infrastructure is just the beginning and has little impact if the community of interest is not financially capable of accessing the services the initiative provides. Access is also seen from the perspective of physically being able to use the technology. KwaZulu-Natal province is very sparsely populated, and this too brings another challenge as these initiatives may not be physically accessible to the rural communities who normally travel on foot. This means that people have to walk long distances to access these services, unlike in urban areas that are more densely populated (Mulonga, 2006). Siochru & Girrard (2005) argue that for significant development to take place using ICT, rural communities need to show ownership of the initiatives. The authors state that this is the main ingredient of sustainability. Quebral (1988) observes that people having the responsibility to make decisions over their own affairs promotes the aspect of ownership. This is a major critical success factor when initiatives are deployed, and indicates the use of a participatory or bottom-up approach to deployment of developmental initiatives.

Bridges.org (2005) defines e-readiness as the degree to which a country is able to amalgamate with other digital societies. South Africa is ranked thirty-ninth in the world for e-readiness, making it the most e-ready society in Africa (Economic Intelligence Unit, 2009), and is the leading country in Asia and Africa with regard to the legal environment. This suggests that the country is doing something right in its policy and framework area in terms of ICT in the country. Even if the country deserves accolades for its attempts at creating a digitally inclusive environment, this e-readiness status is not a reflection of the equal distribution nationally of the capacity to deploy ICT. This status or capacity for ICT deployment usually refers to urban areas being ready. The problem arises when it comes to rural communities where ICT is usually expensive due to poor or non-existent infrastructure. It is this that poses a challenge when it comes to providing efficient communication channels and the ability to exchange information, and it is this point that the technology pessimists identify as the fundamental flaw in claims that ICT is a conduit for development.

## **2.4 CHALLENGES IN RURAL INFORMATION COMMUNICATIONS TECHNOLOGY DEPLOYMENT**

The trend towards digital societies has fuelled the motivation to incorporate rural communities into this global digital family. The deployment of ICT to rural communities brings with it various challenges (Gumucio-Dagron, 2003). Etta & Wamahiu (2003) explain that it is impor-

tant to align the needs of these communities with the correct technology to address those needs, as inappropriate technologies are sometimes deployed to rural communities if this alignment does not occur. This viewpoint is shared by Gumucio-Dagron (2003) and Quebral (1988), and this lack of alignment has been identified as one of the stumbling blocks to the uptake and sustainability of ICT (Etta & Wamahiu, 2003). Compounding this challenge is the barrier to ICT due to the costs that the primarily low-income rural communities cannot afford (Etta & Wamahiu, 2003).

Gumucio-Dagron (2003) also identifies a major flaw in the development of ICT initiatives. Most technology initiatives lack the involvement of the community members for whom these developments are meant. This design flaw eventually leads to the failure of these projects. This can be seen as a common trend in most failed telecentre projects. Parkinson (2005) explains that it is important to understand the needs of the community and provide services that have a direct impact on those needs. Evidence of this line of thought is seen in table 2.2, which shows the specific goals set up in various policies and a comparison of how two telecentres in KwaZulu-Natal performed on each. Chapman & Slaymaker (2004) also explain that ICT initiatives are not sustainable and eventually fail due to the lack of involvement of community members who are the beneficiaries of the development. This is a general project management concept, as when developing a project it is vital to consider user involvement. This is the reason for the popularity of techniques such as prototyping as compared to the traditional structured methods.

One of the reasons that some ICT initiatives have been successfully deployed in communities is that extensive needs assessments have been carried out prior to the deployment. This can be seen in initiatives such as the eBario project (eBario, 1998). Gumucio-Dagron (2003) concurs that the lack of research on needs assessment accounts for some of the failures of ICT initiatives, and states that community involvement helps build ownership and hence increases the chances of these initiatives being sustainable.

Another important factor that Emdon (2003) raises is the concept of liberalisation. Emdon argues that the poor quality of service and the cost of using the Internet are linked to the failure to liberalise the telecommunications industry, thus leading to a lack of competition and the existing telecommunications organisations taking advantage of users by charging high rates. Hodge (2000) argues that South Africa has attempted to liberalise the telecommunication industry but only partially, thereby limiting the benefits of liberalisation. The author states that supplier foreign investment has been limited to a cumulative maximum of 30%. The Department of Home Affairs has also been a limiting point with regards to the inflow of personnel to

set up firms in South Africa and it is at the discretion of the government to prevent companies that are more than 25% owned by foreigners from raising capital locally. It is due to these limitations that the country is considered partially liberalised. The main benefit of liberalisation is the competitive environment that brings about lower prices to customers and better quality of service. The approach undertaken by South Africa therefore limits the benefits it receives from competition as it is controlled. Some of the reasons advanced for limiting liberalisation were that the parastatal company Telkom would not survive in a competitive environment and that technology rollout to under-serviced areas would be reduced, hence the granting of a monopoly licence to the service provider (Hodge, 2000).

Lack of local content is another challenge that can negatively affect the deployment of ICT. Gumuci-Dagron (2003) encourages the development of local content that is of interest to the communities at which the deployment is aimed. An example of this concept in implementation is the village knowledge centres in Chennai, India.

## 2.5 DEVELOPMENT OF INFORMATION COMMUNICATION TECHNOLOGY IN KWAZULU-NATAL

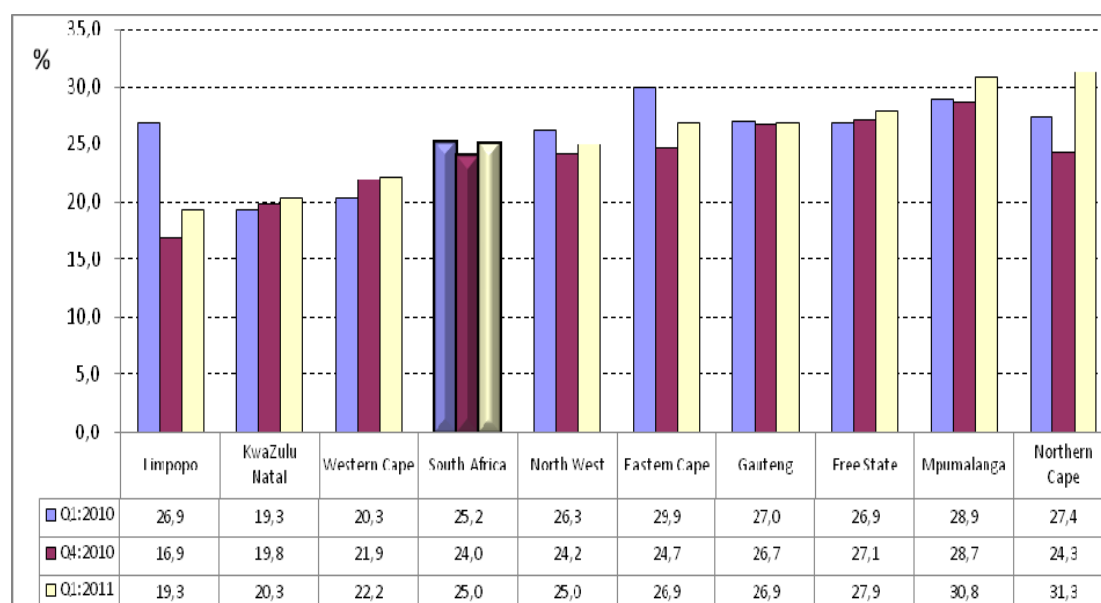


**Figure 1: Municipal map of the province of KZN**  
(Source: GIS Unit, KZN Department of Health)

Figure 1 above shows KwaZulu-Natal province and its district municipalities. The province has a population of around 10,65 million people (Statistics SA, 2010b), with around 3 million



living in the eThekweni metropolitan area and the remaining 7 million spread across the ten district municipalities, namely Ugu (south coast), Sisonke and uMgungundlovu (south inland), uThukela and uMzinyathi (Drakensberg midlands), Amajuba and Zululand (north inland), and uMkhanyakude, uThungulu and King Shaka districts (north coast). In this province approximately 3,52 million people are younger than 15 years. This is approximately 21,3% of the total South African population in this age group, and is only smaller in comparison to Gauteng province.



**Figure 2: Quarterly Labour Force Survey, Quarter 1, 2011 (Source: StatsSA)**

The above figure shows the quarterly unemployment figures by province. KwaZulu-Natal province as of the first quarter of 2011 had an unemployment rate that stood at just above 20%. It can be seen that the province has the second lowest unemployment levels in the country. Much as this is a positive thing it is important to keep in mind that most of the province is rural and this might account for the low unemployment rates. In KwaZulu-Natal province more than half the provincial population (57.2%) lives in the four largest magisterial districts, namely eThekweni, uMgungundlovu, Zululand and uThungulu, which have populations of over 800 000 people each (Department of Economic Development). Of these, uThungulu incorporates South Africa's largest harbour, Richards Bay, and manufacturing activities (metals, metal products and equipment, chemical products, wood and paper) are the largest contributors to the local economy. Zululand, with its sugar and timber plantations, and game and nature reserves, is largely an agricultural district and has the second highest unemployment rate at 50%. uMgungundlovu includes the provincial capital of Pietermaritzburg and the Southern Drakensburg tourism industry, and has the second lowest unemployment rate at

21.2%. Based on an economic perspective, all have limited infrastructure and resources for the deployment of innovations for human capital development, for ICT infrastructure and for social development.

It is from this back ground that Gumucio-Dagron (2003) asserts that rural communities would view ICT initiatives as a luxury, due to the fact that they are faced with more critical problems in their livelihoods, such as food shortages, unemployment, lack of electricity supply and lack of clean drinking water. This mind-set therefore creates a barrier to technology deployment to rural communities. Maslow (1954) supports this perception that there are other more important needs to satisfy before one can consider ICT in rural areas of the province.

## **2.6 INFORMATION COMMUNICATIONS TECHNOLOGY IN SOUTH AFRICA**

The South African government has emphasised the development of an Information Communication Technology sector through the formation of national ICT strategies that address ICT penetration and adoption, particularly in under-served communities. As previously stated, South Africa is ranked at position 54 of Internet users in the world (CIA, 2011). In 2001 South African Internet access was mainly concentrated in urban areas. Demographically, the ethnicity of people who had access to Internet was largely white people with a good education background (Jensen, 2001). Over the years studies have shown improvements with regard to access to Internet in rural areas, although generic barriers such as the high cost of equipment, and the lack of skills and education necessary to access the services that ICT provides still exist (Odendaal, Nancy, Duminy, & Saunders, 2008; Billon, et al., 2009).

### **2.6.1 Information Communication Technology and policy**

The main pillar for ensuring that the South African government provides e-government services to all is the use of legislative and policy frameworks that promote Information Communication Technology deployment to communities in need of these services. The United Nations Commission for Science and Technology for Development is in agreement with this viewpoint and in a study of almost 90 countries the results singled out leadership and organisational reform as the factors that influence ICT diffusion (Wilson, 1999). National policies on the liberalisation of the telecommunications sector, and governments' commitment towards technology deployment and creating a digitally inclusive government have an impact on ICT diffusion. Liberalisation of the telecommunications sector opens markets up to competition that in most cases benefits the users, as companies begin to compete for the market share that leads to reduced costs of accessing the services (one of the main drivers of Internet diffusion) and better quality (Gibbs, Kraemer & Dedrick, 2002). The South African govern-

ment's response to this need to liberalise the telecommunications sector can be seen from the 2004 policy directives that attempt to ensure that this takes place (DOC).

What is most interesting is how cultural values are reflected in a country's regulatory framework. Examples of this trend are analyses of countries like China, which has focused on content regulation, reflecting their values of social control, or Germany, which has focused more on privacy and consumer protection, reflecting values of individual rights (Gibbs et al., 2002). Cultural values could be a possible explanation for why in South Africa the government has focused on policies that promote universal access for all and make information readily available for people, thereby attempting to create a digitally inclusive society (DPSA 2001).

A report produced from a study of 67 cases that contributed to the European strategic guidelines for rural development, identified policy aspects as one of the four areas of focus for the rural deployment of technologies. The study revealed that one of the challenges posed by Information Communication Technology policies is the risk that a number of policy frameworks are not specific on their aims but rather adopt a more general approach. This creates a problem in that policies end up lacking focus (D.G. AGRI, 1997). The report gives an example of Finland as a one of the few countries with ICT policies that are clear and well defined. Another challenge revealed is the ability to create consistency and to synergise various ICT policies developed at different levels, such as regional, national and provincial initiatives (D.G. AGRI, 1997). The challenges identified show that as much as policy frameworks are crucial in the deployment of ICT, it is equally as important for policy makers to take the above issues into consideration in order to formulate workable solutions.

### **2.6.2 The South African context**

The Republic of South Africa ranks at position 54 of Internet users on the world stage. The country boasts 4.225 million fixed-line users and 50.372 million mobile phone users as of 2010 (CIA, 2011). These statistics place the country in first place in Africa. But as much as the country boasts such impressive statistics from an African perspective, these technologies mostly have an impact on urban dwellers and are not evenly distributed to the rural areas. In an attempt to improve the standard of living for its people, the government of South Africa has made funds available meant for rural Information Technology initiatives (Singh, 2010). A worrying trend has been the diversion of resources meant for such initiatives towards what are considered more pressing problems, such as electrification projects (Burger, 2009). The government has in a way made the first step towards creating a digitally inclusive society by providing policy and regulatory frameworks. There is a need to apportion responsibility equally,

and provincial governments also need to accept some portion of this responsibility, as they are responsible for the disbursement of funding towards Information Communication Technology initiatives (DPSA, 2001). Provincial Growth and Development Strategies can be used to fund ICT initiatives and municipalities can be used to take these services to the people. Government departments such as the Department of Cooperative Government and Traditional Affairs can provide strategic assistance in managing the various municipalities engaged in the deployment of ICT in order to provide services that in turn empower rural community members (DOC). Acacia (2000) is of the view that the value that ICT brings to rural communities and how it can benefit the community members should be emphasised, because without this happening, community members feel they have more pressing needs such as financial sustainability and do not realise that these technologies can assist them in their quest for economic emancipation.

### **2.6.3 Information Communications Technology for development in South Africa**

Information Communication Development for development (ICT4D) has evolved over three periods (Kleine & Unwin 2009). ICT4D 1.0, this is the period from the 1950s to the early 1990s where emphasis was placed on data processing and back office operations. The period from the 1990s to the 2000s saw a shift to a more user centred approach with emphasis being on technology initiatives in developing countries (Kleine & Unwin 2009). This influence was also partly due to the advent of the millennium development goals (MDGs). The MDGs in turn encouraged investment in the sector. Typical initiatives were the telecentre approach to providing access to information and various government services. These initiatives are discussed in detail in section 2.7. The period from the 2000s to date has seen the advent of ICT4D 2.0 (Heeks, 2009a) whose focus now has shifted from the telecentre approach towards the use of mobile devices to provide access to information such as the mobile phone. ICT4D 2.0 places emphasis on the under serviced communities being the solution providers and generators of their own information not as mere consumers of information. ICT4D is a new concept and is still being defined, for the purposes of this research the researcher focuses more on ICT4D 1.0 related technology initiatives.

The government has attempted to bridge the digital divide through its department of public service and administration (DPSA). This department formulated a ten-year plan for e-government deployment with the aim of providing universal access to Information Communication Technology for all by 2011. Much as it is evident that this goal has not been met completely, it was a welcome move and a lot of positive developments have been seen because of the policy. An example of the results of this policy is the South African Government Online website ([www.gov.za](http://www.gov.za)), which seeks to provide a variety of information about the government

to its citizens. This is a clear sign of government's attempt to bring to fruition its vision of providing universal access. This attempt is also seen by the various government departments that have developed their own websites that make available information that is considered to be of interest to the general citizenry, such as annual reports, and various policies and pieces of legislation. Government information is therefore increasingly democratised and is becoming more widely available, even to rural communities that never had access to it previously (DPSA, 2001).

This initiative by government of attempting to increase citizen participation by providing e-governance services is seen as a welcome initiative by many. E-governance allows not only the ability to transmit information at low costs but also makes communication with people all over the world possible (Crede & Mansell, 1998). Cognisance also has to be taken of the fact that e-government initiatives come with their own challenges. Ndou (2004) identifies the challenges to be Information Communication Technology infrastructure, policy frameworks and skills availability, to name but a few. It is because of these challenges that it is not enough merely to provide information. These initiatives need to be followed up by providing uptake activities such as training and sensitisation workshops so as to allow people to understand the initiatives and provide them with the skills to access the services.

Taking Information Communication Technology initiatives to rural communities is only the first stage. There is also the very important issue of sustainability. Sustainability poses a big challenge and can be seen in failed projects such as the telecentre in Mankweng, situated in rural Limpopo province. The centre provided typing services but failed as a result of not addressing the problem of sustainability (Maleka, 2003). The vandalism of this centre by community members showed a lack of appreciation of what it offered and pointed to a lack of proper preparation in the deployment process. It is for this reason that sensitisation workshops are encouraged to assist in making the community aware of the benefits these centres bring. Maleka (2003) explains that one of the reasons for the community's actions was that they were protesting for better health services rather than a telecentre. This view of the centre as not being an immediate need like health services supports the viewpoint expounded in Maslow's theory.

Gillwald (2005) argues that infrastructure costs to deploy Information Communication Technology initiatives such as telecentres is one of the main reasons why the rate of deployment of these technologies is relatively low compared to other technologies such as the mobile phone. The penetration of mobile phones in rural communities has increased greatly compared to older technologies such as fixed-line phones (CIA, 2011). This can be attributed to the con-

cept of leapfrogging, a concept used in development theory where older technologies are skipped and newer ones are used without using the old ones. Gumucio-Dagron (2003) follows the same line of thought by explaining that a reason for this leapfrogging in technology is that rural communities are usually given older technologies that end up not having any relevance in those environments and hence those people do not see the need for them. This results in situations like the one experienced in Mankweng. Gillwald (2005) asserts that Internet access is less accessible to rural communities compared with mobile phones and that only 5.7% of the rural population has an email address. She further explains that Internet penetration is poor due to the cost factor associated with it both during initial setup and also in order to use it. It is this economic factor associated with ICT that widens the digital divide between rural and urban communities (Gillwald, 2005). Ali & Bailur (2007) acknowledge several factors that lead to the failure of ICT initiatives, but singled out the financial factor as a critical factor with regard to the sustainability of these projects. This economic factor is also identified by Parkinson, who classified it under the key success factor referred to as local market.

#### **2.6.4 Universal access policy**

Naidoo & Klopper (2005) argue that South Africa has deliberately introduced legislation to integrate Information Communication Technology as an integral part of socio-economic and academic advancement. The government has introduced legislative frameworks to stimulate the growth, access and affordability of ICT.

The objectives of the universal access policy to Information Communication Technology exist as part of national development policies. The universal access policy framework is meant to chart out detailed deployment strategies. A way that is used to achieve this is by stimulating and regulating markets using areas such as licensing of telecom operators (Parkinson, 2005). The author explains that there are three policies that are the main contributors to the universal access to ICT drive. These three policies are the Telecommunications White Paper of 1996, the Telecommunications Act of 1996 and the Telecommunications Act Amendment of 2001. It was through the 1996 Act that telecommunications regulatory body was created. These entire policies target the same goal: to find innovative ways to encourage universal access for all (Emdon, 2003).

These Acts seemed to produce a number of challenges. The Telecommunications Act of 1996 was flawed due to the fact that the roles and responsibilities of the Universal Service Agency were vague. The agency seemed to be toothless because it did not have the authority to regulate or implement policy. There seemed to also be some overlap between the roles and responsibilities of the Universal Service Agency and the regulatory body for telecommunications. Another

notable weakness of the 1996 Telecommunications Act was the lack of clear definitions and benchmarks (Parkinson, 2005). This is one of the challenges that were highlighted in the European Strategic Guidelines for Rural Development (D.G. AGRI, 1997), as difficulties arise where policies are too vague. The Telecommunications White Paper of 1996 also suffered a similar challenge of overlap with the Universal Service Agency, that also attempted to provide universal access via telecommunications and Internet unfortunately it lacked a methodology to achieve this (Parkinson, 2005).

Much as it is clear that the policies that underpin the universal access to Information Communication Technology show flaws, it is important to commend government for the commitment shown (Emdon, 2003) in attempting to create a digitally inclusive society, and attempting to provide information and services to all. The policies also attempt to increase awareness of the advantages of telecommunications and encourage their use (Emdon, 2003). The element of awareness is also identified as one of the local factors that was identified as necessary in order for these development initiatives to achieve sustainability (Parkinson, 2005). Once the community members are aware of the project and its benefits to the community, resistance is removed and it creates an appreciation that leads to the people taking care of the initiative's infrastructure. The awareness ensures an easy uptake of developmental projects by the community, which would not be the case if the community were not aware of the development initiative.

Parkinson (2005) explains that upon creation of the Universal Service Agency using the 1996 Telecommunications Act, the Universal Service Agency was mandated to create telecentres throughout the country. This thrust to create universal access to Information Communication Technology for all citizens, which was motivated by the post-apartheid era, was dampened when only 65 telecentres were deployed out of the hundreds that were envisaged. Further challenges were faced when most of the deployed telecentres failed quite soon after deployment to become sustainable (Benjamin, 2001a, 2001b). The main challenge faced by these centres was the lack of clear benchmarks (Parkinson, 2005) to help the technology implementers to plan and make targets for progress measurement. This problem also created a situation where reporting on the progress of deployments was made difficult. A number of these initial challenges faced by the Universal Service Agency have now been overcome and lessons have been learnt from these failures. Restructuring has taken place to improve the development and deployment of these telecentres, as can be seen from the several restructuring exercises the organization has undergone since 2003.

Universal access, being the underpinning theme, results from a 15-year review of the Telecommunications Act of 1996, which reveals that government has now recognised the advent of newer technologies and trends such as mobile access. This has led to government's attempts to partner with private telecommunications operators to provide access to rural communities (Hodge, Lipschitz, Sheik, & Aproskie, 2008). The authors also state that the provision of subsidies can be used to stimulate efforts to take Information Communication Technology to rural communities. This is seen by the government providing licensing subsidies for the deployment of technologies to areas that government has classified as underserved and that have suffered access problems (Hodge, et al., 2008). The table below provides a summary of the various other documents that relate to universal access to ICT services provision to all citizens.

<i>Goal</i>	<i>Evidence/where stated (not exhaustive)</i>	<i>Implementation mechanisms</i>
Universal access to telecom (and broadcasting) service, redressing historic inequities	Telecommunications Act 1996, revised Act 2001, mandate of Parliamentary Portfolio Committee on Communications	Regulatory authority (ICASA), licensing agreements, Universal Service Agency, Universal Service Fund
Delivery of government services including social services (e-health, e-education, etc.)	E.g., Department of Education White Paper on E-education (2003), research commissioned by PNC ISAD	Various government departments, GCIS, PNC ISAD, Universal Service Agency under 2001 mandate
Improvement of communication between government and citizens	RDP 1994	Various government departments coordinated by GCIS (own services)
Democratization, diversification of media and expression	RDP 1994, MDDA Act 2002	DoC, MDDA, Department of Arts and Culture
Supporting local development through information provision	Mandates of DoC, Universal Service Agency	DoC, GCIS, Universal Service Agency, various government departments
Supporting SMMEs and job development	ICT Economic Empowerment Charter (2004 in progress)	Department of Trade and Industry, ISETT SETA, Universal Service Agency under 2001 mandate
Creating a South African information society	Presidential speeches, e.g. 2001 State of the Nation address, Telecommunications White Paper 1996	Various: DoC, Universal Service Agency, Department of Arts and Culture, presidential task forces

**Table 2.2 Summary of South African national policy goals related to universal access (Source: Parkinson, 2005)**



Bailey (2009) raises the important point of education. The author notes that illiteracy can be a barrier to accessing the services provided by Information Communication Technology initiatives. In order to access these services one needs to possess a certain level of ICT literacy. This normally favours school going children, and the majority of the rural community members are illiterate and end up not being able to access these services. Evidence from the study by Bailey indicates that individuals need to have ICT literacy in order to access the services that telecentres provide. Lack of these skills leads to a situation where a would-be user has to depend on a third party such as the staff of the centre or a friend to carry out a task or access information. It is research of this nature that strongly suggests the need to provide Information Communication literacy training in areas where these centres are deployed. This will enable even people who previously never had the skills to attain the required skills for the purpose of accessing the various services that these centres provide.

Rothenberg-Aalami & Pal (2005) identify the purpose of telecentres as being for social needs. The author also explains that most rural communities lack Information Communication Technology initiatives due to the diversion of resources to other projects. This problem usually is caused by provincial municipalities that do not divert the resources or do not identify projects to fund and eventually return the funding to the central government. This finding is congruent with the DPSA draft policy report. In order to be able to achieve sustainability, one of the aims of the universal access policy was the ability to monitor and evaluate the telecentres under its charge. Hence it is important to provide a mechanism by means of which the functionality and progress of the telecentres can be measured.

## **2.7 NOTABLE DEVELOPMENTS IN KWAZULU-NATAL PROVINCE**

The government of the republic of South Africa and various civil society organizations have come together in an attempt to improve the lives of citizens through the provision of ICT, thereby exposing communities to the various benefits these technologies provide. Government Communication Information System (GCIS) is among others responsible for developing various technology initiatives to provide access to information. The government has embarked on the development and deployment of Multipurpose Community Centres (MPCC) as the main method of providing access to information in under serviced communities. MPCCs also are a conduit for the provision of service delivery to these communities (DOPW, 2011).

### **2.7.1 Zibambeleni Telecentre Project**

The Minister of Communication launched a telecentre called Zibambeleni Telecentre in Muden, KwaZulu-Natal province on 31 March 2010. This project is a combined partnership between government, the community and other private players.

The telecentre is in a rural area, with 10 computers that will offer services to a population estimated at five thousand (Nyanda, 2010). Whilst the ratio of the computers to the population appears inappropriate, at least an effort has been made to avail Information Communication Technology to this rural community. In the speech, the minister actually says that this is the first development of its kind in this area. This means that though the government drew up an action plan back in 2001 (DPSA) it has taken this long for the action to materialize. The minister maintained in his speech that government remains committed, with organizations like USAASA involved, but in most cases funds limit what would be desired to be developed. The centre will provide access to Internet, computer training, photocopying and facsimile services (Nyanda, 2010).

### **2.7.2 The Manguzi Telecentre Project**

The telecentre project in Manguzi was deployed in 1998. This project came into existence with the aid of the Council for Scientific and Industrial Research (CSIR), which was established to provide social economic research and development. The Manguzi area is very poor, and there is virtually no transport. This means that people have to walk long distances to access services. The needs which were identified in the rural community were to provide greater opportunities and information to the community members, including the student community.

The initial setup was the deployment of a telecentre that provided a dial-up link to access the Internet, but because of the long distances community members had to walk, it was realised

that this challenge was an inhibiting factor to accessing information (CSIR, 2009). The project was further extended to deploy Internet access to two schools that were identified. This brought the services closer to the people. One main criterion the project had to consider was the need to provide cheap access to the Internet. This was achieved through the use of connecting the schools to the telecentre, which was used as a gateway to the Internet using a wireless connection between the sites.

This wireless connection between the telecentre and the schools proved to be a good setup because it generated no extra monthly costs. A train-the-trainer initiative was also used in order to improve on sustainability by providing community members with the skills required to access the services. The cost of accessing the Internet produced by the telecentre and the two schools was covered by the income that was generated by the telecentre. This telecentre proved to be a success because the development team took into consideration issues such as financial sustainability, staff and user community training, and making the service physically accessible by bringing it closer to the people (CSIR, 2009).

### **2.7.3 The Shongololo Project**

The Shongololo Project was developed and deployed by the KwaZulu-Natal Department of Education and Culture through the Education Libraries and Information Technology Services (ELITS). The project sought to connect 20 developing schools in KwaZulu-Natal, 20 developed schools again in KwaZulu-Natal and 20 developed schools in the United Kingdom. The main aim of this project was to provide learners with a platform from which to communicate and share information with each other using e-mail. The project set up preconditions to participation in the pilot project. Participating schools had to commit to participating for the entire year and the principal also had to actively support the project. The maintenance of e-mail communication was made the responsibility of the school and training was provided for the librarian and another person to provide support.

The project faced challenges, such as insufficient training being provided, equipment being diverted for administrative use, and a breakdown of the relationship with the schools in the United Kingdom. However, the project scored notable successes, such as exposing educators and learners to a variety of information as they established e-mail communication with other colleagues. Due to the exposure to new information and the creation of a collaborative atmosphere, the learners showed an increase in the information content learnt.

#### **2.7.4 Other projects in KwaZulu-Natal**

In the speech by the Honourable Minister of Communication, Radhakrishna (Roy) L. Padayachie, at the celebration of World Telecommunication and Information Society Day on 9 May, it was announced that the government had launched a cyberlab in the Maphophoma School in Nongoma. On 11 May it launched another cyberlab in Mzingezwi Secondary School in Ndwedwe, and on 12 May government launched an Information and Communications Technology centre, which is equipped with about 20 PCs and Internet located in the government Multi-Purpose Community Communications Centre (MPCC) in Mpendle. A milestone was the launch on 13 of May in Msinga of a broadcasting signal for transmission of television and radio as well as the opening of a cyberlab in the Msinga High School.

The discussed technology initiatives above that are deployed by government and other stakeholders is evidence of governments attempts to creating a digitally inclusive society and much as there is also evidence of failed technology initiatives (Madon, Reinhard, Roode & Walsham, 2007) it is clear that the projects have a positive impact on the communities they are deployed in.

#### **2.8 UNIVERSAL SERVICE AGENCY**

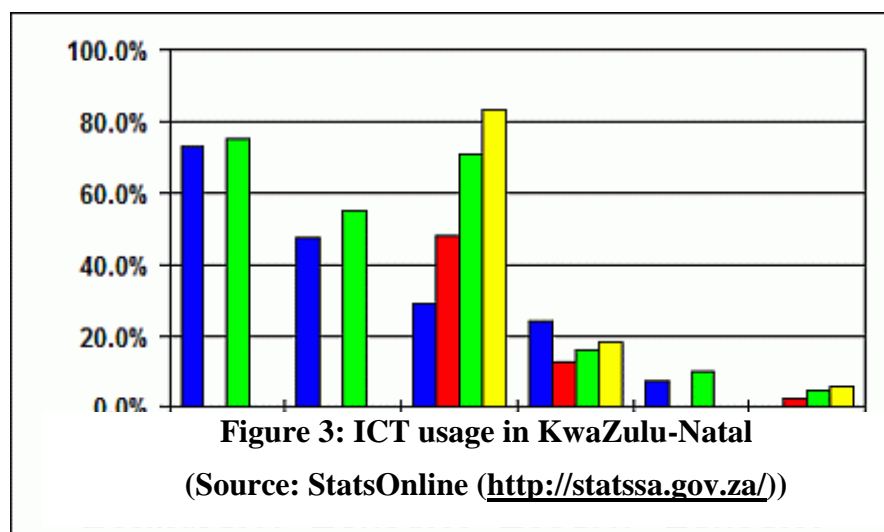
The Universal Service Agency is a product of the 1996 Telecommunications Act. The agency was created to encourage universal access and provide these services to the citizens of South Africa. The agency was also tasked with the responsibility of providing training, deploying technological innovations and sensitizing the general citizenry on the benefits of telecommunication services. Primarily the agency committed itself to developing and deploying public access points such as telecentres country wide.

#### **2.9 STATE INFORMATION TECHNOLOGY AGENCY**

The state information technology agency (SITA) having been created in 1999 was mandated to manage the government's technology assets. This agency was mandated to help merge these resources, thereby improving government expenditure and streamlining provision of ICT to its various departments and projects. The technologies provided by SITA are meant to be used in a strategic manner. Other responsibilities of the agency are to purchase these technologies at competitive prices from suppliers and provide the necessary support to create an inclusive society through the use of e-governance methods (SITA, 2008).

## 2.10 E-READINESS IN SOUTH AFRICA

According to Bridges.org (2005) the concept of e-readiness relates to how skilled and willing societies, regions, communities and institutions are to utilize Information Communication Technology to access and utilize global electronic resources for business, education, health, government, and leisure activities. It is therefore considered that e-readiness is the extent to which an area in question such as a country or region is able to create an inclusive society through the use of Information and Communication Technology. The e-readiness scale or index has an important impact on provision of services such as e-education. The e-readiness index can help government and other organisations determine how ready a particular area is to participate in e-education, thereby taking the necessary steps to improve deployments of these services to that area. Skilled and willing societies are able to utilize ICT to access and utilize global information and networks.



The figure above shows the status of KwaZulu-Natal province with regards to the presence of Information Communication Technology within the province, and combines data from several surveys, namely the Census 2001, the General Household Survey 2005, the Community Survey 2007 and the General Household Survey 2009. KwaZulu-Natal has an above average density of landline connections and an average percentage of private Internet connections compared to the other South African provinces. The statistics show that mobile phones and the radio have the greatest penetration in the province. It can be assumed that another 4 to 6% have access through places like libraries, schools or Internet cafés and multipurpose community centres. The data indicates that more than 80% of the inhabitants have a mobile phone, thus showing evidence of leapfrogging of technology and making the mobile phone the most widely used form of media

in KwaZulu-Natal, overtaking even older technologies such as the radio. Based on the data gathered from the studies above it is evident that Internet penetration since the General Household Survey of 2005 has increased, but at a very low rate, with less than 10% having personal access to Internet. The researcher conducted a survey of municipal websites in the province and counted a total of 52 websites.

## **2.11 INFORMATION COMMUNICATION TECHNOLOGY DEPLOYMENT APPROACHES**

Development initiatives to rural communities can be approached either through a top-down or a bottom-up approach. The initial approach to development was the top-down approach, involving the use of professionals who are not from the community in which the initiative is to be deployed. These professionals are charged with the responsibility to plan, develop and implement the initiative (Macdonald, 1995). Some typical characteristics of the top-down approach to development are:

- Almost all decisions regarding the planning of the initiative to be developed and deployed are made from a central point by the professionals and do not involve the community in which the development is to be deployed.
- The professionals plan without consideration of the social factors that may affect the project and behave as if they were developing a project for a new community. They also mostly follow well-defined, rigid models.
- The plans are usually developed with the use of quantitative statistics.

The concept underpinning this form of development of community initiatives is based on the idea of the provision of professional services to the communities, according to which communities follow the professional experts and merely ultimately use the services provided. The approach assumes the community members will in the process change their attitude towards the initiative and begin to use the services it provides. The bottom-up approach is said to be underpinned by social development theory (Rubin & Babbie, 1993). The bottom-up approach places national government as a catalyst or facilitator rather than the initiator, by providing conducive environments for development initiatives to take root. The bottom-up approach to development involves interventions that are initiated by local needs rather than from the national government centrally. The bottom-up or also “known participation” approach to development breaks down boundaries that may exist between the two groups: the “facilitator” and the community that is receiving the development project. Burkey (1993:118) recommends that it is necessary for the professional “facilitators” from outside the target community to

spend a minimum of six months in that community “with the objective of learning, together with the people, as much about the area and its inhabitants as possible.”

Macdonald (1995) explains that whether the top-down or the bottom-up approach is used, in order to achieve the goal of changing community members’ perceptions on how they can improve their standard of living and actually changing their standard of living, both approaches need community participation by realising that they have a problem and they also have to be willing to take part in the development of the initiative.

Looking at what has just been articulated, one can therefore recommend a bottom-up or participatory approach when deploying technology initiatives to rural communities of KwaZulu-Natal. Project development using the bottom-up approach is not easy to deploy and is considered more difficult to implement compared to the top-down approach. The mere fact that these technologies are foreign can make the use of the bottom-up approach seem a daunting task. Siochru & Girrard (2005) argue that most of these technologies are developed without consideration for their cultural and economic impact, or for their use in the non-Western environments.

Gumucio-Dagron (2003) is also in support of the use of a bottom-up approach and states that community members are more likely to appreciate Information Communication Technology initiatives if they are able to understand how they can use these technologies instead of being shown what ICT initiatives can do for the rural community members. Siochru & Girrard (2005) argue that emphasis must be placed on the people and not the technology, and that it should not be the functionality of the technology that is put in question in these communities but rather the ability of the community members to access these technologies. The authors point out that literacy is of great importance and can be a stumbling block to accessing the benefits that the initiatives bring.

Core to the bottom-up approach is the emphasis on information. The approach suggests treating information as a right and a basic need. This therefore translates into treating Information Communication Technology provision to these communities as a basic service as well. Friedmann (1992:59-60) states that ICT has the “potential to facilitate the delivery of most of the basic needs identified by the International Labour Office (ILO) in 1976, such as health, education and participation.” The idea of classifying ICT as a basic service or need makes the use of the bottom-up approach an attractive option, and accords with Maslow’s hierarchy of needs (1954), which argues in terms of a hierarchy of needs and states that basic needs have to be met before higher level needs can be considered in any society.

Information Communication Technology can be utilised to stimulate economic growth in various sectors of society such as tourism, agriculture, education and telemedicine, by making these sectors function more efficiently and more cost-effectively (Barr, 1999). It is because of this wide-ranging impact on society that some authors are now arguing that ICT should now be considered as a basic need. Max-Neef (1986) argues that needs are constantly changing in nature, and are affected by factors such as time and culture. The author continues to explain that it is because of this that access to ICT services has evolved and it ought to be considered a basic need in this day and age. It is this reasoning that has led to claims that we are now living an information society (Drucker, 1993).

## **2.12 RURAL COMMUNITY DEPLOYMENT SOLUTIONS**

The motivation for development is convenience, and Rajvanshi (1992) argues that when people appreciate the convenience that a technology contributes to their livelihoods, this appreciation will create a demand. The demand factor is the main ingredient in allowing for technology deployment and uptake in rural communities. It therefore goes to say that whatever the technology is that is being deployed, it should be linked directly to serving a purpose in that community. Rajvanshi (1992) also makes the point that rural community members deserve the same level of consideration as their urban counterparts and that technology development should not be transplanted from urban settings to rural areas but should rather be developed for rural areas specifically, as rural areas have their own unique needs.

## **2.13 INFORMATION COMMUNICATION TECHNOLOGY AND CULTURE**

Culture is considered by some as a barrier to the deployment of Information Communication Technology in many poor communities. Authors such as Hasan & Dista (1999) share this viewpoint and suggest that every country must have an IT policy that takes cognisance of existing cultural norms and protects them.

## **2.14 INFORMATION COMMUNICATION TECHNOLOGIES AND SUSTAINABILITY**

The e-Bario project was launched in 1998 (eBario, 1998) by the University of Malaysia Sarawak. The project involved the use of Information Communication Technology (public telephones, computers for two schools, a community telecentre with computers, and using satellite technology powered by diesel and solar energy to access the Internet) to provide socially, culturally and economically sustainable development to this remote and isolated community. The project also aimed to find ways in which sustainable development can be used to eradicate problems and capitalize on opportunities for development. The Bario region lacks support infra-



structure to provide basic amenities and resources such as electricity, water and telecommunications, and according to Maslow's (1954) hierarchy of needs theory this can be a barrier to deployment of technology as the rural communities of Kelabit people will concentrate on what they consider basic needs (water and electricity) before having an interest in ICT, which might be considered a luxury and not a basic need (Gumucio-Dagron, 2003).

The ground-breaking success of the e-Bario telecentre project has led to it winning numerous awards. One of the innovations and lessons learnt from this project is the value of emphasising people and processes, and not merely the technologies (Dyson & Humphreys, 1990). This can be achieved by analysing the relevance of the technology for the community before the technology is deployed. In acknowledging the importance of community engagement and empowerment, the project was designed around a participatory development approach from the start. This was evidenced by the community members' involvement in all stages of development for the project. This ensured that at each stage of the development, the community to which this Information Communication Technology initiative is being deployed inputs its needs, thereby creating a final product of direct relevance to it. This allowed the community members to utilize this resource fully, as it was developed in essence by them (Gumucio-Dagron, 2003). The telecentre that is part of the e-Bario project provides access to students to conduct research (eBario, 1998).

Another lesson learnt from the project was the preparedness of the community for Information Communication Technology. A baseline needs study conducted by the researchers found that all 13 of the secondary school teachers at one of the two schools that were used in the study possessed an intermediate or an advanced level of Information Technology literacy. In order to support greater empowerment, an Information Technology literacy programme was further set up to help increase the teacher's knowledge levels on computers and the Internet (eBario, 1998).

The telecentre had 10 computers with Internet access through the use of V-SAT technology powered by diesel and solar energy due to lack of electricity. The telecentre provided various services and access to information such as phone services, typing and access to the internet. It has allowed students to be at the same level as their colleagues in urban areas in terms of exposure to information and has led to an increased literacy level in terms of computer needs.

The results from research undertaken on the factors that led to the success of the e-Bario project point largely to the use of the user-centred, participatory approach, a factor that Gumucio-Dagron (2003) also agrees with (Abijit & Jean-Pierre, 2002). This ensures that not only are community members made aware of the development but that they also provide much-needed

inputs, as they are the ones who will use the technology initiative in the end. The Barrio community now has access to telecommunications and Internet facilities, and are using these facilities to enhance their social, cultural and economic wellbeing (Gumucio-Dagron, 2003).

Community involvement, especially of key players such as the paramount chief and headman, eased the initiation, implementation and running of the project. Community members were made fully aware of the project and its intentions and how they could use it to their benefit. From the perspective of projects in Africa, a lot can be learnt from this model of Information Communication Technology deployment to help communities adopt and sustain such development (Gumucio-Dagron, 2003).

A bottom-up technique was used to plan and implement the e-Barrio project. Solutions were developed based on the rural communities' needs and not imposed on them by "outsiders" to that community. Gumucio-Dagron (2003) sees this as a critical success factor in achieving sustainable Information Communication Technology initiatives, as the community can clearly see the benefits of the initiative for meeting their everyday needs.

Projects that are deployed without community involvement or with only minimal community consultation are the most likely to fail or be vandalised by the members of the community in which that project has been deployed. The community for whom the technology is to be deployed needs to be made aware of the development and its benefits for them (Gumucio-Dagron, 2003). Heeks & Bhatnagar (1999) identify the following critical factors that lead to project failure:

- Management: there is need for the people managing the project to have sufficient knowledge, skills and experience (James, 1997).
- Culture: the environment in which the technology is being deployed also plays a role. People interact with the technology based on their cultural or behavioural norms (Braa, 1996).
- Structural factors: poor setup of the project team in terms of structure can lead to project failure. A typical instance is where the structure does not allow for information flows between the relevant parties (Brodman, 1987). This is seen in the top-down approach to development where in most cases information flows are from the top structures and rarely trickle in the opposite direction.
- Technical factors: differences in the technologies that are already being used and the new technologies to be deployed can lead to a lack of compatibility of information

technology equipment, leading to a lack of scalability of the new system and eventual project failure (Bellamy & Taylor, 1998).

- Processes: efficient processes need to be put in place that will perform tasks such as monitoring and evaluating project operations. Poor processes can lead to poor information flows and eventual delayed or wrong decision making (James, 1997).
- Strategic factors: haphazard planning of technology development can lead to project failure. Meticulous attention must be placed on development planning decisions such as the vision and aim of the technology deployment. Devolving of deployment decisions to provincial level is a typical example of a situation that can lead to uncoordinated deployments and eventual project failure (King & Kraemar, 1991).
- Political factors: the motivations behind these technology initiatives can have an impact on their success. The political thrust of the post-apartheid era to provide services to all by government has helped encourage the creation of a digitally inclusive society and has propelled South Africa to the number one position in Africa in terms of e-readiness (Economic Intelligence Unit, 2009).
- Environmental factors: the environment in which the technology is to be deployed plays a critical role. The successful deployment of an initiative is dependent on a conducive environment.

## **2.15 THEORETICAL FRAMEWORK**

A number of theoretical frameworks have been developed as a result of research on technology adoption, each of these frameworks consist of various components that are used in order to determine adoption of different technologies. Below is a discussion of the various frameworks that are available.

### **2.15.1 Theory of Reasoned Action (TRA)**

Ajzen & Fishbein (1975) offer a highly adaptable theoretical framework. According to this theory, there are two determinants to the approach of one's actions. The first is the conviction that a result is directly linked to a particular action and the second is the assessing of the action. A favourable result of an action leads one to possibly partaking in an action. According to Chidambaram & Kwon (2000), TRA is involves determinants of actual and planned action; it therefore translates into the thinking that actions are carried out based on a purpose that also translates into being able to understand one's approach to an action. They further argue that one's approach to an action is impacted by their thinking that their actions can produce particular results. Attitude toward behaviour is defined as "an individual's positive or negative feelings (evaluative effect) about performing the target behaviour" (Ajzen & Fishbein, 1975),

while subjective norm is “the person’s perception that most people who are important to him think he should or should not perform the action in question” (Ajzen & Fishbein, 1975).

### **2.15.2 Technology Acceptance Model (TAM)**

In 1989, Davis and his colleagues developed a theoretical framework called the Technology Acceptance Model (TAM). The Technology Acceptance Model replaces the attitudinal determinants of the theory of reasoned action with two distinct variables i.e. perceived usefulness and perceived ease of use (Chidambaram & Kwon, 2000). Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989) and perceived ease of use is “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989).

### **2.15.3 Motivational theory**

Studies in the discourse of psychology have attributed the reason behind the actions of individuals to motivational theory. This theory is also used in Information Systems to understand the various approaches to technology deployment and acceptance by its users. The main determinants used in this theory are extrinsic motivation and intrinsic motivation.

Extrinsic motivation is referred to as being able to perform a task based on the fact that the results of that task will be appreciated. Example of extrinsic motivation are financial or recognition at a work place through the awarding of a prize (Davis, Bagozzi, & Warshaw, 1992). Davis et al (1992: 1112) define intrinsic motivation as “the perception that users will want to perform an activity for no apparent reinforcement other than the process of performing the activity per se.”

### **2.15.4 Model of PC utilization**

Thompson, Higgins & Howell’s (1991) theoretical framework of PC utilization draws from the theory of human behaviour by Triandis (1977). It is used to determine PC utilization by determining an individual’s adoption of a variety of technologies. This theory sought to establish an individual’s action and not their intention. The main determinants used in this theory are:

- Job-fit
- Complexity
- Long-term consequences
- Affect towards use
- Social factors

- Facilitating conditions.

Job fit is defined as the degree to which a person perceives a task they are carrying out can be made easier or made better through the use of technology (Thompson, Higgins, & Howell, 1991). Thompson, et al. (1991:128) define complexity as “the degree to which an innovation is perceived as relatively difficult to understand and use” and long-term consequences as “outcomes that have a pay-off in the future” (Thompson, et al., 1991:128). Adopted from Triandis (1977), the determinant effect toward use is defined as “feelings of joy, elation, or pleasure, or depression, disgust, displeasure, or hate associated by an individual with a particular act” (Thompson, et al., 1991:128). Social factors are said to be defined as “the individual’s internalization of the reference group’s subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations” (Thompson, et al., 1991:128). Facilitating conditions are defined as the “provision of support for users of PCs may be one type of facilitating condition that can influence system utilization” (Thompson, et al., 1991:129).

### **2.15.5 Diffusion of Innovation Theory**

This theory investigates factors that influence the rate of diffusion. Moore & Benbasat (1991) used Rogers’ determinants to come up with more refined determinants which they could use on studies involving individual technology acceptance. Literature on diffusion of innovation sets out the determinants that are necessary before a technology can be deployed and adopted by a society successfully. These determinants are as follows:

- Relative advantage
- Ease of use
- Image
- Visibility
- Compatibility
- Results’ demonstrability
- Voluntariness of use

Moore & Benbasat (1991:195) define relative advantage as “the degree to which an innovation is perceived as being better than its precursor.” Ease of use is “the degree to which an innovation is perceived as being difficult to use” (Moore & Benbasat, 1991). Image is defined as “the degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system” (Moore & Benbasat, 1991). Visibility is “the degree to which one can

see others using the system in the organization” and compatibility is “the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters” (Moore & Benbasat, 1991: 195). Results demonstrability is further defined as “the tangibility of the results of using the innovation, including their observability and communicability” (Moore & Benbasat, 1991: 203). Voluntariness of use is “the degree to which use of the innovation is perceived as being voluntary, or free will” (Moore & Benbasat, 1991).

### **2.15.6 Unified Theory of Acceptance and Use of Technology (UTAUT)**

According to Venkatesh, Morris, Davis and Davis (2003), the Unified Theory of Acceptance and Use of Technology (UTAUT) extends the Technology Acceptance Model (TAM) to take into account several new constructs, i.e. performance expectancy, effort expectancy and social influence, that have a significant influence on behavioural intention and ultimate usage of technology. The following are determinants that form the UTAUT theory:

- Performance expectancy
- Effort expectancy
- Social influence
- Facilitating conditions
- Attitude toward using technology (indirect determinant)
- Self-efficacy (indirect determinant)
- Anxiety
- Behavioural intention to use the system

Performance expectancy is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (Venkatesh, et al., 2003). Effort expectancy is defined as “the degree of ease associated with the use of the system” (Venkatesh, et al., 2003). The determinant effort expectancy is utilized in two of the above discussed theories: perceived ease of use (Technology Acceptance Model) and ease of use (Diffusion of Innovation). Social influence is defined as “the degree to which an individual perceives important the way others believe he or she should use the new system” (Venkatesh, et al., 2003). Facilitating conditions are defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh, et al., 2003). The determinant of attitude toward using technology (indirect determinant) is defined as “an individual’s overall affective reaction to using a system” (Venkatesh et al., 2003: 455), and self-efficacy (indirect determinant) to be the measure of a person’s extent to use technology while anxiety is generating emotions of uncertainty based on an action, i.e. using a computer.

### **2.15.7 Hofstede's Cultural Dimensions Theory**

Hofstede (1980) considers culture to be perceptions that are held by grouping of people and they vary from one group of people to another. Straub, Loch, Evaristo, Karahanna & Srite (2002) assert that it is not possible to understand culture based on an individual's perception but rather can be understood based on analysis of groups of individuals. An individual's culture is impacted by the different principles they adhere to and therefore the result of culture is not the same (Srite & Karahanna, 2006). In research by Dwyer, Mesak & Hsu (2005), the results showed linkages between the determinants identified by Hofstede to the rate of diffusion of five consumer products.

## **2.16 SYNTHESIS**

Evidence from the literature review reveals the existence of various different theoretical frameworks that can be used in technology deployment research. Each theoretical framework possesses a number of determinants used to determine diffusion. The theoretical framework used in this study is premised on the factors outlined above that this researcher regards as key elements to determine the deployment of technology to rural communities in KwaZulu-Natal. The framework also intends to present solutions to the problems that prompted this study. The deployment of Information Communication Technology to rural areas requires a holistic approach that takes into account aspects such as the appropriate conceptual framework, culture, development and policies. The theoretical framework that underpins this study is Rogers' Diffusion of Innovations theory (DOI). This theory is now analysed in more in detail in the below section.

### **2.16.1 Rogers' Diffusion of Innovations theory**

The diffusion of innovation theory (DOI) has been informed by Rogers' research that as spanned over four decades (from 1962 to 2003). It provides a good platform for analysing development and deployment of technology initiatives to societies because it is centred on application.

The concept of adoption plays a major part in the process of diffusion. Lee) the authors view adoption as being the route of taken to deploy Information Communication Technology into an environment. Rogers (2003: 5, 11) defines the concept of diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social system."

Rogers (2003:14) defines innovation as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption”. Innovation diffusion is “a special type of communication in which the messages are about a new idea”. The “new idea” represents an aspect of uncertainty that can be overcome by providing information about the innovation. Diffusion research focuses on ways in which technology initiatives are deployed in social systems, including organisations. Diffusion research also involves innovation decision processes and factors that influence successful innovation deployment.

Rogers (2003:14) views the decision to introduce a new technology as “essentially an information seeking and information processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation”. Rogers (2003: 216) defines the innovation process as “the process through which an individual passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision”. The innovation decision process has five stages:

1. Knowledge: the stage at which the person is exposed to the new initiative and its workings.
2. Persuasion: the stage at which the person is enticed towards using the initiative.
3. Decision: the stage at which the person chooses to make use of the initiative or not.
4. Implementation: the stage at which the person uses the initiative.
5. Confirmation: the stage at which the person wants reaffirmation for an innovation decision he or she has made (Rogers, 2003).

The argument put forward in the diffusion of innovation theory concurs with the aim of this research that undertakes to investigate the perspectives of technology implementers about Information Communication Technology deployment to rural communities in KwaZulu-Natal. Rogers (2003:216) states that “the Internet can largely remove the cost of communicating across space” and that “diffusion via the Internet greatly speeds up an innovation’s rate of adoption.” This study, therefore, seeks to use Rogers’ DOI model with a view to explain the perspectives of technology implementers.



### **2.16.2 Determinants used in the Diffusion of Innovation Theory**

The following are Rogers (2003) determinants that impact the speed at which an initiative is deployed. These are:

- Perceived attributes of an innovation
- The type of innovation decision
- The nature of communication channels
- The nature of the social system, and
- The extent of change agents' promotion efforts

#### **Perceived attributes of innovation**

Rogers (2003: 223-266) identified factors that impact the speed of deployment of a technology:

1. Relative advantage: the extent to which that technology is considered superior to its predecessor.
2. Compatibility: the extent to which a technology is considered similar in operation and use with the existing technology.
3. Complexity: the extent to which a technology is considered difficult to operate.
4. Trialability: the extent to which a technology can be tested before being put to use officially.
5. Observability: the extent to which the results of using a technology can be viewed by the people whom this technology is meant to serve.

#### **Type of innovation decision**

Rogers (2003) identifies three types of innovation decisions:

1. Optional innovation decisions: the option to use or not to use a technology without being influenced by the decisions of others.
2. Collective innovation decisions: the option to use or not to use a technology being agreed upon by a group of individuals.
3. Authority innovation decisions: this is a type of decision where a small group of people make the decision and impose their option on the rest of the people who are involved.

Rogers (2003) argues that the speed of deciding to deploy a particular technology is directly related to the number of individuals that take part in making that decision. The author states that the bigger the group of individuals the slower the decision will take.

### **The nature of communication channels**

This determinant focuses on the method by which information is passed from one point to another. Communication channels include change agents such as training workshops. These channels are further classified as interpersonal involving physical contact with the between the two parties or a mass media form such as the old Information Communication Technology of radio or television (Rogers, 2003).

### **The nature of the social system**

This determinant looks at the way the environment to which a new technology is to be deployed. Depending on the characteristics of the environment it can impact positively or negatively on the deployment of a technology for instance, culture or the geographical characteristics has very evident impact on an environment in terms of deploying technology. In the research undertaken, the researcher identifies the social system as being rural communities of KwaZulu-Natal province.

### **Extent of change agents' promotion efforts**

The Change agent in this study is the state information technology agency (SITA) that is charged with the responsibility to promote universal access and in turn digital inclusion of various communities regardless of their social status. Rogers (2003) explains that much as there is no direct association between the speed at which a technology is deployed and the change agent, the author argues that the extent of the change agents' promotion effect has a positive contribution to technology adoption.

### **2.16.3 Justification for the use of Diffusion of Innovation (DOI) Theory in this study**

Firstly Rogers' diffusion of innovation theory has proven to be versatile and can be seen in its use in a number of varying fields it is used in. The diffusion of innovation theory has stood the taste of time and has gone through several changes to better suit the changing environment (Rogers, 1995, 2003, 2004). Furthermore, Rogers diffusion of innovation theory when contrasted with other theoretical frameworks similar to it like the technology acceptance model (TAM), the DOI theory stands out because it covers a larger number of determinants (Venkatesh, et al., 2003) that translate into a more comprehensive and intricate understanding of how new initiatives are introduced into an environment (Tetiawat, 2003). This can be exemplified in the research by Plouffe, Hulland & Vandenbosch (2001) where different theoretical frameworks were used to ascertain as to how systems that use smart cards to make payments are adopted. The research used behavioural intention as the factor for analysis. The results showed a

discrepancy in intention described by the technology acceptance model of 33% whilst the diffusion of innovation was 45% (see also Venkatesh et al., 2003: 436). Theoretical frameworks such as the theory of reasoned action (TRA) and the theory of planned behaviour (TPB) mainly use behavioural aspects, which do not encompass the entire scope of this study.

Hargittai (2003) proposes that digital divides ought to be measured using, namely differences in technical equipment for accessing the Internet, where the access point for these technologies is, the extent of a user's social support structures, what the technology is used for and a user's Information Communication Technology literacy levels required.

## **2.17 THE MISSING LINKS IN THE LITERATURE**

The following areas were identified:

- Studies comparing public access centres (run by government) with those that are privately owned.
- Studies that assess the actual impact of these telecentres on the communities in which they are deployed.
- Studies evaluating how these access points benefit the community compared to other access types such as private access using mobile phones.
- Statistical measures of the impact of Information Communication Technology. In the few studies that are available, this impact is indicated without necessarily being quantified. Qualitative studies are usually undertaken in this regard.
- Longitudinal studies that analyse the sustainability and lifespan of technology initiatives.
- Studies focusing specifically on development and on assessing the effect Information Communication Technology initiatives initiated by government (telecentres) have on rural development.

## **2.18 LITERATURE REGARDING THE EXTENT TO WHICH OTHER RESEARCHERS HAVE MANAGED TO SOLVE PROBLEMS IDENTIFIED IN SECTION 1.2 OF THIS STUDY**

In light of the problems identified in section 1.2 of this study, the researcher conducted a literature review to determine whether the problems identified have been addressed. Various university resources were used in this regard, such as the University of KwaZulu-Natal library and the online library databases such as the EBSCOhost research databases, Science Direct and Google Scholar. The search revealed that no other studies have been conducted regarding perspectives of technology implementers on the deployment of Information Communication Technology to

rural communities of KwaZulu-Natal province, although many articles focusing on ICT and policy were found, they did not focus on the technology implementers who are the focus of this research. A few articles were found on ICT deployment; however, the information obtained from these sources did not address the research problems and therefore did not justify the elimination of the problems identified in this study from further research.

## **2.19 RESEARCH QUESTIONS**

A survey of prior research on the perspectives of technology implementers about Information Communication Technology deployment to rural communities in KwaZulu-Natal has not brought to light any research conducted in the above area to date. The researcher therefore confirmed that the interim research questions posed in section 1.4 of Chapter 1 can be confirmed as the actual questions that will be answered by means of the researcher's own empirical findings discussed in the final chapter of this dissertation. Therefore the actual research questions are as follows:

### **Question 1:**

What are the factors that affect access to Information Communication Technology in rural communities of KwaZulu-Natal?

### **Question 2:**

How important are Information Communication Technology policies with regard to the deployment of technology initiatives to rural communities in KwaZulu-Natal?

### **Question 3:**

What are the current types of Information Communication Technology deployed in the rural communities of KwaZulu-Natal being used for?

### **Question 4:**

How should Information Communication Technology be successfully deployed to rural communities in KwaZulu-Natal?

## **2.20 CONCLUSION**

This chapter presented the literature review the researcher undertook using key terms identified from the problem statement. The researcher made use of the concept matrix in order to classify related articles of a particular key term (Klopper, Lubbe, & Rugbeer, 2007). The researcher also reviewed other literature in order to ascertain the degree to which other re-

searchers have attempted to resolve the problems identified in section 1.2 of the previous chapter; this is done so as to eliminate any of the problems that have already been sufficiently researched. The theoretical framework that underpins this research was also discussed. This framework will be used in Chapter 4 to interpret the empirical results and present solutions to the problems that prompted this study. Furthermore, the researcher reviewed research questions stated in Chapter 1 to establish whether they have been addressed by the literature study. As a result of the lack of prior research on Information Communication Technology deployment to rural communities in KwaZulu-Natal from the perspective of technology implementers, the researcher confirmed the interim research questions as the actual questions to be answered by this study.

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

#### **3.1 INTRODUCTION**

In this chapter the researcher describes the research methodology employed in this research to provide empirical answers for the research questions. The researcher will also offer grounds for the choice of philosophy, approach, strategy, choice, time horizon and techniques and procedures for data collection and analysis. Ethical issues are also discussed.

#### **3.2 THE NATURE OF RESEARCH**

Oxford Dictionary (2011) defines the term “discipline” as “a branch of knowledge, typically one studied in higher education”. Much as is it a simplistic approach to attempt to classify research types as being mutually exclusive of each other (Spaapen, Dijstelbloem, & Wamlink, 2007) due to the complexity involved, in order for the researcher to best solve the problem at hand, it was important to be able to distinguish the various types of research and identify to what classification this study falls under. For the purposes of this study the researcher sought to limit the discussion to three main kinds of research. The term interdisciplinary is defined as “a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession” (Klein & Newell, 1997: 393-394). Multidisciplinarity refers to “the placing side by side of insights from two or more disciplines”. Multidisciplinary approach does not translate into combining approaches or theories from the different disciplines but rather understanding the problem scenario using perspectives from the different disciplines without necessarily bringing that knowledge together to obtain a solution. Transdisciplinarity is “the application of theories, concepts, or methods across disciplines with the intent of developing an overarching synthesis” (Lattuca, 2001: 82-83). The transdisciplinary approach involves the use of a super or overarching theory that is applied to the problem scenario. (Langfeldt, 2006:15) articulates that the core aspects of the interdisciplinary approach to research are the factors of “sensitivity to context and flexibility”. It is the overall understanding of the above discussion and desire to make use of these core values that the interdisciplinary approach uses that the researcher selected an interdisciplinary approach for this study, combining Information Communication Technology and social development.

The research is quantitative in nature. Quantitative research methods involve the use of mathematical expressions in order to represent and describe the social world as accurately as possible. Quantitative research methods may also use numbers to represent non-physical phenomena, such as intelligence, academic achievement, the strength of personal preferences and beliefs, or the worth of an employee to an organisation (Leedy & Ormrod, 2005). The analytical procedures are carried out using the statistical application SPSS 19.

### 3.3 RESEARCH DESIGN

The research design is concerned with formulating the logic of how a problem will be solved. This helps the researcher to make legitimate conclusions (Yin, 1989). The author states that a well-developed research design is able to map the empirical results to the research questions that were posed at the beginning of the study. It consequently is the main plan that researchers follow to obtain answers to questions that were asked at the onset of the research. In addition to outlining a clear research plan, the research design must also take into account limitations that the research has, this also ethical matters (Saunders, Lewis, & Thornhill, 2007).

Saunders, et al (2007) proposes their “research onion” as a framework to use when developing a research design. Figure 4 below shows the various layers of Saunders, et al.’s research onion. By taking into account each of these layers of the model a suitable plan, approach and strategy was formulated that addressed the problem identified in this research. The researcher now discusses each layer of the research onion and how each layer informed the research undertaken.

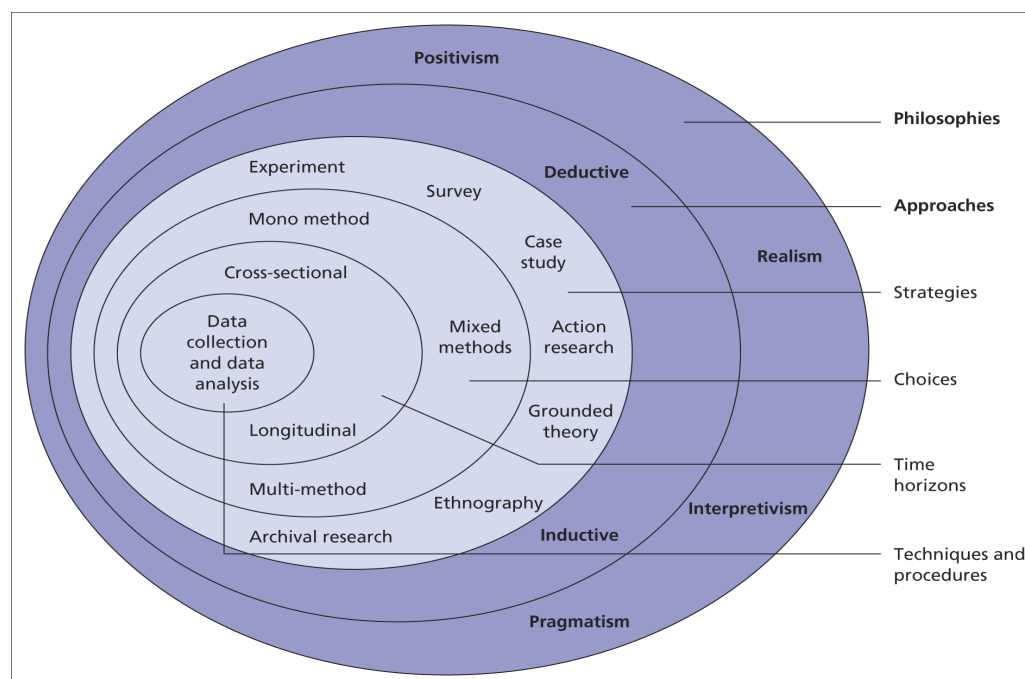


Figure 4: The research ‘onion’ (Saunders, *et al.*, 2007)

### **3.3.1 Research philosophy**

Levin (1988) explains that research philosophy is an understanding of the manner in which data collection and analysis ought to be conducted regarding a particular occurrence. The Encarta World English Dictionary (1999) defines the research philosophy of positivism as “the theory that knowledge can be acquired only through direct observation and experimentation rather than through metaphysics and theology” (cited in Lubbe & Klopper 2004).

The behavioural sciences approach to positivism hypothesize that an individual’s actions can be rationalized based on the idea that an action results into a known reaction (May, 1999). The positivist philosophy’s principle techniques used include observations, experiments and survey techniques. Statistical techniques are also applied on data for the purpose of quantifying the results in a manner that is easily understood (Schiffman & Kanuk, 1997). With these techniques in mind and the research problem as outlined in section 1.2, the researcher concluded that the best fit for this research would be to use a positivist approach.

### **3.3.2 Research approach**

The second outer most layer of Saunders, et al., (2007) research onion is the research approach layer. Here the researcher selected the deductive approach. The research approach used is actually influenced by the choice of research philosophy selected earlier on. It therefore, means that the use of the deductive approach to the research was influenced by the selection of the positivist philosophy (Saunders, et al., 2007). The use of the deductive approach allowed the researcher to make use of a structured questionnaire and to perform statistical tests on the quantitative data; this allowed the researcher to be able to make generalisations on the results that were obtained taking into considerations the prevailing limitations outlined. This approach was used due to the fact that it allowed the researcher to select a theory, form hypothesis that were tested, observe the results and make inferences from it.

### **3.3.3 Research strategy**

The third outer most layer of Saunders, et al., (2007) research onion is the research strategy layer. In this research the survey technique was used. This decision was arrived at after taking into consideration the objective of this study (to investigate the perspectives of technology implementers on Information Communication Technology deployment to rural communities of KwaZulu-Natal). This choice of strategy allowed for the researcher to collect data from respondents who were widely geographically dispersed (State Information Technology Agency offices in Pietermaritzburg and Durban). The strategy also made possible the collection of data that could be used to create relationships between variables for further interrogation.



### **3.3.4 Choice**

The fourth outermost layer of Saunders, et al., (2007) research onion is the research choice. A Mono-method was selected to be used in this research. The quantitative method used allowed the researcher to collect closed-ended responses and these closed-ended responses enabled the researcher to use the statistical application SPSS 19 to generate results.

### **3.3.5 Time horizon**

The fifth outermost layer of Saunders, et al., (2007) research onion is the research time horizon. A cross-sectional approach was used in this study due to the time constraints and the dynamic nature of the field under study.

### **3.3.6 Research techniques and procedures**

In order for the researcher to be able to collect sufficient data for deductive inferences to be made the researcher employed the use of a closed-ended questionnaire. This approach enabled analysis that would show relationships between variables (Saunders, et al., 2007). The closed-ended questionnaire allowed for more reliable and accurate responses to be given. It was also seen to be the best choice as the respondents were far apart and very busy, which made scheduling of interview in the event the researcher choose an alternative data collection technique difficult.

The section below offers an explanation of the questions that were included in the questionnaire.

#### Demographic Questions

Questions 12 – 18 consisted of demographic data of the technology implementers to be collected. Good questionnaire design suggests that these questions should be placed at the end of the questionnaire (Ross, 1996).

Question 1 assessed the level of preparedness of rural communities in KwaZulu-Natal. This question sought to get the perspectives of technology implementers regarding the e-readiness of rural KwaZulu-Natal.

Questions 2, 4, 5 and 6 determined to assess the technology implementer's perspectives regarding Information Communication Technology policy and its impact on rural communities of KwaZulu-Natal.

Question 3 assessed the perspectives of the technology implementers regarding the impact that geographical location has on Information Communication Technology deployment.

Question 10d identified the respondents' perspectives on the impact of culture on technology deployment.

#### Questions on ICT access

Questions 5, 6, 10a, 10b, 10e, 10g, 11a, 11b, 11e, 11f, 11g, 11h, and 11i assessed the technology implementers' perspectives on factors that hinder access to Information Communication Technology in rural communities of KwaZulu-Natal.

#### Questions on ICT policy

Questions 2 and 6 determined impact of policy frameworks on rural areas regarding Information Communication Technology deployment.

#### Questions on ICT use

Questions 7, 9, 10c, 11c and 11d assessed what the technologies in rural KwaZulu-Natal are being used for and the recommended technologies to be deployed to rural communities of KwaZulu-Natal.

#### Questions on successful deployment

Questions 1, 3, 4, 5, 6, 8, 10d, 10f, 11b, 11f and 11i assessed how Information Communication Technology can be successfully deployed to the rural communities of KwaZulu-Natal.

### **3.4 PLANNING**

In this section the researcher describes the processes that were followed in preparing to conduct the survey. The researcher conducted the data collection at the State Information Technology Agency (SITA) premises in Pietermaritzburg and Durban. Management changes at the SITA regional head office in Pietermaritzburg had a negative impact on the research in that there was a lot of time lost when trying to get permission from the organization to conduct research there, as most of the relevant people were not yet available.

### **3.4.1 Permission in principle obtained from KZN State Information Technology Agency to conduct research with their staff in KwaZulu-Natal**

The survey was conducted at the two SITA sites in Pietermaritzburg and in Durban. The survey process was facilitated by the researcher's supervisor, who wrote letters to the gatekeeper requesting that the researcher be permitted to conduct research with their organisation.

### **3.4.2 Selection of respondents**

The research focuses on the KwaZulu-Natal province and in the province there are only the two SITA sites, Pietermaritzburg and Durban. All relevant staff identified formed part of the sample population that was surveyed. From a total population of fifty-two (52) targeted respondents (employees who had a direct and indirect role to play in relation to Information Communication Technology deployments), forty-seven (47) responses were received.

### **3.4.3 Research instrument**

The data collection tool that was used in this research was a questionnaire. All the relevant respondents at both State Information Technology Agency (SITA) sites were courteously asked to take part in the survey. The researcher explained the purpose of the survey, how the results could be of benefit to the respondents and also how little time it would take them to complete. It was also stated in the questionnaire that participation in the survey was entirely voluntary and that respondents could withdraw at any point, although their participation would be greatly appreciated.

### **3.4.4 Development of the questionnaire**

According to Dillman & Don (2000), questionnaires that are not constructed properly can lead to questions being mistakenly omitted or questions being misunderstood. Some common errors in questionnaire construction included:

- Questions being listed in the order they were developed. Respondents were therefore required to switch back and forth to answer questions on similar topics at different places in the questionnaire.
- Incorrect placement of questions that respondents may deem sensitive on the questionnaire.
- Folding the questionnaire several times can confuse respondents and lead to them mistakenly skipping some questions.
- Using various design styles in a single questionnaire e.g. fonts, use of shading, bolding and italics.

- Reducing font sizes to fit as many questions as possible on a page.

Dillman & Don (2000) suggest that aesthetic issues such as font styles and paper colour should be considered in conjunction with the design of the content of the questionnaire.

According to Lubbe & Klopper (2004) a structured questionnaire is ideal in a large-scale data collection. Hence the researcher used structured questionnaires to conduct the survey. The researcher formulated questions using the scaled items for choices. Lubbe & Klopper (2004) state that viewpoints can be accurately measured using a scale because a scale is able to rank the degree of a viewpoint using its multiple levels.

### 3.4.5 Guidelines followed in constructing the questionnaire

According to Leedy & Ormrod (2005) the construction and administration of questionnaires are not simple undertakings and if not properly thought out the consequences could be data that cannot be interpretable or poor response rates. Welman, Kruger & Mitchell (2005) state that questionnaires should be the culmination of carefully thought out processes and discussions. The authors have also listed a number of things to keep in mind when constructing a questionnaire. These considerations are as follows:

- **Choose judiciously between closed and open-ended questions:** Make questions open ended when it is required that respondents formulate their own responses, and closed when it is required that they choose the response that best applies to them from the responses included in the questionnaire.
- **Take the respondents' literacy levels into consideration:** When formulating the questions we should use words and concepts that we can expect the respondents to be familiar with.
- **Be careful not to offend:** Not only should we avoid technical language but also terms that might also offend the respondents.
- **Be brief and focused:** We should give preference to questions that are concise without being ambiguous. The longer the question, the longer it may take to read and the greater the possibility that it may create resistance in the respondents.
- **Maintain neutrality:** We should not formulate questions that may encourage respondents to answer in a particular way.
- **Use of justified sequence:** We should carefully consider the order in which we put items because earlier items may affect responses to subsequent items. To put the respondents at ease it is recommended that the questionnaire should begin with a few easy and non-threatening questions.

- **Be sure the question is appreciable to all respondents:** Questions to single respondents asking how long they have been married or to unemployed persons about how long they have worked on their current job are typical examples. Sometimes the questions are applicable to all respondents, but not the options in the structured item.
- **The layout:** The questionnaire must be laid out or printed in such a way that the person who needs to read it is able to follow the instructions easily and answer all the questions that he or she is meant to answer.

The researcher found these guidelines useful and incorporated them into the data collection instrument used for the survey.

### **3.4.6 Questionnaire design**

This section gives a brief outline of the questionnaire. The questionnaire contains a section that describes e-government in order to enhance the respondents' understanding of the questions and enable them to answer all questions without difficulty. The questionnaire also contains a section that explains the procedure involved in answering the questionnaire.

### **3.4.7 Measures**

A survey of literature of similar studies helped determine the measured used. The measurement of variables was conducted with the help of a six-point Likert-type scale that ranged from "strongly agree" to "strongly disagree". The questionnaire also included questions that required checking-off and scaled responses such as "Yes", "No" and "I don't know". All constructs in this research model were operationalized using standard scales from literature.

### **3.4.8 Instrument validation**

According to Litwin (1995) before a data collection tool is used in a research its reliability has to be measured as these instruments' measurement error differs. In this study the researcher consulted a statistician to ascertain the instrument reliability and its content validity to ensure that it included all relevant content.

### **3.4.9 Pilot of questionnaire**

Saunders, et al., (2007) recommends that before a questionnaire is administered, a pilot study should be conducted with the questionnaire. The aim of this exercise is to obtain valuable feedback from a test group that will enable the researcher to improve the standard of the questionnaire. This eliminates errors such as complex questions, or unclear questions. Saunders, et

al. (2007) also states that running a pilot enables the researcher evaluate aspects of the questionnaire such as validity and reliability.

The questionnaire used in this research was piloted on 10 respondents (Fink, 2003). When the questionnaire was distributed to the respondents they were kindly requested to add comments to the questions. These responses were later incorporated into the final questionnaire that was distributed at a later stage. Some of the issues highlighted by the pilot group were the phrasing of questions, lack of clarity of some questions and unclear instructions.

#### **3.4.10 Administration of questionnaire**

Walliman (2005) noted the benefits and pitfalls of the two basic methods of questionnaire administration, one being, personally delivering as opposed to posting, with e-mail being similar to posting. Bearing this in mind, the researcher emailed the questionnaires and followed up with personal deliveries to optimise the response rate. The questionnaire was emailed together with the regional manager's letter granting the researcher permission to conduct the research and the same was done with the personal deliveries. The latter allowed the researcher to be able to explain any issues the respondents had with filling in the questionnaire, to provide reassurance that the data would be kept confidential, to emphasise the benefits that participation could have for the respondents and to remind the respondents to fill in the questionnaire.

### **3.5 SAMPLING FRAME**

Gay & Lorrie (2006) offer guidelines on sample sizes. The authors recommend that for populations of less than 100 people or units, the entire population be surveyed. The total number of questionnaires returned was 47 out of an identified population of 52 SITA employees in SITA KwaZulu-Natal offices, that is, the Pietermaritzburg and Durban offices combined. The population included management staff, technical personnel, consultants and trainers. This data set was then analysed using a statistical application called SPSS version 19.0.

### **3.6 SETTING UP ENCODING PARAMETERS IN SPSS 19**

Data were entered directly into SPSS. In data view of SPSS, data files are organized by cases (rows) and variables (columns). Figure 5 shows data captured of the technology implementers. A row of data represents data from an individual respondent. Each question response from the survey represented a variable. Variables are of different types, including numbers, strings and dates. Below is the screenshot of the data editor in the data view of the researchers' respondents.

1 : Formno 1 Visible: 38 of 38

	Formno	q1	q2	q3	q4	q5	q6	q7	q8	q9a
1	1	5	Don't know	6	4	3	6	reduce digi	basic com	yes
2	2	6	Don't know	6	6	6	3	social incl	basic com	yes
3	3	6	DPSA	1	1	6	6	financial s	basic com	yes
4	4	6	Don't know	.	.	.	.	.	.	.
5	5	5	Don't know	.	.	.	.	.	.	.
6	6	5	Don't know	3	3	3	5	improve di	basic com	yes
7	7	2	DPSA	2	2	2	2	social incl	basic com	yes
8	8	5	DPSA	2	2	3	2	improve di	basic com	yes
9	9	6	Don't know	.	.	.	.	reduce digi	basic com	yes
10	10	6	Don't know	2	1	3	2	social incl	basic com	yes
11	11	5	SITA	5	5	4	5	social incl	no comput	I dont kno
12	12	4	SITA	6	6	6	6	financial s	basic com	yes
13	13	4	SITA	2	6	2	1	improve di	intermedia	no
14	14	2	Don't know	6	2	2	4	improve di	basic com	yes
15	15	5	Other	2	1	.	3	reduce digi	basic com	yes
16	16	4	DPSA	1	2	4	2	social incl	advanced	yes
17	17	3	DPSA	5	5	2	2	social incl	basic com	no

SPSS Processor is ready

**Figure 5: A screenshot example of the Data View in SPSS**

The researcher initially had to define the variables that would be used. This data was defined in variable view. Variable view is shown in Fig. 6 below.

	Name	Type	Width	Decimals	Label	Values	Missing	Column
1	Formno	Numeric	1	0		None	None	8
2	q1	Numeric	1	0	Preparedness	None	None	8
3	q2	Numeric	1	0	Department in	{1, DPSA}...	None	8
4	q3	Numeric	1	0	Importance of	None	None	5
5	q4	Numeric	1	0	Importance of	None	None	5
6	q5	Numeric	1	0	Slow pace of I	None	None	6
7	q6	Numeric	1	0	ICT policy add	None	None	5
8	q7	Numeric	1	0	Motivation for I	{1, provide inte	None	8
9	q8	Numeric	1	0	Level of comp	{1, advanced c	None	8
10	q9a	Numeric	1	0	Intent of ICT d	{1, yes}...	None	8
11	q9b	Numeric	1	0	Intent of ICT d	{1, yes}...	None	8
12	q9c	Numeric	1	0	Intent of ICT d	{1, yes}...	None	8
13	q9d	Numeric	1	0	Intent of ICT d	{1, yes}...	None	8
14	q9e	Numeric	1	0	Intent of ICT d	{1, yes}...	None	8
15	q9f	Numeric	1	0	Intent of ICT d	{1, yes}...	None	8
16	q10a	Numeric	1	0	Number of co	None	None	8
17	q10b	Numeric	1	0	Poor public ke	None	None	8
18	q10c	Numeric	1	0	Choice of tech	None	None	8

SPSS Processor is ready

**Figure 6: A screenshot example of the Variable View in SPSS**

### 3.6.1 Representing results by means of tables and graphs

Jackson (2008) explains that tables and graphs can help explain data sets more clearly, thereby increasing the meaningfulness of the data. Jackson explains that data can be represented as either frequency distributions or graphs. Tables and graphs were used to represent the results of the data analysis and helped to draw meaningful conclusions. Jackson (2008: 107) defines bar graphs as “a graphical representation of a frequency distribution in which vertical bars are centred above each category along the x-axis and are separated from each other by a space indicating that the levels of the variables represent distinct, unrelated categories.” The researcher chose to generate tables and graphs that had significant results to include in the discussion of this research and would help explain the various phenomena surrounding the deployment of Information Communication Technology initiatives to rural communities of KwaZulu-Natal. Below is the demographic breakdown of the group of respondents for this study (Figure 7), also showing the frequency of the various categories of respondents.

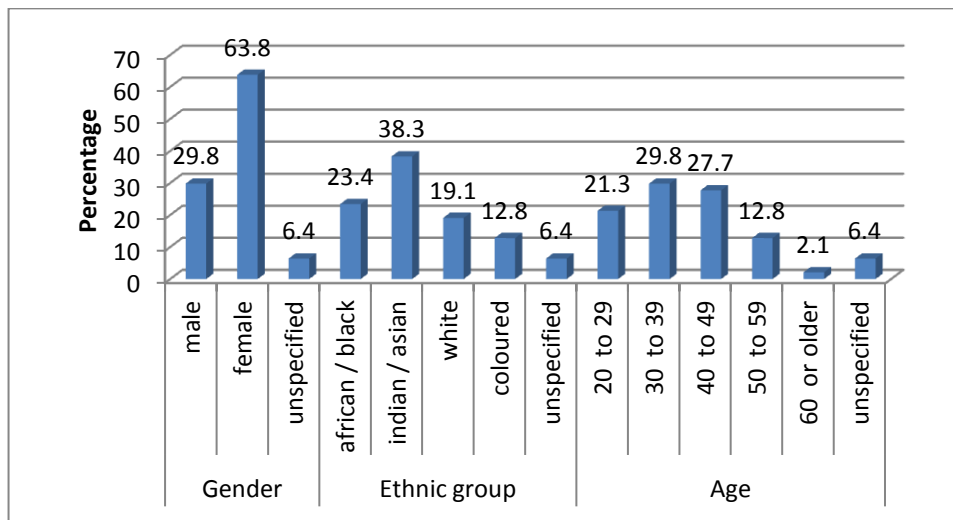
		%	Frequency
<b>Gender</b>	Male	29.8	14
	Female	63.8	30
	Unspecified	6.4	3
<b>Ethnic group</b>	African / Black	23.4	11
	Indian / Asian	38.3	18
	White	19.1	9
	Coloured	12.8	6
	Unspecified	6.4	3
<b>Age</b>	20 to 29	21.3	10
	30 to 39	29.8	14
	40 to 49	27.7	13
	50 to 59	12.8	6
	60 or older	2.1	1
	Unspecified	6.4	3

**Figure 7: A typical frequency table generated by SPSS 19 showing demographical data**

Figure 8 shows an example of one of the bar graphs generated for the purpose of helping understand the demographic data of this research. The bar graph represents a combined demographic representation of the technology implementers, showing the gender, ethnic group and age of respondents. The data was generated by asking the technology implementers to com-



plete the following statements: “My gender is”; “I belong to the following ethnic group”; and “My age falls within the range.” On analysis of the graph below, the following conclusions were easy to come to. More females than males took part in the survey, most of the technology implementers surveyed belonged to the Indian / Asian ethnic group, and the age distribution is fairly even. It is through the use of typical empirical data such as that drawn from the above bar graph that the researcher drew his conclusions and recommendations.



**Figure 8: A typical bar graph generated by SPSS 19 showing demographical data**

### 3.7 ETHICAL CONSIDERATIONS

The researcher was very vigilant about ethical issues that might have had an undesirable impact on the respondents of this research. Hence the methodology used for this research was carefully constructed to take these ethical issues into account. Issues that fell under ethics such as Anonymity, Informed consent and the right of a respondent to withdraw from participating in this research were dealt with accordingly.

Respondents were asked to give their consent to participate in the research by them signing an informed consent letter (Appendix 4) before taking part in the research. The respondents were also assured of total anonymity and confidentiality regarding their identity and input into the research. The researcher also availed himself for any clarifications regarding the research and questions posed in the questionnaire and made the respondents aware of their right to withdraw from participating from the research.

### **3.8 DETERMINING THE STATISTICAL SIGNIFICANCE OF THE RESULTS**

The researcher used statistical and inferential tests to interpret data and to validate the results of the study. Statistical tables were used to interpret data and to describe the results visually. Waliliman (2005) states that descriptive statistics provide a means of measuring the characteristics of data, finding its middle point, how widely the data is dispersed and how various aspects of the data are related to each other. In this study the statistical tests such as descriptive statistics, graphical statistics and frequency tables were used. In addition to the inferential statistics, tests such as parametric tests were also conducted.

In the final chapter the researcher will explain that, in spite of the application of the above quantitative tests, there are qualitative reasons why the results of the survey should be treated with circumspection.

### **3.9 CONCLUSION**

This chapter has described the processes followed in order to answer the research questions posed at the onset of this research. The rationale covering, the choice of philosophy, research approach, strategy, choice, time horizon and techniques and procedures for data collection and analysis was given. This also included a discussion of the research instrument. The researcher also described how permission to conduct the research was obtained from gatekeepers, and the sampling frame. The chapter also outlines the ethical procedures undertaken.

In the next chapter the researcher discusses the fieldwork conducted, the data analysis and the interpretation conducted in order to draw conclusions and make informed recommendations.

## **CHAPTER 4**

### **FIELDWORK, DATA PROCESSING AND DATA ANALYSIS**

#### **4.1 INTRODUCTION**

Methodological procedures adopted in this research were discussed in the previous chapter. It also included the data collection instrument used to gather the data necessary for answering the research questions posed in chapter one. This current chapter continues by outlining the fieldwork and presenting the findings, followed by a discussion on the perspectives of technology implementers on the deployment of Information Communication Technology to rural communities of KwaZulu-Natal. This chapter seeks to demonstrate the extent to which the research questions presented in this research have been answered using the empirical data obtained.

#### **4.2 FIELDWORK**

The data collection method was through the use of a questionnaire that was administered electronically to the technology implementers using SITA organizational e-mail addresses. The low responses from the respondents prompted the researcher to follow this method up with several physical visits to the SITA premises to solicit manual responses from the respondents. The researcher's initial perception was that most respondents were not willing to take part in the study because of genuinely busy time schedules, which led the researcher to make one-on-one appointments with the particular technology implementers. Another reason for the poor response rate was a general fear on the part of the respondents of a negative response if they took part. This fear was almost totally removed after several assurances that the study was anonymous and for academic purposes. After the reassurances the response rate drastically improved, especially after the SITA regional manager sent out a request to staff members to assist in the study.

Due to the multiple sites of SITA offices in KwaZulu-Natal province, the data collection exercise was very challenging as on numerous occasions the researcher had to travel long distances to meet with the various technology implementers, who are constantly in the field. This was very tiring and time-consuming.

### 4.3 ANALYTICAL PROCEDURES

Firstly, graphical and descriptive analyses were carried out. A summary on the insights of technology implementers regarding deployment of Information Communication Technology to rural communities of KwaZulu-Natal province was generated using bar graphs and frequency tables. This analysis was with the aid of a statistical application called SPSS version 19. The descriptive statistics generated helped to provide the summary of insights about the technology implementers. The descriptive statistics differ from inferential statistics that seek to give a researcher an insight of the population the respondents are thought to represent. Part of the descriptive statistics was the respondent demographics, calculating the mean, mode, median and standard deviation of the sampling frame; this helped the researcher develop a better understanding of the sample under study.

A number of tests were applied on the data set. The Kolmogorov-Smirnov test that is nonparametric in nature was used in an attempt to determine if the data sets differ significantly. The advantage of using the Kolmogorov-Smirnov test was that it allowed for the generation of graphical representation of the data that made it easier to check for whether the distribution of the data was normal or non-normal. Establishing the distribution of data was the point of departure in terms of this analysis. It was with the results of the distribution in mind that the researcher identified the most suitable subsequent tests to follow. For data that had a normal distribution, a parametric test was applied. In order to assess if the average score on perspectives of technology implementers regarding deployment of Information Communication Technology in rural KwaZulu-Natal province were tending towards strongly agree, agree or strongly disagree and disagree a parametric tests such as the one-sample t-test was used. This parametric test was preferred because a parametric test is used to assess data that is ranked into categories such as the strongly agree, agree or strongly disagree and disagree classification. Nonparametric tests were applied on data that was found to have a non-normal distribution. Specifically the chi-square test was applied.

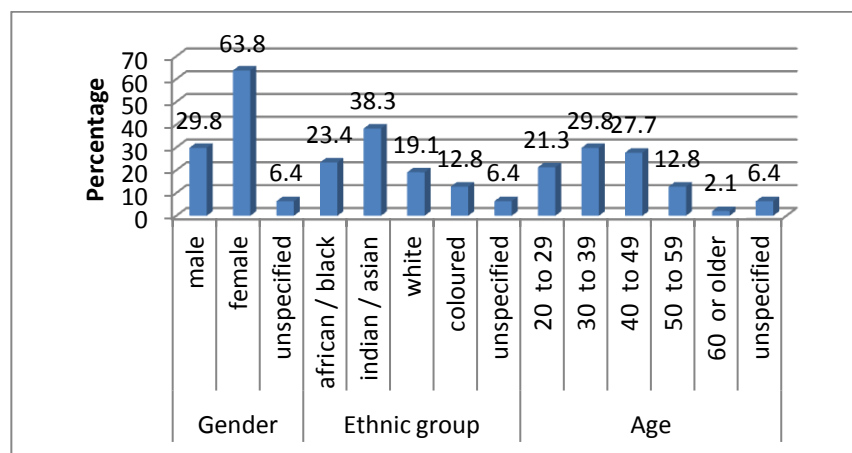
The chi-square test aided the researcher by analysing data measured using normal scales. The chi-square value that is calculated was compared to a predetermined chi-square value (actual versus allocated). If the actual value is equal or greater than the allocated then the null hypothesis is rejected but if the actual is less than the allocated then the null hypothesis is accepted. This test helped the researcher ascertain if the perspectives of the technology implementers were key drivers to successful deployment of Information Communication Technology in rural KwaZulu-Natal or not, based on the distribution of the responses within the question categories.

The Cronbach's Alpha test is another test that the researcher used. The purpose of using this test was to ascertain the consistency and reliability of questions. Questions with the same range were tested for consistency. The general rule of thumb that was followed was that questions that showed a value of 0.7 or higher indicated good internal consistency and reliability. It is this rule that some statisticians apply to determine whether a data collection instrument can be used or not.

## 4.4 RESULTS OF THE SURVEY

### 4.4.1 Demographic characterization of respondents

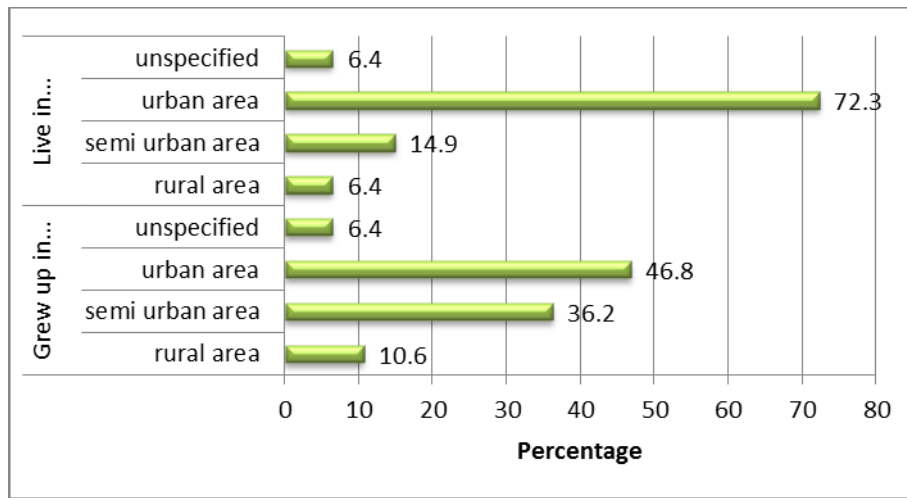
The age group ranges for the respondents are 20-29, 30-39, 40-49, 50-59, 60 or older, and unspecified. The respondents' ages are presented in Fig. 9 below in the form of a bar graph. The highest number of respondents is in the age group of 30-39 with a 29.8% response rate. This distribution indicates that the majority of technology implementers of information technology initiatives for government in KwaZulu-Natal are aged between 30-39, with a 29.8% response rate, followed by respondents aged between 40-49, with a response rate of 27.7%.



**Figure 9: Demographic data (gender, ethnic group and age) of respondents**

The results also show that more females took part in the survey (63.8%) as compared to males (29.8%). The ethnic groups that were dominant included Indian/Asian (38.3%) and African/Black (23.4%), while the modal age groups were 20-29 years (21.3%), 30-39 years (29.8%) and 40-49 years (27.7%). There was a comparatively small percentage (21.3%) of respondents aged 50 and above. This low response rate of respondents aged 50 and above can be attributed to the fact that there are fewer employees within this age group in the sampling frame. This is supported by the total number of identified respondents which stands at 52 respondents.

#### 4.4.2 Area respondent grew up in



**Figure 10: Areas in which respondents grew up / live**

The above bar graph reveals that the majority of the technology implementers grew up in urban areas (46.8%) and semi-urban areas (36.2%), while a similar trend is seen in that the majority of the respondents live in urban areas (72.3%) and semi-urban areas (14.9%). The smallest number of technology implementers grew up (10.6%) and live in (6.4%) rural areas, while a notable 6.4% of respondents did not specify where they grew up and live.

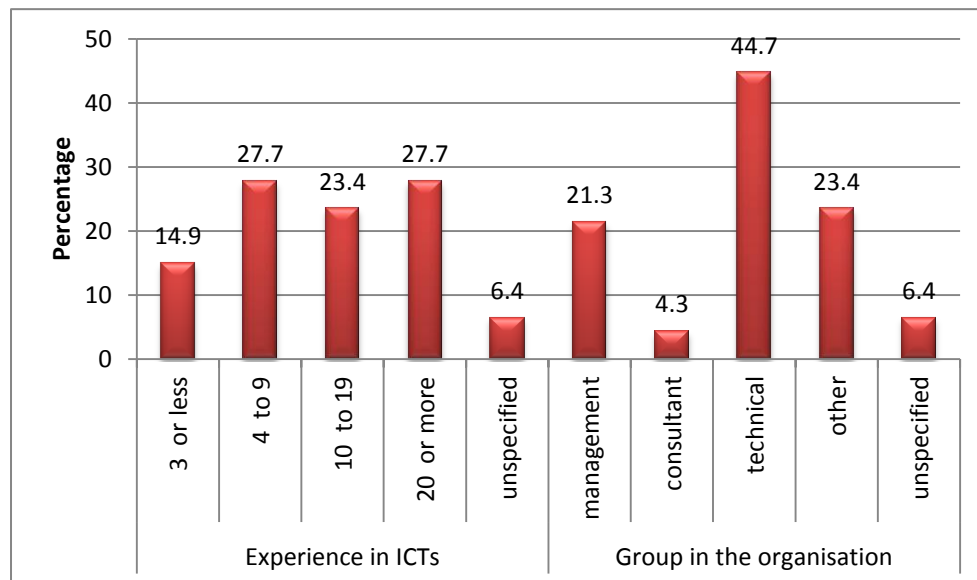
There is a margin of 4.2% between technology implementers who grew up in rural areas and the number of technology implementers who live in rural areas. Therefore, area could be used as one of the variables to establish whether there is a difference between growing up/living in rural areas and growing up/living in urban areas with regard to the manner in which technology implementers' perspectives differ.

The reduction in the number of technology implementers who grew up in rural areas compared to the number of technology implementers who live in rural areas can be attributed to the migration towards better education and job opportunities. This migration has a positive impact on technology deployment initiatives in rural communities, as these technology implementers can use their personal experience of social and cultural factors in rural communities to deploy Information Communication Technology successfully.

#### 4.4.3 Experience in Information Communication Technology

		%	Frequency
<b>Experience in ICT</b>	3 or less	14.9	7
	4 to 9	27.7	13
	10 to 19	23.4	11
	20 or more	27.7	13
	Unspecified	6.4	3
<b>Group in the organisation</b>	Management	21.3	10
	Consultant	4.3	2
	Technical	44.7	21
	Other	23.4	11
	Unspecified	6.4	3

**Figure 11: Experience in Information Communication Technology / group in the organisation**



**Figure 12: Experience in Information Communication Technology / group in the organisation**

The figure 11 and 12 show that over half the respondents have experience in Information Communication Technology, which is a very important determinant in the successful deployment of ICT initiatives. The level of experience ranged from 4-9 years (27.7%), 10-19 years (23.4%) and 20 or more years (27.7%). Furthermore, the modal occupied group in the organization was technical (44.7%), management (21.3%), and other occupations (23.4%)

The demographic data presented above gives an overview understanding of the characteristics of the sampling frame. It is relevant to understand the sampling frame so as to ascertain if there are any relationships that may exist between the demographic characteristics of the data and the results of the data analysis. These relationships are tested and results presented in section 4.8 below.

## **4.5 DESCRIPTIVE STATISTICS**

The researcher utilised the mean, the mode, the median, the sample variance and the sample standard deviation to generate the descriptive statistics. The mean was calculated by totalling the values for all observations and dividing by the total number of observations. The median was obtained by placing data in ascending or descending order and then picking the middle value. Sometimes it is possible to have two middle values in which case the average of the two is taken and represents the median. Mode was obtained by identifying an occurrence that is most frequent given the range of occurrences. It is possible as well to have two modes in which case the data set is referred to bi-modal. The standard deviation was obtained by using a measure of dispersion from the mean. This meant that a high standard deviation represented data being widely dispersed from the mean whilst a low standard deviation represented less dispersion and closer to the mean. The sample variance was obtained by measuring of how far the given set of numbers is spread out.

On analysis of the descriptive statistics generated in figure 16, majority of the questions have a mode value of “1” and some of the questions have a mode value of “2”, which translates into “strongly agree” and “agree”. The data also indicates that there is a good consistency with regards to the standard deviation. Most of the responses indicated a standard deviation of about “1”, this showed that dispersion from the mean was not very wide.

### **4.5.1 Kolmogorov-Smirnov test**

The following hypotheses were put forward in order to test if the distribution was normal or non-normal.

$H_0$ : the tested variables come from a Normal distribution



$H_1$ : the tested variables do not come from a Normal distribution

	<b>Kolmogorov Smirnov Z</b>	<b>Asymp. Sig. (2-tailed)</b>
Preparedness to participate in e-government	1.688	.007
Department in charge of ICT policy	1.694	.006
Importance of geographical location	1.638	.005
Importance of ICT policy document in deployment	1.678	.007
Slow pace of ICT policy document development	1.823	.000
ICT policy addressing rural areas	1.607	.008
Motivation for ICT deployment	1.634	.010
Level of computer skills required	2.681	.000
Intent of ICT deployment to rural areas: e-mail	3.425	.000
Intent of ICT deployment to rural areas: Internet	3.362	.000
Intent of ICT deployment to rural areas: research	3.000	.000
Intent of ICT deployment to rural areas: chat	1.743	.005
Intent of ICT deployment to rural areas: instant messaging	1.736	.005
Intent of ICT deployment to rural areas: access to information	3.524	.000
Number of computers is sufficient	1.845	.002
Poor public key infrastructure is the cause of lack of ICT	1.743	.004
Choice of technologies in rural areas	1.732	.004
Effect of culture on user acceptance	1.927	.000
There are other more important issues in rural areas	2.074	.000
Computers should be used for financial benefit	2.216	.000
Computers should be used more in rural areas	1.961	.001

Are computers evenly distributed?	2.643	.000
Is infrastructure to support ICT available?	2.904	.000
Do you think e-learning is a priority?	2.621	.000
Do you think e-government is a priority?	2.705	.000
Is cost of access an inhibiting factor?	2.470	.000
Does the government consider ICT to be a priority?	1.708	.006
Are there initiatives to deploy ICT in rural areas?	1.786	.003
Is Internet access part of those initiatives?	2.189	.000
Are current ICT deployment initiatives sufficient?	2.705	.000

**Figure 13: Kolmogorov-Smirnov Test results**

Based on the above results of the Kolmogorov-Smirnov test, results that were considered significant (lower than or equal to 0.05) meant that they did not have a normal distribution and therefore the researcher rejects  $H_0$ . This meant that the researcher had to apply nonparametric tests such as the chi-square test, the Mann-Whitney U test, and the Kruskal Wallis test were it was required.

## **4.6 EMPIRICAL RESULTS OF STUDY**

### **4.6.1 Objective 1: To identify what the factors are that affect access to Information Communication Technology in KwaZulu-Natal province are.**

#### **Chi-square goodness of fit test**

Coakes & Steed (2003:195) distinguish the two types of chi-square tests “the chi-square test for the goodness of fit applies to the analysis of a single categorical variable, and the chi-square test for independence or relatedness applies to the analysis of the relationship between two categorical variables.” This explanation helped the researcher conclude on the use of the “chi-square test for the goodness of fit”. The main motivation for the use of this test was to determine the frequency of chosen options in comparison to others. Under the null hypothesis it is assumed that all options are equally likely to be selected. A 5% significance level is used for all testing.

Figure 14 below shows a summary of the analysis. All significant results are in highlighted red text.

The tested hypothesis for all the questions is:

H<sub>0</sub>: there is an equal distribution of responses per category in each of the questions

H<sub>1</sub>: there is an unequal distribution of responses per category in each of the questions

Question		p-value	Option selected significantly more often than others
5	Slow pace of ICT policy document development	0.509	6
6	ICT policy addressing rural areas	0.546	
10a	Number of computers is sufficient	<.0005	
10b	Poor public key infrastructure is the cause of lack of ICT	0.4	
10e	There are other more important issues in rural areas	0.5	1
10g	Computers should be used more in rural areas	<.0005	
11a	Are computers evenly distributed?	<.0005	
11b	Is infrastructure to support ICT available?	<.0005	
11e	Is cost of access an inhibiting factor?	0.001	Yes
11f	Does the government consider ICT to be a priority?	0.039	No
11g	Are there initiatives to deploy ICT in rural areas?	0.320	“no” selected less often
11h	Is Internet access part of those initiatives?	0.002	
11i	Are current ICT deployment initiatives sufficient?	<.0005	

**Figure 14: A table showing Chi-square goodness of fit test results for questions 5, 6, 10 and 11**

Looking at the overview of the results of this analysis, question 10a shows that significantly ( $p < .0005$ ) more respondents than expected indicated that the number of computers is insufficient

to allow members of rural communities in KwaZulu-Natal adequate access to Information Communication Technology. This is a very important perspective from the technology implementers because this suggests that before technology deployment takes place, the initiatives must take into account the population factor in order to service the community in question well and avoid creating a bottleneck effect when community members flock to access the service. This would create a negative perception in the minds of community members, as the people would end up getting frustrated when the services are always unavailable due to the low number of computers provided.

Question 10g shows that significantly more ( $p < .0005$ ) technology implementers than expected indicated that computers should be used more in rural areas (DPSA 2001). This finding suggests that there is insufficient usage of computers that could point to the fact that the current technology deployments are not fully appreciated hence people shunning to use this technology that exists in their communities.

Question 11a shows that significantly more ( $p < .0005$ ) than expected technology implementers felt that the distribution of technology is not even. This could be due to the sparsely populated nature of the province. It also point out that there could be an after effect of hindering access to the technologies because people who live in these rural communities will now have to walk very long distances to where these initiatives are accessible. This factor is very important when it comes to the sustainability of these deployments as people will tend to shun their use if they have to walk long distances just to be able to access them.

Question 11b ( $p < .0005$ ) again shows that significantly more than expected technology implementers indicated that there is no infrastructure to support the deployment of Information Communication Technology initiatives. This finding further suggests that it may be a prerequisite to have a good infrastructure setup available before technology initiatives can successfully take root in rural communities. This finding is supported by literature (James, 2007) that identifies infrastructural problems as some of the reasons to why rural communities are not part of digital community.

Question 11e shows that significantly more ( $p = 0.001$ ) technology respondents indicated that cost of access is an inhibiting factor (Billon, et al., 2009). This suggests that government should look at ways in which it can try to mitigate costs for rural communities or consider options such as full liberalisation of the telecommunications industry to allow the low costs due to competition to trickle down to the consumers. Government can also consider subsidising companies

which take Information Communication Technology initiatives to these areas or offer incentives such as tax exemptions.

Question 11f shows that significantly more ( $p = 0.039$ ) than expected technology implementers responded that the government does not consider Information Communication Technology as a priority. This could suggest that the government has more pressing needs to attend to first such as clean water, food and sanitation and as much as it considers access to ICTs important these other issues are higher up the list of priorities.

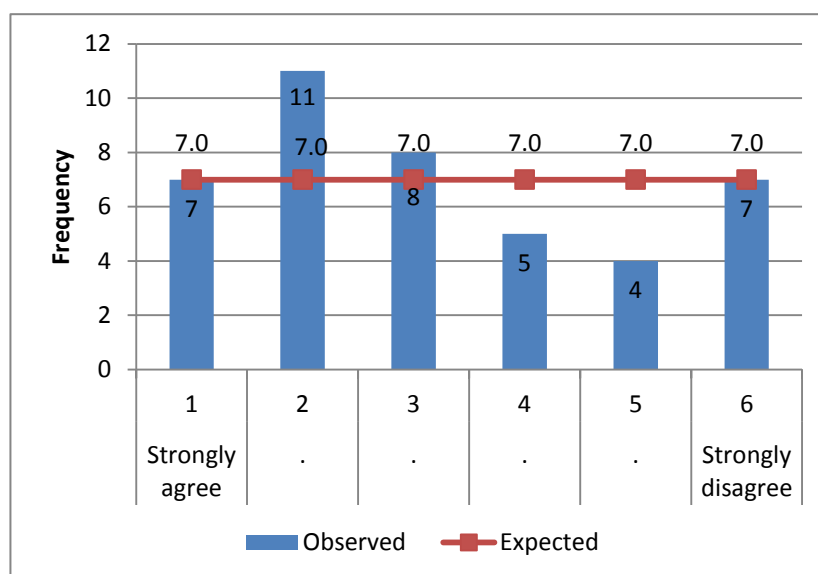
Question 11h shows that significantly less ( $p = 0.002$ ) technology implementers selected no. This finding suggests that most of the technology implementers were not sure of the availability of internet as a product of the deployment of technology. Question 11i shows that significantly more ( $<0.0005$ ) than expected technology implementers indicated that the current Information Communication Technology initiatives deployed in KwaZulu-Natal are not sufficient. This suggests that government should encourage the rollout of more of these initiatives and create more enabling environments for their deployment.

The frequencies of these questions have been graphed and appear below. Note, on some of them expected values have been added (that is the value expected if all options are chosen equally often).

The results revealed p-values are below 0.05 (shaded in red), the results are skewed towards a certain category and there is no equal distribution in the choices of respondents for the questions. The graphs below now reveal the distribution of responses over several questions, and illustrate the breakdown and skewedness in favour of certain categories.

The researcher makes use of questions 5, 6, 10a, 10b, 10e, 10g, 11a, 11b, 11e, 11f, 11g, 11h, 11i, and consider the descriptive and graphical statistical analysis of these questions.

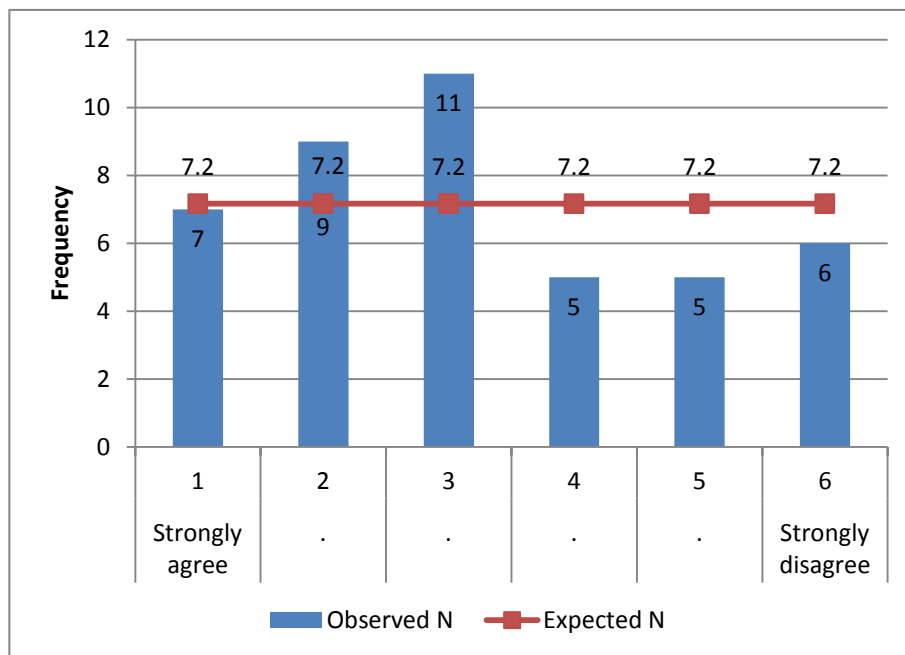
### Question 5. Slow pace of ICT policy document development



**Figure 15: Technology implementers' perspectives on the pace of the ICT policy framework formulation**

The majority of the technology implementers agreed and strongly agreed on the importance of Information Communication Technology policy document development. 26 out of the total of 42 technology implementers who answered this question had a positive response towards this question. This means that technology implementers do value the ICT policy frameworks the government is developing to underpin the deployment of ICT, and the slow rate of policy formulation will have a negative impact on ICT deployment in rural communities of KwaZulu-Natal. One of the reasons for the delay in policy formulation is the lack of involvement of stakeholders who are knowledgeable about these rural communities' needs, and therefore in order to expedite the process of policy formulation it is important to include such individuals. The individuals can include technology implementers who are familiar with these rural communities as a result of currently living in these communities or growing up in them. Evidence in this study shows that there has been a migration from technology experts from rural areas to urban areas, and it is this knowledge base that the policy makers can tap into.

### Question 6. ICT policy addressing rural areas

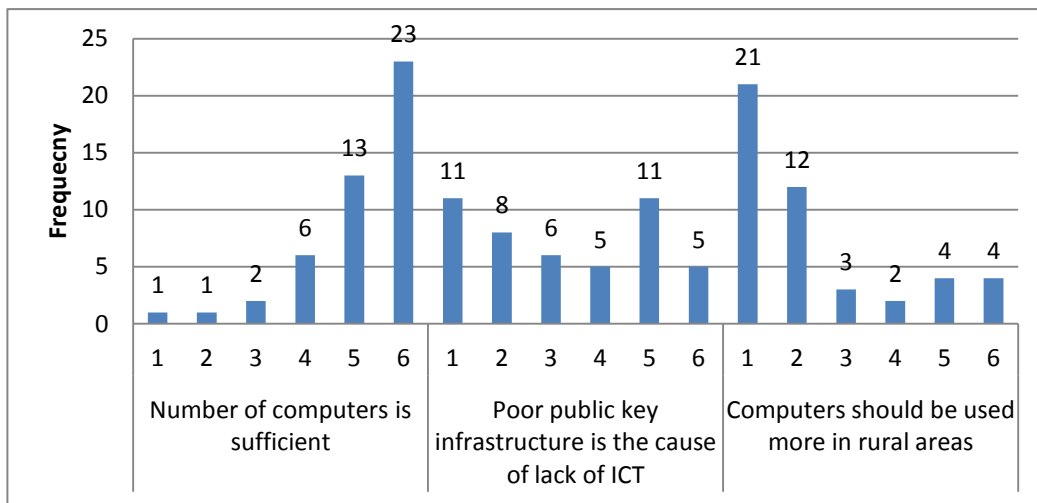


**Figure 16: Responses of technology implementers on the importance of ICT policy addressing rural areas**

As illustrated in figure 16 above, 27 out of a total of 43 technology implementers who responded to this question gave a positive response on the importance of an Information Communication Technology policy framework in the deployment of ICT to the rural communities of KwaZulu-Natal. The majority of the technology implementers responses were somewhat agreed, agreed and strongly agreed on the importance of ICT policy addressing rural areas. A policy framework specifically designed for the deployment of ICT is important because rural areas have unique challenges when it comes to technology deployment as compared to urban areas. Sparsely populated areas, low literacy levels, insufficient infrastructure and lack of financial capacity are challenges that are more predominant in rural areas, and hence tailor made policy frameworks that target rural communities and are informed by these challenges are necessary for the successful and sustainable deployment of ICT initiatives.



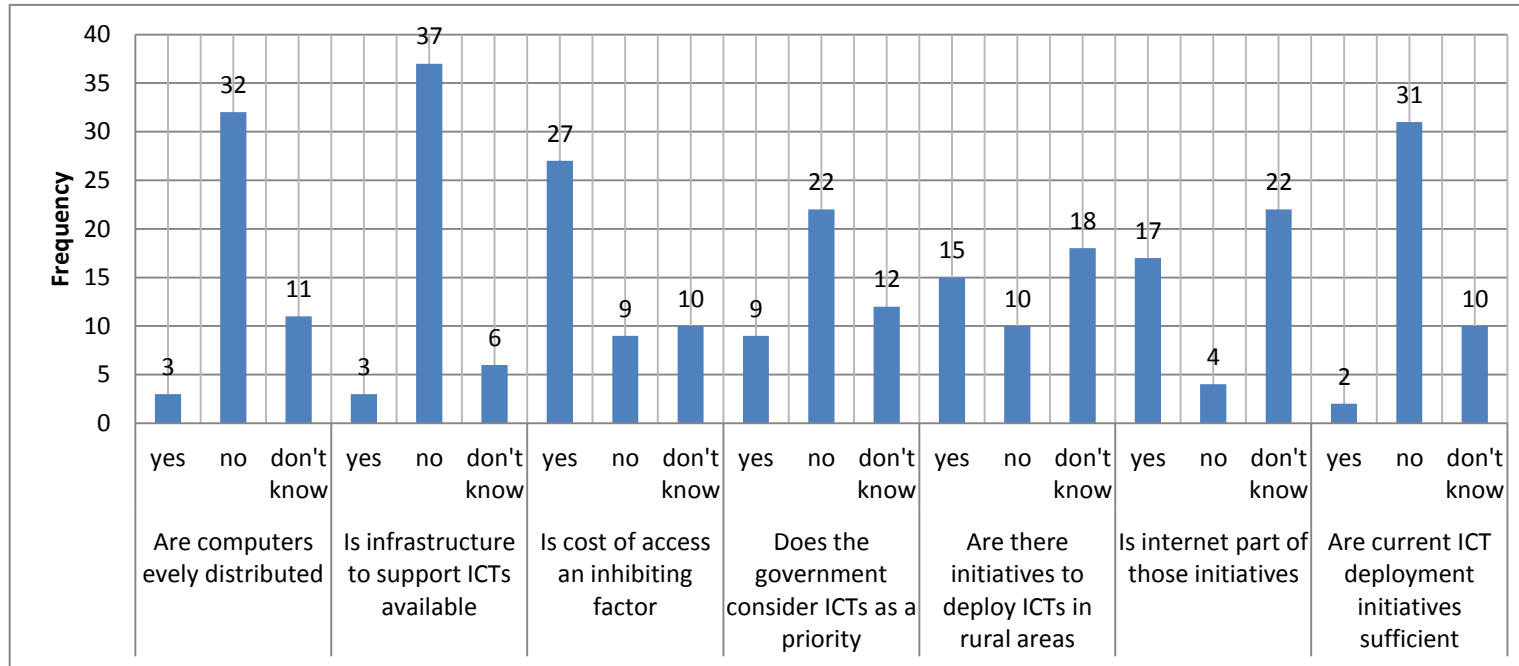
### Questions 10A, B, E



**Figure 17: Combined responses of technology implementers on the number of computers, infrastructure and use of computers**

Looking at the above bar graph showing combined responses of technology implementers on the number of computers, infrastructure and use of computers, it is evident that respondents believe that the number of computers is insufficient, with 32 technology implementers out of 36 technology implementers stating as such. The technology implementers disagreed to strongly disagreed with respect to the number of computers being sufficient. 25 technology implementers out of 46 who answered this question felt that poor key public infrastructure is the cause of lack of Information Communication Technology, while the only issue that the respondents agreed to strongly agreed was that computers should be used more in rural areas, with 36 technology implementers out of a total of 46 who answered this question. The almost even number of responses between the technology implementers who felt that poor key public infrastructure is the cause of lack of ICT and those who disagreed with this statement is noted and makes interesting findings. It would be interesting in further research to interrogate this result.

### Question 11



**Figure 18: Combined responses of technology implementers on computer distribution, infrastructure, ICT prioritization by government, initiatives for ICT deployment, Internet and whether ICT initiatives are sufficient**

Figure 18 reveals technology implementers' perspectives on the distribution of computers in rural communities of KwaZulu-Natal. Hewitt de Alcantara (2001) and Rambowan, et al., (2005) believe that Information Communication Technology can contribute positively towards alleviating poverty, hence there is a need on the part of the government to plan for deployment of technology initiatives carefully in order to avoid concentrating initiatives in one area at the expense of another. 32 technology implementers answered negatively to the question on whether computers are evenly distributed, while 3 said yes and 11 did not know. In response to question 11B, which focuses on the availability of infrastructure to support ICT deployment in rural areas, such as electricity supply, 37 out of 46 technology implementers felt that there is no available infrastructure to support ICT deployment. This perspective somewhat contradicts the answer given by the technology implementers to question 10B on whether poor key public infrastructure is the cause of lack of ICT (21 technology implementers responded "no"). This perspective of technology implementers on infrastructure availability concurs with (James, 2007), who asserts that infrastructure plays an important role in creating a digitally inclusive society. Technology implementers also agreed (27 out of a total of 48) that the cost of access is an inhibiting factor, whilst the technology implementers are unaware or do not know about new initiatives to deploy ICT to rural communities in KwaZulu-Natal (18 responded "don't know," 15 responded "yes" and 10 responded "no"). The results also reveal that technology implementers felt that government does not consider ICT as a priority (22 responded "no," 9 responded "yes", while 12 responded "don't know"). These mixed perspectives can have a negative effect on deployment initiatives and hence the need for training or sensitization workshops for technology implementers. On a positive note, the results revealed that there are initiatives to deploy ICT to rural communities in KwaZulu-Natal (15 responded "yes," 10 responded "no," while 18 responded "don't know"). The technology implementers felt that the current ICT initiatives are not sufficient (2 responded "yes," 31 responded "no," whilst 10 responded "don't know") and they did not know if Internet access is part of the initiatives of government (17 responded "yes," 4 responded "no," whilst 22 responded "don't know").

#### **4.6.2 Objective 2: To evaluate to what extent Information Communication Technology policies are considered important in the deployment of Information Communication Technology to rural communities in KwaZulu-Natal.**

In order to address this objective, we make use of the Chi-square test once again together with graphical statistics using questions 2 and 6 from the data collection instrument. The hypothesis that we wish to test is:

$H_0$ : there is an equal distribution of responses per category in each of the questions

$H_1$ : there is an unequal distribution of responses per category in each of the questions

Question		p-value	Option selected significantly more often than others
2	Department in charge of ICT policy	<.0005	DPSA/Don't know
6	ICT policy addressing rural areas	0.546	

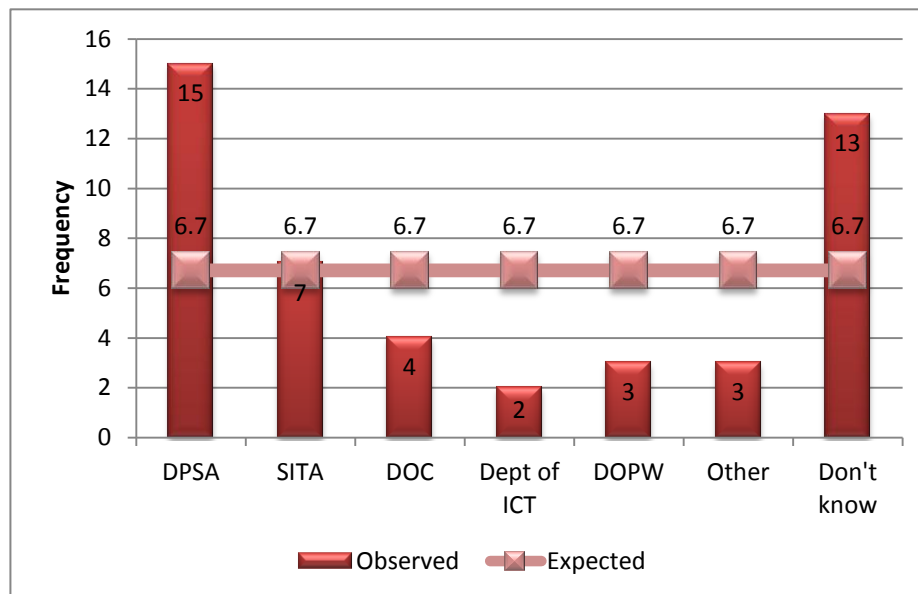
**Figure 19: Chi-square test results for question 2 and question 6**

At the 5% level, the researcher only rejected  $H_0$  for question 2 and concluded that there is a certain dominant perception or category for this question, while for question 6, the researcher accepted  $H_0$  and concluded that there is an equal distribution of responses per category of this question. The researcher then considered the graphical statistics.

#### **Question 2. Department in charge of ICT policy**

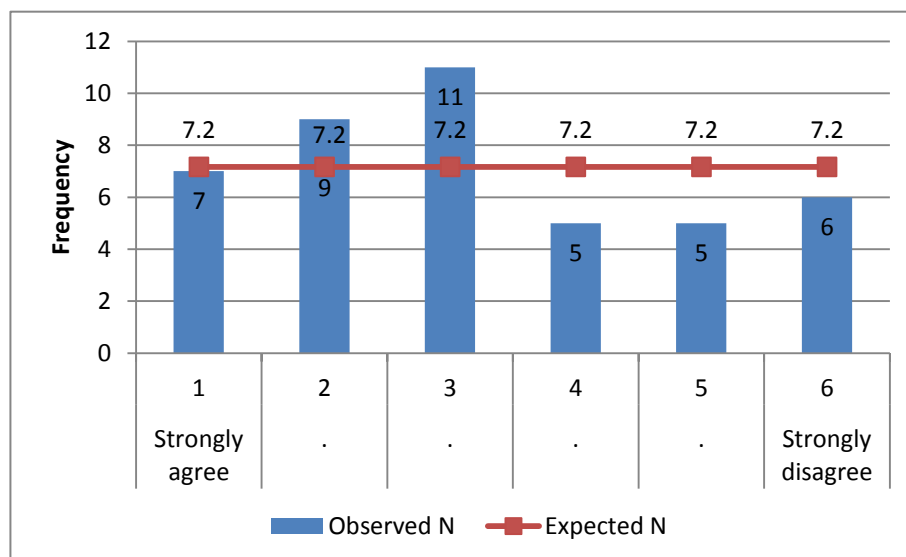
From the data collected and presented in the bar graph below the researcher sought to check the knowledge level of the technology implementers with regard to existing Information Communication Technology policies. The below results revealed that most technology implementers felt that the Department of Public Service and Administration (DPSA) was the government department in charge of the ICT deployment policy (15 technology implementers from a total of 47). Of the 47 technology implementers who answered this question, 13 did not know which government department is in charge of creating policy frameworks to support technology initiative deployment to rural communities. This perhaps points us in the direction of educating ICT implementers more extensively about departments in charge of ICT. The benefit of this knowledge is that if the technology implementers are aware of which department is in charge of technology policy frameworks for ICT deployment, and of the policies themselves, then it would help gov-

ernment and the technology implementers themselves have a measure as to what extent they have met their stated objectives in creating universal access to ICT.



**Figure 20: Responses from technology implementers on which department is in charge of ICT policy formulation (DPSA 2001)**

#### Question 6. ICT policy addressing rural areas



**Figure 21: Responses from technology implementers on ICT policy addressing rural areas**

Heeks (2009b) asserts that technology policy frameworks are of importance in ICT4D and can be seen in the inclusion of policy aspects in ICT4D 1.0 and 2.0. It is through these policy

frameworks that government is able to convey its direction and strategy regarding ICTs. Figure 21 shows that the majority of the technology implementers somewhat agreed (11), agreed (9) and strongly agreed (7) that it is important to have Information Communication Technology policy frameworks that are deliberately formulated to address the deployment of ICT to rural communities, the benefits of which have already been discussed by the researcher in the earlier part of this section.

It can be seen from the empirical evidence above that current Information Communication Technology policy frameworks are perceived to be important in the deployment of ICT to rural communities of KwaZulu-Natal, and therefore information on these policies should be transmitted to technology implementers for better results in achieving government objectives. In this case the empirical evidence is supported by literature regarding the importance of ICT policies.

#### **4.6.3 Objective 3: To determine what present Information Communication Technology in rural communities of KwaZulu-Natal are being used for**

In order to address this objective, the researcher made use of the Chi-square test once again together with graphical statistics, using questions 7, 9, 10c, 11c and 11d of the research instrument. The researcher wishes to test the following hypothesis:

$H_0$ : there is an equal distribution of responses per category in each of the questions

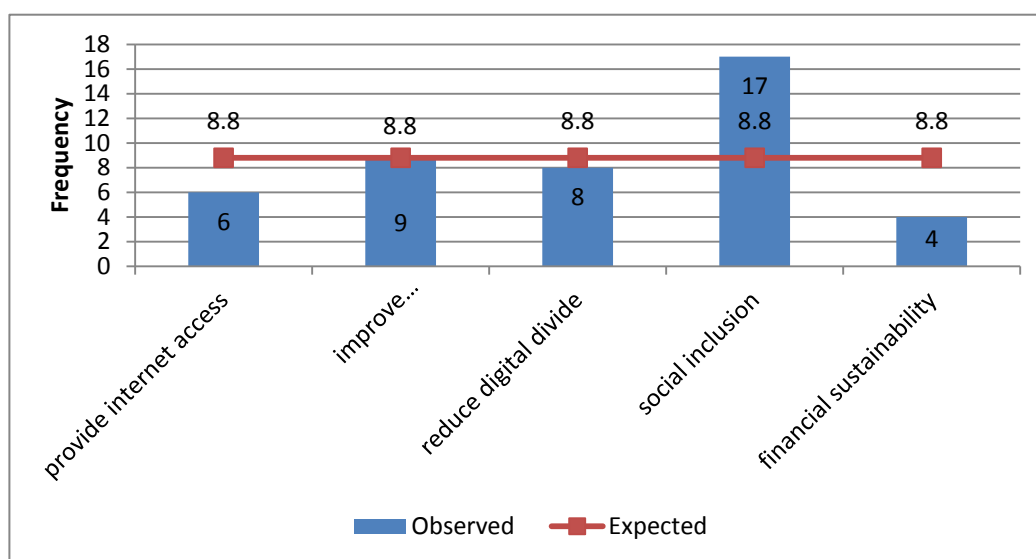
$H_1$ : there is an unequal distribution of responses per category in each of the questions

Question		P-value	Option selected significantly more often than others
7	Motivation for ICT deployment	0.024	Social inclusion
9a	Intent - e-mail	<.0005	Yes
9b	Intent - Internet	<.0005	Yes
9c	Intent - research	<.0005	Yes
9d	Intent - chat	0.021	No
9e	Intent - instant messaging	0.020	don't know' selected less often
9f	Intent - access to information	<.0005	Yes
10c	Choice of technologies in rural areas	0.118	
11c	Do you think e-learning is a priority?	<.0005	Yes
11d	Do you think e-government is a priority?	<.0005	Yes

**Figure 22: Chi-square test results on question 7, 9a, 9b, 9c, 9d, 9e, 9f, 10c, 11c, 11d**

At the 5% significance level, the researcher rejected  $H_0$  where p-values are below 0.05 (shaded in red) i.e. 7, 9a, 9b, 9c, 9d, 9e, 9f, 11c and 11d and concluded that for these questions there is an unequal distribution of responses per category in each of the questions. However, for question 10c, the researcher accepts  $H_0$  and concludes that there is an equal distribution of responses per category in the question. This means there is no statistical evidence to support a clear tendency of a category for question 10c. The researcher now examines the perspectives of respondents for the rest of the questions that were significant.

### Question 7. Motivation for ICT deployment

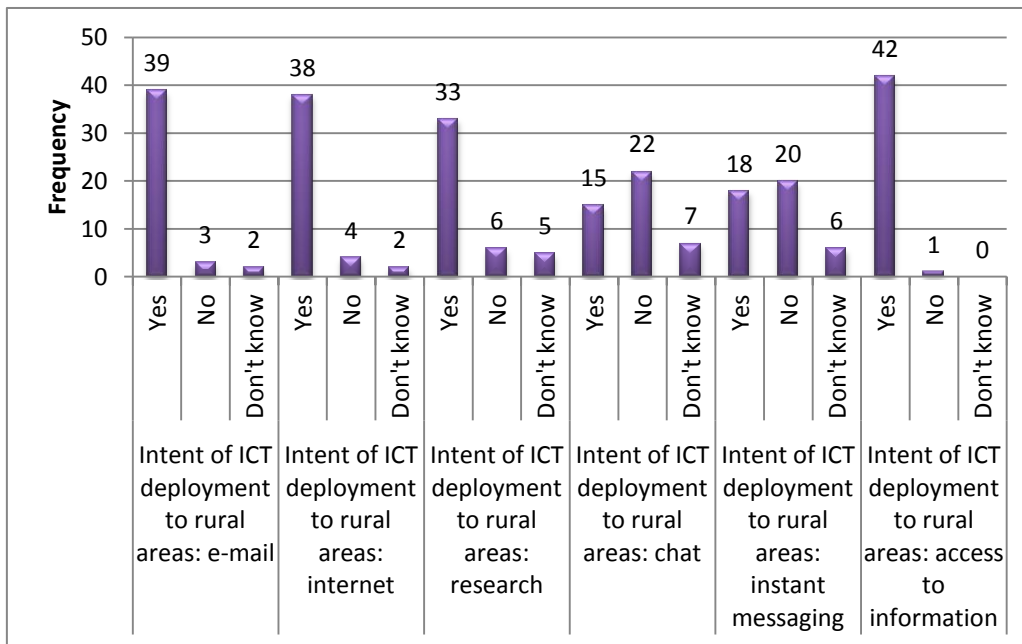


**Figure 23: Responses from technology implementers on motivation for ICT deployment to rural communities**

Based on the data presented in figure 23 above, technology implementers felt that the main motivation for Information Communication Technology deployment to rural communities of KwaZulu-Natal was social inclusion (with a response of 17 technology implementers) and to be able bring rural communities into the digital family, thus promoting the concept of digital inclusiveness (DOC, 2011). This perspective is a possible explanation for the explosive use of Internet-based applications such as Facebook and Twitter (iloubnan.info, 2011) and mobile phones capable of running these Internet-based applications.. The findings support Rothenberg-Aalami (2005) who state that ICT initiatives are used for social purposes. An interesting observation is the low response rate on financial sustainability being a motivation for ICT deployment to rural communities of KwaZulu-Natal, as a number of authors (Hewitt de Alcantara, 2001; Torero & Braun, 2006; Rambowan, et al., 2005) have alluded to poverty alleviation as one of the motivations for ICT deployment to under-served communities.



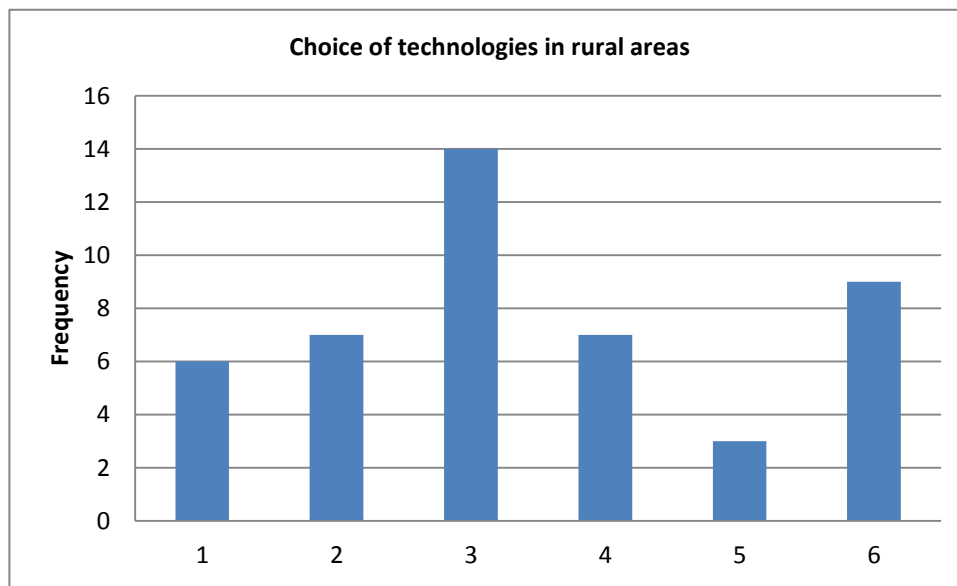
### Question 9



**Figure 24: Combined responses of technology implementers on the intent of ICT deployment to rural areas**

Figure 24 shows the perspectives of technology implementers on what Information Communication Technology deployment to rural communities is intended for is: email (39 responses out of a total of 44 respondents who answered this question), Internet (38 responses out of a total of 44 respondents), research (33 responses out of a total of 44 respondents) and access to information (42 responses out of a total of 43 respondents) were viewed positively, while chat (22 responses out of a total of 44 respondents) and instant messaging (20 responses out of a total of 44 respondents) were viewed negatively. The above data is in support of the results observed in question 7, which looks at the motivation of ICT deployment to rural communities.

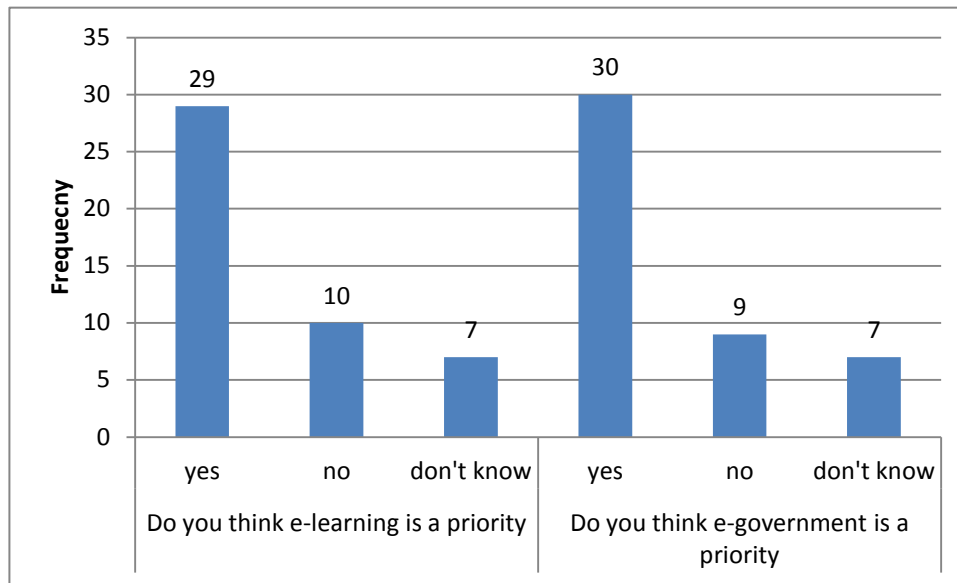
### Question 10C



**Figure 25: Responses of technology implementers on technologies such as Wifi and mobile computing being the technologies of choice in rural KwaZulu-Natal**

Based on the data shown in figure 25, the technology implementers were positive (27 out of 46 respondents) when it came to the question of using technologies such as Wifi and mobile technologies as the technologies of choice in deploying technology initiatives to rural communities of KwaZulu-Natal. This positive result can be as a result of the geographical terrain of KwaZulu-Natal that consists of both coastal areas and a mountainous inland geography. The province is also sparsely populated. It is these characteristics of the province that make the use of wired communication media not economically viable, and that instead favour wireless technologies as the technologies of choice by technology implementers in the province. Much as technologies such as Wifi and mobile technologies are the preferred technologies to use in the deployment of Information Communication Technology initiatives to rural KwaZulu-Natal, an almost equal number of technology implementers (19 technology implementers) to those who preferred Wifi and mobile technologies felt that these technologies were not the most appropriate. A most likely explanation for this response would be the deterrent running costs of wireless technologies, such as service provider monthly service fees.

### Question 11C and Question 11D



**Figure 26: Combined responses of technology implementers on prioritization of e-learning and e-government?**

Figure 26 indicates that technology implementers agreed that e-learning is a priority (29 technology implementers) with other technology implementers disagreeing that e-learning is a priority (10 technology implementers), while 7 technology implementers did not know if it was a priority. Figure 29 also shows that the majority of technology implementers rate e-government as also being a priority (30 respondents were of this perspective) with 9 respondents disagreeing and 7 not knowing if it was a priority.

The above section discusses the use of the current Information Communication Technology in rural communities of KwaZulu-Natal, including the motivation behind technology deployment initiatives, and provides suggestions of better suited communication media to use when deploying technology initiatives to rural communities. The data also shows the priority initiatives that the government can concentrate on when planning the deployment of new technology initiatives to these rural communities.

#### **4.6.4 Objective 4: To investigate issues that affect the successful deployment of ICT to rural communities in KwaZulu-Natal**

The researcher makes use of the Chi-square test once again, together with graphical statistics using questions 1, 3, 4, 5, 6, 8, 10d, 10f, 11b, 11f and 11i of the questionnaire. The hypothesis that the researcher sought to test is:

$H_0$ : there is an equal distribution of responses per category in each of the questions

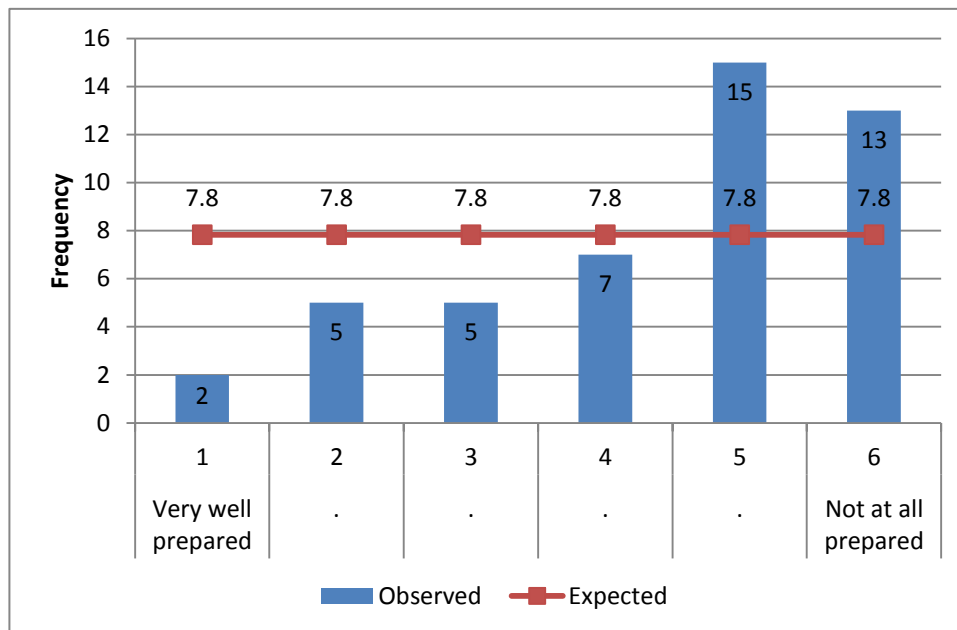
$H_1$ : there is an unequal distribution of responses per category in each of the questions

Question		p-value	Option selected significantly more often than others
1	Preparedness to participate in e-government	0.006	5
3	Importance of geographical location	0.145	
4	Importance of ICT policy document in deployment	0.002	1
5	Slow pace of ICT policy document development	0.509	
6	ICT policy addressing rural areas	0.546	
8	Level of computer skills required	<.0005	Basic computer skills
10d	Effect of culture on user acceptance	0.098	
10f	Computers should be used for financial benefit	<.0005	5 and 6
10g	Computers should be used more in rural areas	<.0005	1
11b	Is infrastructure to support ICT available?	<.0005	No
11f	Does the government consider ICT as a priority?	0.039	No
11i	Are current ICT deployment initiatives sufficient?	<.0005	No

**Figure 27: Chi-square test results for questions 1, 3, 4, 5, 6, 8, 10d, 10f, 11b, 11f and 11i**

At the 5% significance level, the researcher rejected  $H_0$  where p-values are below 0.05 (shaded in red) i.e. 1, 4, 8, 10f, 10g, 11b, 11f and 11i and concluded that for these questions there is an unequal distribution of responses per category in each of the questions. However, for questions 3, 5, 6 and 10d the researcher accepted  $H_0$  and concluded that there is an equal distribution of responses per category in the question. This means there is no statistical evidence to support a clear tendency of a category for questions 3, 5, 6 and 10d. The researcher now examines the perspectives of the technology implementers for the rest of the questions that were significant.

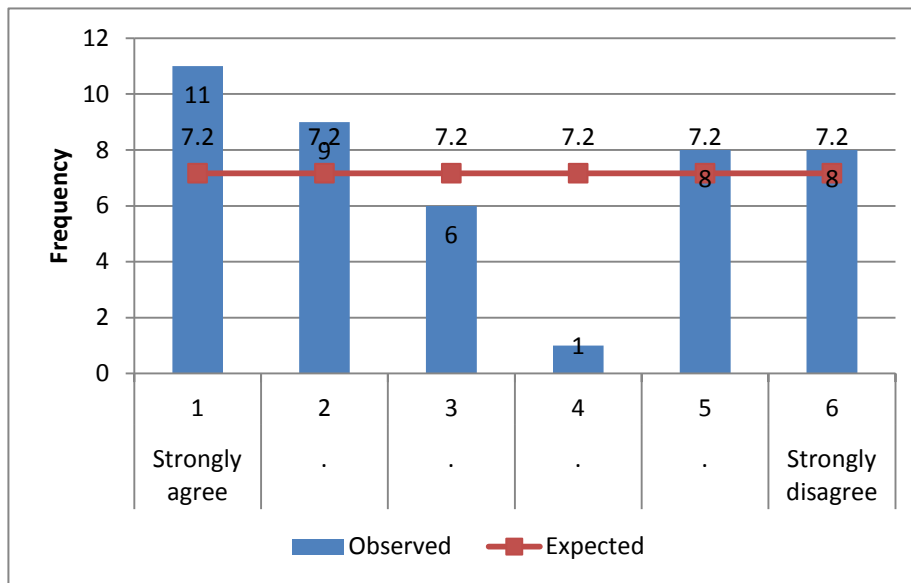
### Question 1. Preparedness to participate in e-government



**Figure 28: Responses of technology implementers on the extent to which rural communities are prepared for e-government deployment**

Figure 28 shows that most rural communities are “not prepared” (15 technology implementers) and “not prepared at all” (13 technology implementers) to participate in e-government, with these two options recording a response rate above the expected value of 7.8. The above responses are bolstered by technology implementers perspectives expressed in questions 10a, 11a, 11b, 11d and 11g. The empirical evidence provided reveals that there is need to address fundamental issues such as infrastructure and prioritising e-governance issues in rural communities of KwaZulu-Natal. Addressing the issue of e-readiness sets the background for the deployment of ICT initiatives that would provide much needed services delivery to the communities involved.

### Question 3. Importance of geographical location

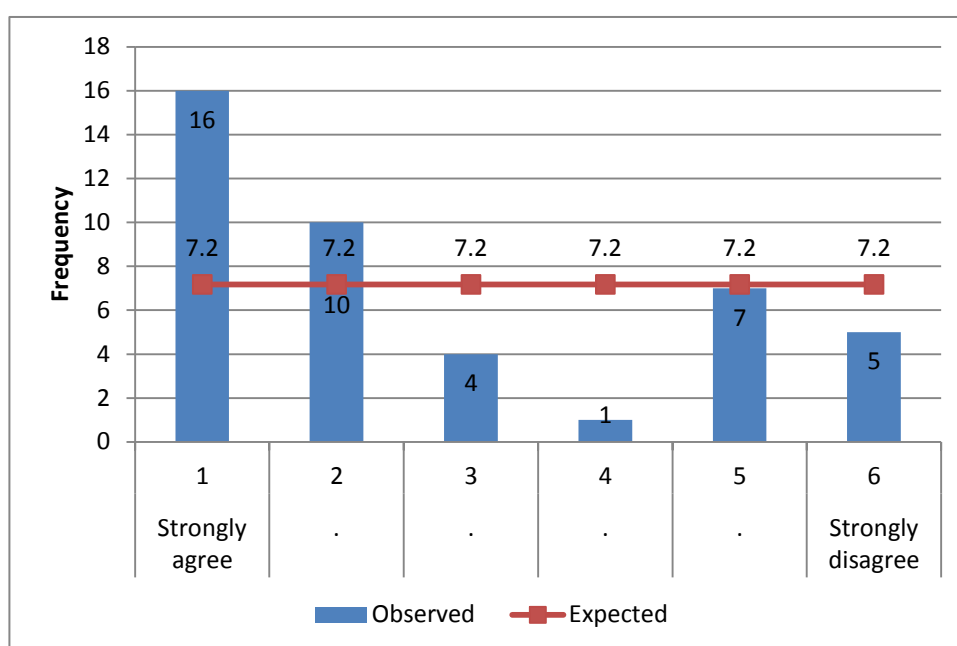


**Figure 29: Responses of technology implementers on the importance of geographical location**

Geographical location is also an important factor in determining the successful deployment of Information Communication Technology. The terrain onto which the technology initiative is being deployed determines the type of technology use. Geographical characteristics such as sparsely populated areas versus densely populated areas, or mountainous versus flat terrain, have a huge bearing on the choice of technology for the new technology initiative. This can be seen by the responses provided by the technology implementers above and can also provide an explanation as to why the technology implementers gave the answer they did in question 10c, which sought to determine the most suitable technology to use in the province. In question 10c, geographical location was also the key determining factor. This theme too can be seen in Fig. 33, which indicates that the majority of the technology implementers agreed (9 respondents) and strongly agreed (11 respondents, this being the modal group) on the importance of geographical location.

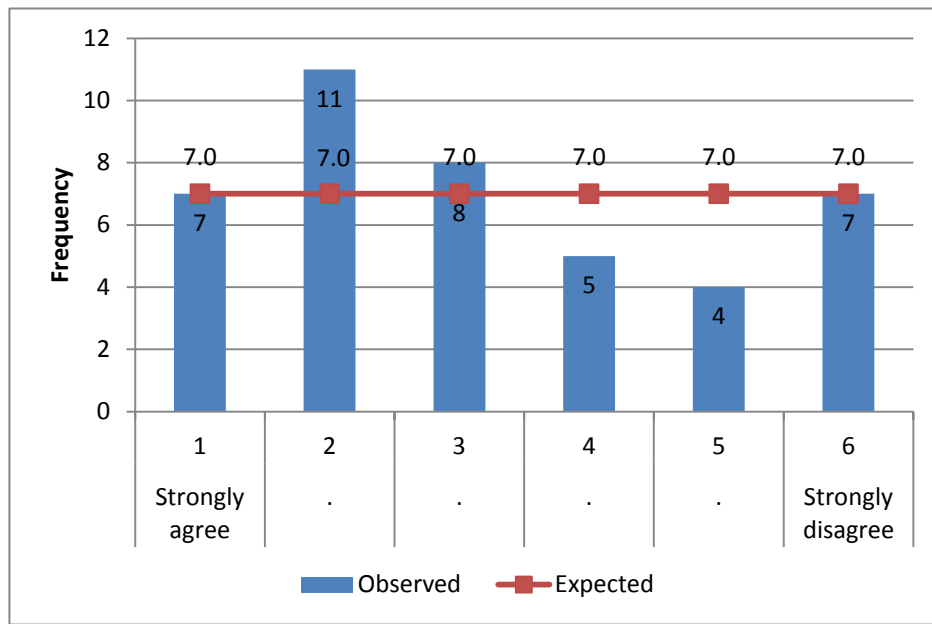
#### Question 4. Importance of ICT policy document in deployment

The bar graph in figure 30 below shows the importance of Information Communication Technology policy frameworks in the deployment of technology initiatives to rural communities. The majority of the technology implementers agreed (10) and strongly agreed (16) on the importance of ICT policy frameworks when deploying new technologies. As has been discussed earlier in this chapter, these policy frameworks help implementers compare what has been set out by the government (policy makers) and what has actually been implemented or what is required on the ground (what the communities these deployments are intended for want). The policy frameworks also avoid a haphazard approach to technology deployments, in which there is more of a “technology dump” than “technology transfer.”



**Figure 30: Responses of technology implementers on the importance of an ICT policy framework for the deployment of new initiatives**

### Question 5. Slow pace of ICT policy document development

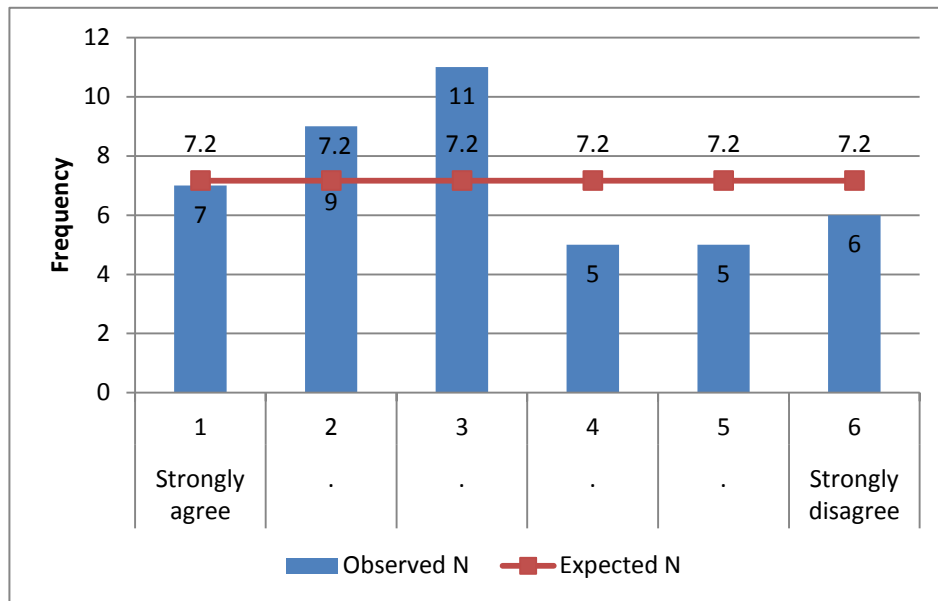


**Figure 31: Perspectives of technology implementers on the pace at which policy frameworks are developed**

Figure 31 shows empirical evidence that the slow development of Information Communication Technology policy frameworks can have an adverse effect on the deployment of technology development initiatives. The majority of the technology implementers agreed (11) and strongly agreed (7) on the importance of the quick development of ICT policy frameworks. These results suggest that policy frameworks must drive technology deployments and not try to catch up with initiatives, which can lead to haphazard deployments of new initiatives.



### Question 6. ICT policy addressing rural areas

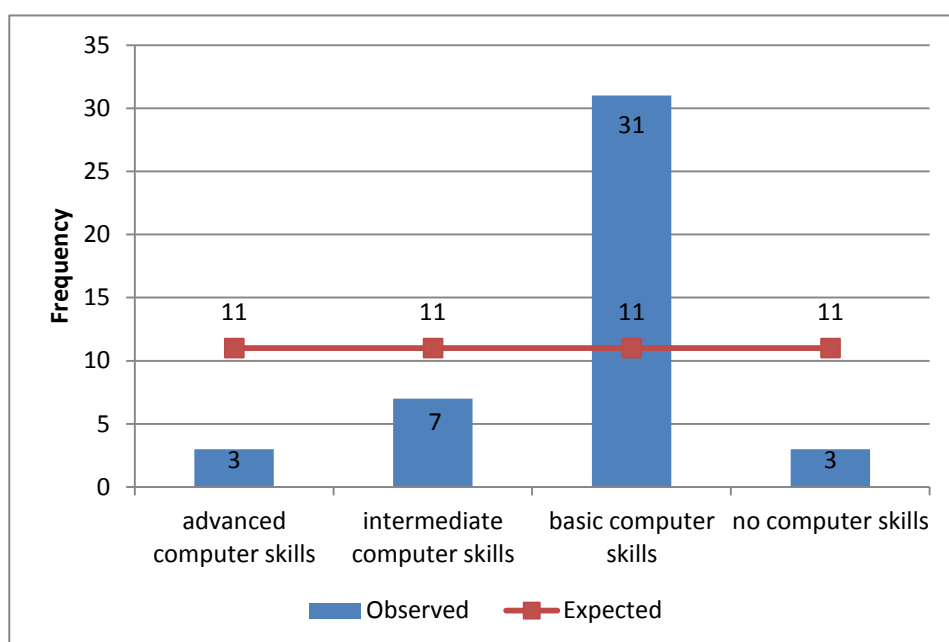


**Figure 32: Perspectives of technology implementers on whether current ICT policy frameworks address rural ICT deployment**

Figure 32 shows that the majority of the technology implementers somewhat agreed (11), agreed (9) and strongly agreed (7) that it is important to have Information Communication Technology policy frameworks that are deliberately formulated to address deployment of ICT to rural communities, the benefits of which have already been discussed by the researcher in the earlier part of this section.

It can be seen from the empirical evidence above that current Information Communication Technology policy frameworks are perceived by technology implementers to be important in the deployment of ICT to rural communities of KwaZulu-Natal and therefore information on these policies should be transmitted to technology implementers for better results in achieving government objectives.

### Question 8. Level of computer skills required

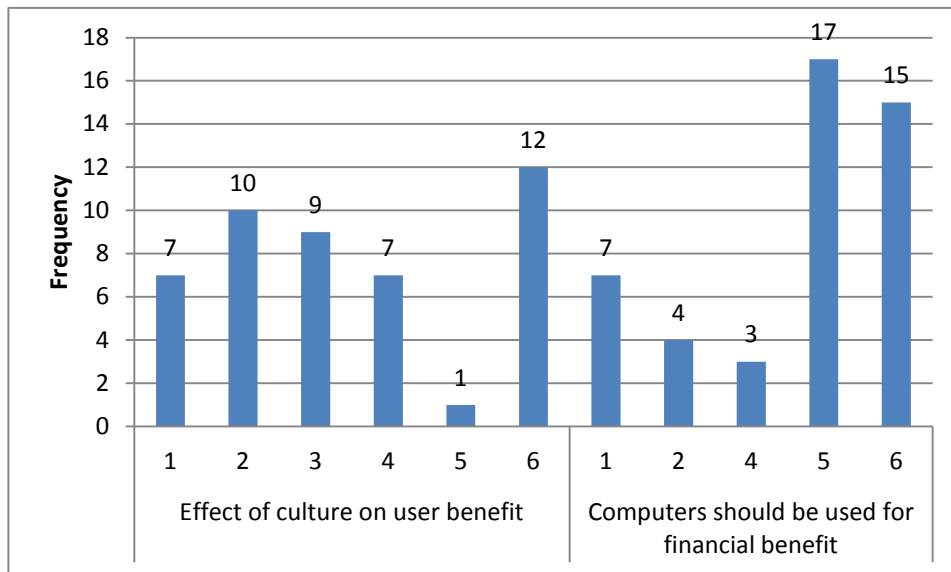


**Figure 33: Perspectives of technology implementers on the literacy levels required to use ICT in rural communities**

One of the challenges with successful deployments of new technology initiatives to rural communities is usually the mismatch between the technology that is being transferred to that community and the knowledge of the community members on how to use the technology. The data presented in figure 33 shows that the majority of respondents felt that basic computer skills are required (31 technology implementers selected this option, with 3 selecting advanced computer skills, 7 selecting intermediate computer skills and 3 selecting no computer skill). The government policy makers can use this knowledge by taking it into consideration every time they plan to deploy a new technology initiative. It therefore follows that in order to deploy the new technology initiative successfully, training workshops should be made available to community members. This would help equip them with the necessary skill set to utilise the new initiative fully. The skills training would also build capacity and confidence in the intended users.

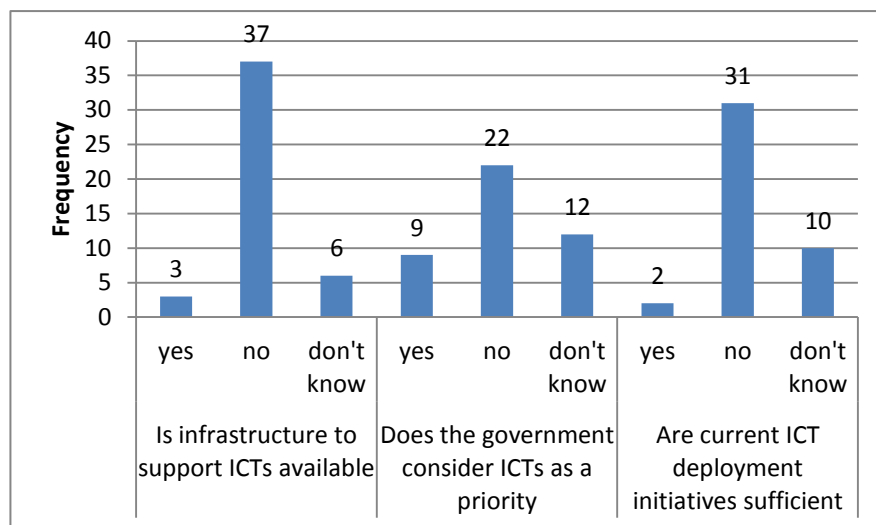
### **Question 10D, 10F**

Based on figure 34, 26 technology implementers gave a positive response to the statement in question 10D that “culture has an effect on user acceptance of Information Communication Technology initiatives deployed to rural communities of KwaZulu-Natal”. The remaining technology implementers selected the options “somewhat disagree” (7), “disagree” (1) and “strongly disagree” (12). Even though the modal group is “strongly disagree”, with 12 respondents, there is an overall positive response agreeing with the statement. The results therefore suggest that policy frameworks and the actual technology deployments of ICT initiatives to rural communities of KwaZulu-Natal should take into consideration the cultural aspects of the communities in order to be successful. The responses provided in this question are interesting and can form a basis for further interrogation in future research. The technology implementers gave a negative response to the statement that computers in rural communities should be used for the financial benefit of community members and restrictions should be placed on non-financial activities. Three technology implementers somewhat disagreed, 17 disagreed and 15 disagreed completely with this statement. The responses to this question can be explained by the responses provided to question 7 earlier in this chapter, which showed that social inclusion is the motivation for ICT deployment to the rural communities of KwaZulu-Natal and that financial sustainability is not viewed as a priority area. The empirical data provided by question 10F also suggest that the purpose of government initiatives to deploy technology to rural communities should be communicated clearly, for instance to provide access for social benefit, financial benefit or research. This avoids a situation where the wrong statement is made by the initiative. There is evidence here of a difference among the perspectives of technology implementers with respect to the effects of social and cultural factors on user acceptance of the technology initiative and the financial benefit derived from using computers.



**Figure 34: Perspectives of technology implementers on the effects of culture and using computers for financial benefit in the rural communities of KwaZulu-Natal**

#### Question 11B, Question 11F, Question 11I



**Figure 35: Perspectives of technology implementers on the literacy levels required to use ICT in rural communities**

The above bar graph shown in figure 35 has previously been discussed in earlier sections of this chapter. It has been included in this section for the purposes of showing the empirical data that relates to the objective the researcher wishes to achieve. The results reveal that computers are not evenly distributed, there is no available infrastructure to support Information Communication Technology, the government does not consider ICT to be a priority and the current ICT

initiatives are not sufficient. These are clearly areas that require serious attention in order to deploy ICT initiatives successfully to the rural communities of KwaZulu-Natal.

#### 4.7 RELIABILITY ANALYSIS

Coakes & Steed (2003) recommend the use of Cronbach's Alpha coefficient as a reliability test. Using a scale of 0 to 1 the coefficient rates the consistency and reliability of questions that use the same range. A rating of 0.7 or more for a question translates into a good consistency and reliability. Cronbach's Alpha coefficient was applied on questions that were used in the questionnaire. Figure 36 below shows the results of the calculation. The results of show that the questions used in the questionnaire had good consistency and reliability and it is acceptable to make use of them.

QUESTIONS	CRONBACH'S ALPHA
1-2	0.700
3-6	0.640
9	0.699
10	0.736
11	0.767

**Figure 36: Cronbach's Alpha test results on questions with the same scales**

##### 4.7.1 One-sample t-test

Average scores were calculated for questions 1, 3 – 6 and 10. A One-sample t-test was then applied to test whether the average score is significantly different from a neutral score of 3.5. If it is, then one can report significant agreement/disagreement or preparedness. The hypothesis for the tested questions was formulated as:

$H_0$ : the average score is not different from a neutral score of 3.5

$H_1$ : the average score is different from a neutral score of 3.5

	N	Mean	Std. De- viation	t	df	Sig. (2- tailed)
1 Preparedness to participate in e-government	47	4.43	1.485	4.272	46	<.0005
3 Importance of geographical location	43	3.23	1.925	-.911	42	.368
4 Importance of ICT policy document in deployment	43	2.72	1.856	-2.753	42	.009
5 Slow pace of ICT policy document development	42	3.21	1.718	-1.078	41	.288
6 ICT policy addressing rural areas	43	3.23	1.645	-1.066	42	.293
10a Number of computers is sufficient	46	5.13	1.166	9.481	45	<.0005
10b Poor key public infrastructure is the cause of lack of ICT	46	3.26	1.782	-.910	45	.368
10c Choice of technologies in rural areas	46	3.46	1.643	-.180	45	.858
10d Effect of culture on user acceptance	46	3.46	1.810	-.163	45	.871
10e There are other more important issues in rural areas	46	3.78	1.750	1.095	45	.279
10f Computers should be used for financial benefit	46	4.39	1.819	3.323	45	.002
10g Computers should be used more in rural areas	46	2.30	1.685	-4.813	45	<.0005

**Figure 37: Results of the one-sample t-test on questions 1, 3 – 6 and 10**

The results from figure 37 show that question 1 showed a significant lack of preparedness; question 4, which dealt with the importance of an ICT policy document and question 10g, which dealt with whether computers should be used more in rural areas, showed significant agreement; question 10a, which dealt with whether the number of computers is sufficient, and question 10f, which dealt with whether computers should be used for financial benefit, showed significant disagreement.

## 4.8 ASSESSING RELATIONSHIPS

### Cross-tabulations and Chi-square test of independence

Relevant cross-tabulations were examined and tested to ascertain whether a relationship exists between the two variables in the cross-tabulation. This was done by applying the Chi-square test of independence. Under the null hypothesis it is assumed that no relationship exists between variable 1 and variable 2 (i.e. the two variables are independent of each other). Because the sample size of technology implementers is small, it is necessary to apply Fisher's exact test when the conditions of expected values are violated. Cross-tabulations were done for all questions with the demographic variables.

Significant results are summarized below.

#### 4.8.1 By "My gender"

*"My gender" vs "Is cost of access an inhibiting factor?" (Question 11e)*

		Is cost of access an inhibiting factor?			Total
		Yes	No	Don't know	
My gender	Male	5	3	6	14
	Female	21	6	2	29
Total		26	9	8	43

**Figure 38: The relationship between cost of access as an inhibiting factor and gender**

The results of figure 38 show that female technology implementers (21 respondents) are more sensitive to cost as an inhibiting factor because they are more understanding of the fact that women in rural areas have less financial capacity compared to males and rely heavily on the men for financial support this is due to the responsibilities that women in rural communities face such as household chores. This consumes their time to be financially active and hence the reliance on their male counterparts (Gill, Brooks, McDougall, Patel, Kes, 2010). The report by Gill, et al., (2010) expound that women face financial challenges and that most low income earners are not able to afford even the basic fees charged by public access points such as tele-

centres. The government needs to look into providing technology initiatives that are sensitive to gender imbalances due to financial capacity, and should therefore consider initiatives that will build capacity for women or are subsidized by government to allow equal opportunity to access these facilities. Significantly ( $p=.013$ ) more than expected male respondents responded “Don’t know”. Gender and the perception of cost of access as an inhibiting factor are related to each other

*“My gender” vs “Are there initiatives to deploy ICT in rural areas” (Question 11g)*

Figure 39 shows that significantly ( $p=.034$ ) more than expected females responded ‘No’. This can be attributed to females not being exposed to information, and the general perception that technology is a male-dominated field and that women are “visitors”, and are therefore made to operate behind the scenes rather than spearheading the industry. Gender and respondents’ perceptions of the presence of initiatives to deploy ICT in rural areas are related to each other.

		Are there initiatives to deploy ICT in rural areas?			Total
		Yes	No	Don't know	
My gender	Male	7	0	7	14
	Female	8	10	11	29
Total		15	10	18	43

**Figure 39: The relationship between awareness of initiatives to deploy ICT in rural areas and gender**



#### 4.8.2 By “I grew up in”

*“I grew up” vs “Motivation for ICT deployment” (Question 7)*

		Motivation for ICT deployment					Total
		Provide Internet access	Improve digital inclusiveness	Reduce digital divide	Social inclusion	Financial sustainability	
I grew up in	Rural area	3	2	0	0	0	5
	Semi-urban area	3	2	6	5	1	17
	Urban area	0	5	2	12	3	22
Total		6	9	8	17	4	44

**Figure 40: The relationship between motivation for ICT deployment and where the technology implementer grew up**

The results in figure 40 show that significantly ( $p=.003$ ) more than expected of those technology implementers who grew up in a rural area selected the motivation for Information Communication Technology as to “provide Internet access”. This is a very simplistic view and does not take into account the great potential these technology initiatives can bring to rural communities other than just providing Internet access, which might not have any relevance to that community. This perspective points the importance of training the technology implementers on the vast benefits these initiatives have and the goals government wishes to achieve. Technology implementers who grew up in a semi-urban area selected “reduce digital divide” as the motivation behind ICT initiatives. The technology implementers who grew up in semi-urban areas seemed to see the disparity between the haves and the have not’s, as they are literally situated in the middle in terms of having and not having access to these technologies, hence their response.

*“I grew up in” with question 8 “Level of computer skills required”*

		Level of computer skills required				Total
		Advanced computer skills	Intermediate computer skills	Basic computer skills	No computer skills	
I grew up in	Rural area	1	1	3	0	5
	Semi-urban area	0	0	16	1	17
	Urban area	2	6	12	2	22
Total		3	7	31	3	44

**Figure 41: The relationship between literacy level and where the technology implementer grew up**

Figure 41 shows that significantly ( $p=.046$ ) more than expected technology implementers who grew up in an urban area selected “Intermediate skills”. This could be due to their early exposure to these technologies and their more advanced use of Information Communication Technology. The technology implementers from semi-urban areas selected “Basic skills” and not “Intermediate skills”. The data presented in Figure 44 reveals that the place in which a technology implementer grew up and their level of computer skills are related to each other.

*“I grew up in” with question 10e “There are other more important issues in rural Areas”*

Figure 42 shows that significantly ( $p=.024$ ) more than expected technology implementers who grew up in urban areas selected option 3 (somewhat agree) and not option 6 (strongly disagree), possibly as a result of having been exposed to Information Communication Technology early in their lives; those from semi-urban areas selected option 5 (disagree) and not option 3 (somewhat agree); and technology implementers from rural areas selected option 6 (strongly disagree). One would expect technology implementers who grew up in rural areas not to appreciate technology,

but on the contrary they seem to appreciate it more than those who grew up in urban areas and who feel that there are more important issues to deal with in rural areas. These results show a relationship between where the technology implementer grew up and their perception of whether there are other more important issues in rural areas. These results are interesting and further analysis would be recommended.

		There are other more important issues in rural areas						Total
		1	2	3	4	5	6	
I grew up in	Rural area	1	0	0	0	0	4	5
	Semi-urban area	1	3	1	2	3	6	16
	Urban area	2	3	8	6	1	2	22
Total		4	6	9	8	4	12	43

**Figure 42: The relationship between the perspectives of technology implementers on there being more important issues in rural areas and where the technology implementer grew up**

*“I grew up in” with question 11h “is Internet access part of those initiatives”*

		Is Internet access part of those initiatives?			Total
		Yes	No	Don't know	
I grew up in	Rural area	1	3	1	5
	Semi-urban area	6	0	10	16
	Urban area	10	1	11	22
Total		17	4	22	43

**Figure 43: The relationship between the perspectives of technology implementers on Internet access and where the technology implementer grew up**

The data presented in figure 43 shows that significantly ( $p=.018$ ) more than expected technology implementers who grew up in a rural area responded “No” when asked if Internet access is part of those new deployment initiatives. This suggests that it would be a good idea to provide training and sensitization workshops to educate the technology implementers on the specific purpose of each deployment project that is being undertaken, as some may not perceive Internet access to be the motivation but rather just the provision of basic exposure to computers. The place in which the technology implementers grew up and their perspectives on whether Internet access is part of the ICT initiatives are therefore related to each other

### 4.8.3 By “I live in”

*“I live in” with question 4 “Importance of ICT policy document in deployment”*

		Importance of ICT policy document in deployment						Total
		1	2	3	4	5	6	
I live in	Rural area	0	1	0	0	2	0	3
	Semi-urban area	3	0	3	0	0	1	7
	Urban area	13	9	1	1	5	4	33
Total		16	10	4	1	7	5	43

**Figure 44: The relationship between the perspectives of technology implementers on the importance of an ICT policy framework on deployment of new initiatives, and where the technology implementer lives**

When tested for a relationship between the respondents’ place of residence and their perceptions on the importance of an Information Communication Technology policy framework (figure 44), significantly ( $p=.028$ ) more than expected technology implementers who live in rural areas responded ‘5’, which translates to disagreeing with the statement that an ICT policy framework is a very important document when it comes to ICT deploy. This may suggest that there is lack of policy information being made available to the technology implementers and hence the need for training workshops to increase sensitization. Meanwhile technology implementers

from semi-urban areas responded '3' strongly agreeing and somewhat agreeing. Technology implementers who live in urban areas strongly agreed to agreed with the statement. Based on the evidence provided, respondents' place of residence and their perceptions on the importance of an ICT policy development in deployment are related to each other.

#### **4.8.4 By ethnic group**

*“Ethnic group” with question 9d “Intent of ICT deployment to rural areas: chat”*

Figure 45 shows that significantly ( $p=.020$ ) more than expected technology implementers in the “African/Black” ethnic grouping responded “Yes” to the statement that Information Communication Technology deployment to rural areas is intended for chatting, while technology implementers in the ethnic groupings of “Whites” and “Coloureds” responded “No” to the same statement. This empirical evidence suggests that majority of the technology implementers in the “African/Black” ethnic grouping are unaware of the potential benefits of ICT initiatives. This perspective that these technology implementers hold might be due to the level in which they are in the organization that does not allow them to have an over view understanding of the ICT initiatives they are involved with, the response might also be due to a general lack of information and hence the suggestion by the researcher for sensitization workshops to help technology implementers fully understand these initiatives they are deploying. The respondents' race group and their perceptions on whether chat is an intention of ICT deployment to rural communities are related.

		Intent of ICT deployment to rural areas: chat			Total
		Yes	No	Don't know	
Ethnic group	African/Black	6	2	3	11
	Indian/Asian	8	7	3	18
	White	1	7	1	9
	Coloured	0	6	0	6
Total		15	22	7	44

**Figure 45: The relationship between the perspectives of technology implementers on whether ICT deployment is intended for chat, and the ethnic group of technology implementers**

#### 4.8.5 By age

*“Age” with question 6 “ICT policy addressing rural areas”*

		ICT policy addressing rural areas						Total
		1	2	3	4	5	6	
Age	20 to 29	1	1	6	0	1	1	10
	30 to 39	4	2	2	2	4	0	14
	40 to 49	2	2	2	2	0	4	12
	50 to 59	0	4	1	0	0	1	6
	60 or older	0	0	0	1	0	0	1
Total		7	9	11	5	5	6	43

**Figure 46: The relationship between the perspectives of technology implementers on an ICT policy framework addressing rural areas, and the age of technology implementers**

Significantly ( $p=.025$ ) more than expected technology implementers from the age group 20 – 29 responded ‘3’, translating to somewhat agreeing to the statement that current Information Communication Technology policy frameworks do not deliberately address the rural. The wide distribution of results suggest that technology implementers are not well informed regarding policy frameworks and suggest further sensitization towards government policy frameworks which support technology deployment. The wide dispersion is shown with technology implementers aged 30 – 39 group ‘responded ‘1’ strongly agree and ‘5’ disagree; 40 – 49 group responded ‘6’ strongly disagree; 50 – 59 group responded ‘2’ agree and 60 or older group responded ‘4’ somewhat disagree. The age group of respondents and their opinions on an ICT policy addressing rural areas are related.

#### 4.8.6 By IT experience

No significant relationships exist between the IT experience of respondents and their responses to any question.

#### 4.8.7 By position in organization

*“Position in the organisation” by question 8 “Level of computer skills required”*

		Level of computer skills required of users				Total
		Advanced computer skills	Intermediate computer skills	Basic computer skills	No computer skills	
Position in the organisation	Management	1	2	6	1	10
	Consultant	2	0	0	0	2
	Technical	0	4	15	2	21
	Other	0	1	10	0	11
Total		3	7	31	3	44

**Figure 47: The relationship between the perspectives of technology implementers on ICT literacy level and their position in their organisation**

Figure 47 shows that significantly ( $p=.032$ ) more than expected consultants responded “Advanced skills”. These results are of concern as the consultants are the people who actually spearhead these technology deployments and more training is required to harmonise this requirement. Interesting is that management, technical and other personnel indicated that basic computer skills are required for people in rural communities to be able to access Information Communication Technology. These results suggest that there is a lack of needs analysis undertaken to ascertain the level of technology knowledge and an alignment with the technology to be deployed in these communities before these technology initiatives are actually deployed. This needs analysis can help determine exactly what the skills levels are that are available



and what is required. Provision of training can help bridge the knowledge gap that may exist.

*“Position in the organisation” with question 10b “Poor key public infrastructure is the cause of lack of ICT”*

Significantly ( $p=.005$ ) more than expected managers responded ‘2’ or ‘4’; consultants responded ‘6’; technical responded ‘5’ and Other responded ‘1’. From the data provided in figure 48 it can be seen that the consultants, who are the professionals who head new deployments of technology to rural areas, and the technical personnel, who physically carryout the installations and maintenance in some cases, feel the hindrance is not necessarily poor key public infrastructure, but can be attributed to other issues such as prioritisation of initiatives the government implements in rural areas. Position in the organisation and perceptions on whether poor key public infrastructure is the cause of lack of Information Communication Technology, are related.

		Poor key public infrastructure is the cause of lack of ICT						Total
		1	2	3	4	5	6	
Position in the organisation	Management	0	5	1	3	0	1	10
	Consultant	1	0	0	0	0	1	2
	Technical	3	3	3	1	7	3	20
	Other	6	0	2	1	2	0	11
Total		10	8	6	5	9	5	43

**Figure 48: The relationship between the perspectives of technology implementers on infrastructure, and their position in their organisation.**

*“Position in the organisation” with question 10d “Effect of culture on user acceptance”*

		Effect of culture on user acceptance						Total
		1	2	3	4	5	6	
Position in the organisation	Management	1	5	2	1	1	0	10
	Consultant	0	0	0	1	0	1	2
	Technical	2	2	7	1	0	8	20
	Other	2	3	0	3	0	3	11
Total		5	10	9	6	1	12	43

**Figure 49: The relationship between the perspectives of technology implementers on culture, and their position in their organisation**

Significantly ( $p=.018$ ) more managers than expected responded “agree” or “disagree”; consultants responded “somewhat disagree”; technicians responded “somewhat agree” and those from the group “Other” responded “somewhat disagree”. Due to the mixed perspectives obtained on in the analysis shown in figure 49, further research is recommended to assist in obtaining a clearer perspective. The respondents’ position in the organisation and their perspectives on the effect of culture on user acceptance are related.

*“Position in the organisation” with question 10g “Computers should be used more in rural areas”*

		Computers should be used more in rural areas						Total
		1	2	3	4	5	6	
Position in the organisation	Management	6	4	0	0	0	0	10
	Consultant	0	0	0	0	0	2	2
	Technical	9	6	0	0	3	2	20
	Other	4	2	2	2	1	0	11
Total		19	12	2	2	4	4	43

**Figure 50: The relationship between the perspectives of technology implementers on computers being used more often, and their position in their organisation**

Significantly ( $p=.036$ ) more than expected consultants responded “strongly disagree”; whilst management indicated that they strongly agree and agree and agree to computers being used more in rural areas. The technical personnel also strongly agreed and agreed to the statement. Those from the group “Other” responded “strongly agree” to “somewhat disagree”. These results seem to suggest that there is a difference in the drive of technology. Whilst the consultants may be more focused towards providing solutions to rural communities and not make emphasis on technology, the other groups may have a more technology focus provision. This disparity needs to be harmonised and this is where policy frameworks can provide guidance. Respondents’ position in their organisation and their opinion on whether computers should be used more in rural areas are related.

*“Position in the organisation” with question 11e “Is cost of access an inhibiting factor”*

		Is cost of access an inhibiting factor			Total
		Yes	No	Don't know	
Position in the organisation	Management	9	0	1	10
	Consultant	1	1	0	2
	Technical	11	7	2	20
	Other	5	1	5	11
Total		26	9	8	43

**Figure 51: The relationship between the perspective of technology implementers on cost as an inhibiting factor, and their position in the organization**

Figure 51 shows the relationship between the perspectives of technology implementers on cost of access as an inhibiting factor and their position in their organisation. Significantly ( $p=.033$ ) more management than expected indicated that they felt that cost of access is an inhibiting factor, consultants had an even response, whilst technical personnel were of the perspective that cost was an inhibiting factor. “Other” technology implementers were unaware of whether it was an inhibiting factor or not. The results suggest that cost issues must be taken into account before development and deployment of Information Communication Technology initiatives are embarked upon. Without doing so would result in possibly low usability of the initiative and its eventual failure.

*“Position in the organisation” with question 11h “Is internet access part of those initiatives”*

		Is Internet access part of those initiatives?			Total
		Yes	No	Don't know	
Position in the organisation	Management	7	1	2	10
	Consultant	0	2	0	2
	Technical	6	1	13	20
	Other	4	0	7	11
Total		17	4	22	43

**Figure 52: The relationship between the perspectives of technology implementers on Internet access as part of new initiatives and their position in their organisation**

Significantly ( $p=.007$ ) more managers than expected responded “yes”; and consultants responded “no”. The respondents’ position in the organisation and their perspectives on Internet access being a part of the ICT initiatives are related.

## 4.9 TESTING FOR DIFFERENCES AMONG DEMOGRAPHIC VARIABLES

### Testing difference in means for demographic categories

For those questions with an ordinal response (Q1, Q3 – 6, Q10), the Mann-Whitney U test was applied to test whether average scores differ significantly between categories of demographic variables (when two categories exist). This is the non-parametric equivalent of the independent samples t-test. Because the sample sizes for the categories are so different and the fact that the data is not interval scale, it is better not to use the t-test. This was further confirmed by the Kolmogorov-Smirnov test. For three or more categories, the Kruskal-Wallis test is used. This is equivalent to ANOVA and is used for Likert or ordinal data.

#### 4.9.1 By gender

No significant differences are evident.

#### 4.9.2 By “I grew up in”

No significant differences are evident.

#### 4.9.3 By “I live in”

No significant differences are evident.

#### 4.9.4 By ethnic group

No significant differences are evident.

#### 4.9.5 By age

No significant differences are evident.

#### 4.9.6 By IT experience

No significant differences are evident.

#### 4.9.7 By position in organization

### Question 3. Importance of geographic location: $p = .021$ ;

		N	Mean	Std. Deviation
Importance of geographical location	Management	9	2.78	1.986
	Consultant	2	6.00	.000
	Technical	21	3.81	1.940
	Other	11	2.00	.894
	Total	43	3.23	1.925

**Figure 53: The difference in means by the position of technology implementers in their organisation and their perspectives on the importance of geographical location**

Figure 53 shows results from the question to what extent do you agree with the statement, geographic location is very important when it comes to Information Communication Technology deployment in rural areas. The results show a consultant score that is significantly bigger than the others. Technical is larger than the rest. There is a difference in the perception of positions in the organization with respect to the importance of geographic location. Consultants who travel to rural areas know the value of geographic locations, for example, choosing wireless technologies as opposed to wired technologies.

**Question 10g. Computers should be used more in rural areas:  $p = .044$ ;**

		N	Mean	Std. Deviation
Computers should be used more in rural areas	Management	10	1.40	.516
	Consultant	2	6.00	.000
	Technical	20	2.40	1.847
	Other	11	2.45	1.440
	Total	43	2.35	1.717

**Figure 54: The difference in means by the position of technology implementers in the organization and their perspectives on computers being used more often**

The consultant score is significantly bigger than the others (figure 54). At SITA, the organizational structure is such that the consultants are the people who are responsible for the development of ICT initiatives. These are the professionals who go out into rural communities, carry out preliminary investigations and subsequently deploy new ICT initiatives to these rural communities. It is with this background in mind that consultants have an in depth understanding of the impact, value and benefits of computers to these communities. This knowledge consultants possess might explain why their score is significantly bigger than the others. Management are more involved with the entire functioning of the organization and much as they may be aware of the various ICT projects in that they also have an input to them, they are not as involved in these projects as the consultants. Technical personnel more focused on specific areas of the projects and might not have a holistic understanding of the project.

## **4.10 THE THEORETICAL FRAMEWORK USED TO CONSTRAIN THE INTERPRETATION OF RESULTS**

### **4.10.1 Nature of the Social System (Socio-Cultural Factors)**

The researcher combines the discussion of the nature of the social system together with cultural aspects because the social factors affecting the deployment of Information Communication Technology to rural communities in KwaZulu-Natal include cultural aspects.

The results presented in this chapter confirm the choice of the theoretical framework used, which takes into account the impact of social and cultural aspect on a new initiative such as Information Communication Technology deployment (Rogers, 2003). The results show that finances are an inhibiting factor to technology deployment and that some technology implementers feel that there are more pressing issues than ICT deployment. Education on technology initiatives is necessary and the results show that in order to use these technology initiatives the user must have at least basic computer skills. They also show that there is insufficient infrastructure, including a lack of computers. The fact that the province of KwaZulu-Natal is sparsely populated also compounds this issue of access, as members of rural communities have to walk long distances in order to access ICT services. Odero-Musakali & Mutula (2007) support Rogers' (2003) suggestion that the successful deployment of an innovation requires early exposure to users for a better understand of the initiative. The authors also state that the lack of an ICT policy framework to manage technology deployment is an added hindrance to technology deployment. The results also show the need for basic computer skills in order to use Information Communication technologies deployed in these rural communities. This suggests that ICT illiteracy can become a hindrance to deployment of technology initiatives to rural areas. From the cultural perspective, the tendency to resist ICT deployment is in line with a determinant called uncertainty avoidance (Hofstede, 2001), whereby community members fear the use of a newly deployed technology as a result of a perception of a negative result.

The findings discussed in the above section support the theory of diffusion of innovation (DOI) and illustrate the effects of the socio-cultural environments in the rural communities of KwaZulu-Natal on the deployment of Information Communication Technology. The section below presents and discusses findings on the determinant type of innovation decision that affects the deployment of ICT in rural communities of KwaZulu-Natal.



#### **4.10.2 Type of innovation decision**

Rogers (2003) also identifies type of innovation decision as a determinant that influences the deployment of a technology initiative. These factors are related to governance. Oyomno (2006) states that factors such as Information Communication Technology leadership and policy frameworks are of great importance when developing a national ICT capacity. This chapter has revealed the following findings that relate to this factor.

Government should prioritise Information Communication Technology initiatives more, as the findings show that technology implementers were of the opinion that government does not consider these technology initiatives a priority. The telecentre concept has been regarded as a successful method of promoting digital inclusiveness and bridging the digital divide (WSIS, 2003), provided that the required infrastructure is made available by government to rural communities.

There is also need to understand the impact of policy frameworks that support Information Communication Technology initiative deployment to rural areas, as the findings of this research project showed that a lack of, or poor policy and legislative frameworks is a hindering factor in technology initiative deployment. A policy framework is critical to the successful deployment of ICT initiatives. It also helps create a clear focal point for deployments.

The analysis of the data collected for this study also revealed and confirmed Hofstede's (2001) concept of cultural differences. This was exhibited in the mixed responses to the question on whether culture has an impact on user acceptance of new Information Communication Technology initiatives. ICT literacy is necessary in technology deployment and as the results of this research show, technology implementers recommend that basic computer skills are necessary in successfully deploying technology initiatives. The literature review conducted for this study revealed that content is vital in sustaining a newly deployed technology initiative and that focus ought to be placed on processes to support the development of local content and not the technology itself.

The section below now presents and discusses findings on the determinant perceived attributes of innovation that affect the deployment of Information Communication Technology to the rural communities of KwaZulu-Natal.

#### **4.10.3 Perceived attributes of innovation**

The previous section discussed the types of innovation decisions that have an impact on the deployment of Information Communication Technology to rural communities of KwaZulu-Natal. This section now presents factors in ICT deployment that are associated with the technology itself from the perspective of the technology implementers.

Technology implementers reported that there was a lack of computers in rural areas of KwaZulu-Natal and that there were insufficient Information Communication Technology initiatives currently in place in these communities. The greater the number of initiatives that are deployed, the greater the chance that community members will try out these technologies (trialability) and the greater the likelihood of user acceptance of the new technology. Rogers (2003) supports this concept and emphasises the need to have community members experience the use of these technologies. The analysis revealed that technology implementers were of the opinion that the lack of infrastructure had impacted on the success of technology initiatives.

With regard to the reliability factor identified by Rogers (2003) in his diffusion of innovation theory, the literature review revealed that Information Communication Technology initiatives that provide reliable services and infrastructure are more likely to be sustainable, therefore problems such as slow connectivity speeds for networks due to the use of older technology, such as dial-up modems and the use of cables with low data-transfer rates, need to be resolved by using newer technology and infrastructure that facilitates much faster media connectivity. Unreliable systems could also deter and discourage community members who are trying to develop sufficient knowledge to use these technologies, and therefore providing training (basic computer skills as stated by the technology implementers) to the community members in conjunction with a reliable, predictable system is important.

This section has addressed factors that have an impact on the deployment of Information Communication Technology to the rural communities of KwaZulu-Natal. The results of the study also confirmed Rogers' diffusion of innovation theory (2003) which states that the perceived attributes of any innovation, such as trialability, have an impact on the rate of the uptake of new information and the spread of the use of the technology.

#### **4.11 CONCLUSION**

In this chapter the researcher presented the fieldwork conducted and interpretation of data collected. The findings regarding the perspectives of technology implementers on the deployment of Information Communication Technology to the rural communities of KwaZulu-Natal were then discussed.

Descriptive statistics were generated to provide a summary of the sampling frame. The analytical procedures used were first discussed and then a demographic profile of the respondents was established. The subsequent sections dealt with attempting to establish as to what extent the research questions were answered using the objectives of the research. The chapter also analysed the findings in relation to Rogers' diffusion of innovation (DOI) theory, which was the theoretical framework that was used in this research.

In the next chapter the researcher will draw conclusions on the perspectives of technology implementers on deployment of Information Communication Technology initiatives to rural communities of KwaZulu-Natal. The researcher will also make recommendations based on these findings and give the limitations of the study undertaken.

## **CHAPTER 5**

### **CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

In this final chapter, the discussion is based on a summary of the research and conclusions from the findings presented in Chapter 4. This chapter also offers recommendations for the successful deployment and use of ICT in rural communities in KwaZulu-Natal.

The primary objective of this research was to establish what the perspectives are of technology implementers on the deployment of ICT to rural communities in KwaZulu-Natal. In doing so it was important to discuss literature that focused on key terms such as access, policy, development and sustainability. The problem identified is not a purely technology-based problem, but draws on social aspects in that it focuses on a specific grouping of people (rural communities of KwaZulu-Natal). The study therefore adopted an interdisciplinary approach in order to accommodate the broadness and complexity of the problem.

This chapter also provides answers to the critical questions that were posed in chapter 1 of this study and that laid the foundation for this study. The answers presented are grounded by the theoretical framework of this study and demonstrate whether the researcher has managed to address the critical questions that prompted this study.

#### **5.2 BRIEF OVERVIEW OF THE STUDY**

##### **5.2.1 Research problem**

In order to provide recommendations and conclusions based on this study, it is necessary to summarise and review the research process so as to determine whether the research questions were answered using the objectives of the research. This study was prompted by the South African government's Department of Public Services and Administration's decision in attempting to make Information Communication Technology accessible to all at rural level and to facilitate access for all by developing a ten-year e-government policy in 2001, which they aimed to implement by 2011.

It is this that provided the background to this research and prompted the researcher to conduct a quantitative investigation of the feasibility of the Department of Public Services and Administration's policy in the context of rural communities, specifically in KwaZulu-Natal. The study mainly focused on technology implementers, specifically at the State Information

Technology Agency of KwaZulu-Natal, and it aimed at establishing what the perspectives of these technology implementers were regarding Information Communication Technology deployment to rural communities of KwaZulu-Natal.

### **5.2.2 Literature survey**

A literature survey was conducted to determine which aspects of the research problem have been researched elsewhere and how applicable the solutions offered by such research are for Information Communication Technology deployment to rural communities in South Africa. The literature survey involved resources such as the University of KwaZulu-Natal libraries and online electronic databases such as the Nexus, Sabinet, EBSCOhost and Science Direct electronic resource materials.

### **5.2.3 Empirical research**

Subsequent to the literature survey was an empirical investigation making use of a quantitative approach. This involved a structured questionnaire-based survey of a sample of technology implementers from the State Information Technology Agency (SITA) regional offices of KwaZulu-Natal. Data was obtained from these technology implementers by means of a structured questionnaire. The researcher used information provided by the regional manager of SITA to ensure that the research targeted a representative sample population. The researcher also obtained permission from SITA to conduct the survey at their premises using their staff. The researcher's supervisor was requested to write the request letter on behalf of the researcher so that the research could be conducted.

### **5.2.4 Data analysis**

The researcher used a statistical application called SPSS 19.0 to analyse data and to determine correlations between variables. SPSS 19.0 was also used to create the various graphs and tables.

### **5.3 LIMITATIONS**

In this section, the researcher wishes to state some limitations of this study that may compromise the validity of the results of this study.

#### **5.3.1 Small sampling frame**

Despite a response rate of ninety percent of the respondents surveyed, the use of the Cronbach's Alpha test to ascertain reliability of results if a larger sample was used and the researcher following established guidelines (Gay & Lorrie, 2006) on sample sizes, the small sample size made it difficult to generalise the study results to other rural communities.

### **5.4 ANSWERS TO CRITICAL QUESTIONS**

In this section the researcher presents answers to critical questions that were posed in this study.

#### **5.4.1 What are the factors that affect access to Information Communication Technology in rural communities of KwaZulu-Natal?**

Before thinking of bridging the digital divide and therefore heading towards achieving the goal of universal access to all, South Africa has to prevail over other issues it is confronted with. Based on the literature review conducted, Trusler (2003) identifies some challenges below:

- Economic factors;
- Poor infrastructure to support Information Communication Technology deployment mostly prevalent in rural communities;
- Governments unpreparedness towards Information Communication Technology;
- Lack of prioritising Information Communication Technology

These assertions are collaborated in this research. An analysis of the data collected from technology implementers revealed that there is need for increased availability of computers in rural communities of KwaZulu-Natal. The technology implementers also highlight the importance of key public infrastructure with regards to Information Communication Technology deployment to these communities, and noted that cost of use was an inhibiting factor to accessing ICT. Rogers (2003) identifies old ICT such as the radio that is still widely used as an important communication conduit at the knowledge stage when looking at diffusion of innovation. According to Goldsmith (2006), the majority of Third World countries suffer from the

problem of a lack of or poor telecommunication infrastructure, which creates a divided population, with some having access to ICT and others failing to have an opportunity to use it.

#### **5.4.2 How important are Information Communication Technology policies with regard to deployment of technology initiatives to rural communities in KwaZulu-Natal?**

Policies of national development tend to neglect rural areas, hence the lack of development at present in the rural communities of KwaZulu-Natal. Furthermore, it is difficult to introduce Information Communication Technology to rural areas, to aim to make it accessible to all rural communities by 2011 (DPSA, 2001), and bridging the digital divide, in the midst of more urgent problems needing attention. It does not make much sense from a rural perspective to address the digital divide when there are other more urgent divides, for example the issue of water supply, health facilities, power supply, food supply and government services. Unless these issues are addressed, ICT from the view point of rural communities will remain a luxury not worth their effort. It is therefore fair to say that before deciding on technology in rural areas, it is important to address some of their much more pressing needs first. Based on the literature review, current policy frameworks pose as a barrier to providing rural communities all the benefits that liberalising the telecommunication sector can bring. It is these regulatory policies that create monopolies for state owned companies such as Telkom. Much as it is important to protect local industry these inhibiting policy frameworks tend to disadvantage users of the services provided.

The research revealed that technology implementers perceived Information Communication Technology policies that specifically address rural communities to be important and indicated their need with regard to deployment of technology initiatives to rural communities of KwaZulu-Natal. The analysis also revealed the technology implementers were not aware of the department that was driving the deployment of technology by setting policy (DPSA, 2001).

As was mentioned in the earlier section of this study, the government of the Republic of South Africa has made commendable strides towards policy formulation. Three pieces of legislation have addressed the issue of access to ICT: the Telecommunications Act of 1996, the Telecommunications White Paper of 1996 and the Telecommunications Act Amendment of 2001. These policies are charged with finding innovative ways to promote universal access (Emdon, 2003).

Rogers (2003) suggests that the speed of decision making is related to the number of individuals involved. The author suggests that the more the individuals involved the longer it takes to make a decision. This suggestion is collaborated by the results of this research that indicated that the slow pace of Information Communication Technology policy formulation has a negative impact on the deployment of technology initiatives.

#### **5.4.3 What are the current Information Communication Technologies deployed in rural communities of KwaZulu-Natal being used for?**

The research revealed that technology implementers in KwaZulu-Natal suggest that Information Communication Technology deployment in rural communities is being driven by the need for social inclusion. The main uses of ICT were identified as being for email, Internet, research and access to information.

The results revealed inconsistencies in the technology implementers' responses in that the majority stated that the main motivation for Information Communication Technology deployment to rural communities of KwaZulu-Natal was social inclusion; however, subsequent responses revealed that access to information was the main intention for the deployment of ICT to rural communities of KwaZulu-Natal. Therefore this suggests that most technology implementers are not adequately educated about government policy regarding the purpose of various ICT initiatives.

The study also revealed that the technology implementers suggested that e-government and e-learning was a priority to rural communities of KwaZulu-Natal province. The effective use of Information Communication Technology initiatives in rural KwaZulu-Natal is dependent on community members having sufficient access to unfailing technologies and stable internet connections. It is these characteristics that encourage e-learning (Department of Education, 2004).

#### **5.4.4 How should Information Communication Technology be successfully deployed to rural communities of KwaZulu-Natal?**

The research results reveal that the majority of KwaZulu-Natal lacks infrastructure to support Information Communication Technology deployment. Trusler (2003) elaborated on this problem of weak ICT infrastructure particularly in rural communities in South Africa.

Rogers (2003) identifies the nature of the social system as a determinant of deployment of technology initiatives. The system the author identifies has the ability to make possible or hinder the deployment of Information Communication Technology innovations. The study revealed that



technology implementers recognised the importance of the influence of culture on user acceptance when deploying ICT initiatives. This suggests that cultural issues need to be taken into consideration when deploying ICT.

The literature review revealed that content of information provided by the Information Communication Technology initiative is also of great importance in the successful deployment of the initiative. One of the major reasons why ICT initiatives fail is the lack of local content that would make the initiative relevant to the community in which it has been deployed. In a report presented to the National Conference on Education and Training in Kenya (Government of Kenya, 2003) one of the recommendations for successful technology deployment was that policies on ICT development should contain a deliberate focus on content development. This factor is also supported by empirical evidence from this research acknowledged that technology implementers were of the perception that ICT initiatives should be used for accessing information. This information should be on direct relevance to their day to day lives otherwise it serves no purpose to these communities.

The technology implementers also indicated that geographical location of where the Information Communication Technology initiative is being deployed is an important factor. Technology implementers also identified the need for basic computer skills on the part of the users in order for users to access these initiatives. The analysis also revealed the importance of a well formulated policy framework that has focus on the target communities.

## **5.5 RECOMMENDATIONS**

The technology implementers' perspectives on Information Communication Technology deployment to rural communities in KwaZulu-Natal can contribute to the diffusion of innovation and hence help in determining government policy. It is against this backdrop that the researcher makes the following contributions that he believes would aid in the deployment of ICT to rural communities in KwaZulu-Natal.

### **5.5.1 The use of fibre-optic cables**

Negroponte (1998) recommends the use of fibre-optic cables as the data-transmission medium for developing countries. He justifies this use by stating its advantages, such as security, higher data-transmission rates than other media, a more interactive nature compared with other types of cables and its ability to use the cable as a backbone media, that is carrying data between main points (e.g. service providers) and also its ability to be used to carry data all the way up to the end user.

According to the literature reviewed in this study, infrastructure is important when deploying Information Communication Technology initiatives to rural communities and its successful deployment depends largely on the appropriate infrastructural capacity. For example, the slow speed of the 9.6 kbps dial-up Internet connection used in the Manguzi connectivity project was noted as a challenge, as the project was intended to connect schools in order to take Internet access closer to students who previously had had to walk for long distances to access the telecentres. Speed challenges such as this can be resolved by using fibre-optic cables.

### **5.5.2 A bottom-up, responsive and integrated approach**

According to the literature review and findings of this study, social and cultural aspects have an impact on the sustainability of technology initiatives and hence affect the success of the deployment and use of Information Communication Technology in rural communities of KwaZulu-Natal. One of the findings of this study showed that technology implementers perceived culture to have an impact on user acceptance of technology initiatives deployed to rural communities. Gumucio-Dagron (2003) asserts that as long as the community does not readily accept innovation, a project may fail. If the benefiting community is not interested in the new initiative, its sustainability is not guaranteed, which is why the same community could end up being negligent with the setup equipment (Maleka, 2003).

The government should make a deliberate effort to implement a bottom-up approach to policy formulation and the deployment of technology initiatives, thereby ensuring that the initiatives take into account the needs of rural communities, such as the communities' social perspectives on the initiatives, for example the physical location of the initiative in the case of a telecentre (Roman & Colle, 2002). The technology initiatives should have sufficient facilities to service the communities they are being deployed to. This allows community members to have adequate access to the technology and to try out these technologies, thus increasing their familiarity with the technologies and their participation in and appreciation of the initiative.

These rural community technology initiatives should not be setup as stand-alone structures but rather should be integrated into the community in terms of providing solutions to what community members perceive to be problems. This ensures the use and appreciation of the technology. As Siochru & Girrard (2005) assert, these technologies are of Western origin and factors such as the literacy levels of the community need to be taken into account, hence justifying the bottom-up approach to the policy formulation and deployment of technology initiatives. In the case of culture, the government should consider providing the target rural com-

munities with sensitisation programmes and campaigns to educate the target community on the benefits the technology initiative would bring and to eradicate any negative perceptions the community members might have towards the initiative (as discussed in Cairncross, 2003).

### **5.5.3 Training for technology implementers and end users**

The study also revealed that technology implementers were not sure which department is in charge of Information Communication Technology policy. This result suggests that technology implementers may need to be trained on government policy related to ICT. This training would be aimed at breaking down the compartmentalised nature that currently exists between the ICT policy makers and the technology implementers.

The training also would create awareness on the part of technology implementers of the various Information Communication Technology policies, thereby creating a positive attitude towards technology initiatives and the use of the most appropriate technology for implementation. The training will also increase their knowledge base and add to their level of confidence during technology deployment initiatives. The training should also be extended to members of the rural communities who are the intended beneficiaries of these initiatives, as the results of the survey show that technology implementers state that basic computer skills are required.

### **5.5.4 Development of ICT infrastructure**

Infrastructure is a major factor that impacts on attempts to promoting a digitally inclusive society by providing universal access to all (James, 2007). As demonstrated in this study, technology implementers' perspectives on e-government were that there were not enough e-government initiatives in rural communities and that the support infrastructure including computers is insufficient and in some cases unavailable. It is therefore recommended that government should embark on initiatives to increase the development of Information Communication Technology support infrastructure that in turn will provide a favourable environment for increasing e-government initiatives.

### **5.5.5 Promoting local content**

The government must focus on the creation of relevant content and not only on the transfer of technology to rural communities. If the community members perceive the technology as a means to access relevant content, the rate of successful and sustained deployment will be higher than when attempting to introduce technology that the community members do not see as relevant or useful to them.

### **5.5.6 Telecommunication industry liberalisation**

The government should also critically look at liberalising the telecommunication industry more to encourage competition which brings benefits to the customers. Emdon (2003) is in support of this recommendation by stating that usually poor quality of service and the cost of using the Internet are linked to the failure to liberalise the telecommunications industry. Reduced costs create an enabling environment for technology initiatives to be deployment to previously underserved areas usual rural communities as there is low economic activity in these areas.

## **5.6 CONCLUSION**

Presented in this chapter were the findings of the research, the limitations of the study and proposed recommendations. It has been shown that Information Communication Technology can serve as a very powerful tool in rural development provided that the necessary climate is provided such as infrastructure and community members are empowered to use and appreciate them. The data analysis reveals that from the perspective of the technology implementers, e-governance is a very important service that is required in rural areas.

The main findings of this research suggest that sustainability of Information Communication Technology initiatives is key to the successful deploying of technology initiatives and that if community members are not aware or included in the deployment process, these initiatives tend to have a higher chance of failure. It is for this reason that this study recommends the use of a bottom up or also referred to as a participatory approach. This approach ensures that community members are made part of the development process thereby increasing ownership of the initiative. The results of the research indicate that majority of the technology implementers feel that there are not enough ICT initiatives in KwaZulu-Natal province. Some of the reasons forwarded for this was the lack or poor supporting infrastructure such as electricity supply, was also identified as one of the contributing reasons for this problem.

The evidence from the data analysis showed that importance ought to be attached to Information Communication Technology policy formulation and the literature points to the need to liberalise this sector so that the benefits of this can be passed on to the consumers such as better quality of service and reduced rates due to competition. In order to successfully deploy ICT initiatives to rural areas of KwaZulu-Natal therefore it will take a concerted effort from both provincial government and central government both taking into account issues of access to the technology, infrastructure, policy frameworks that take into account rural areas specifically, ICT literacy and social aspects such as culture.

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## **APPENDICES**

## APPENDIX 1: ETHICAL CLEARANCE DOCUMENTS



UNIVERSITY OF  
KWAZULU-NATAL  
INYUVESI  
YAKWAZULU-NATALI

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17 January 2012

Mr N Jere (208529551)  
School of Information Systems & Technology

Dear Mr Jere

PROTOCOL REFERENCE NUMBER: HSS/0126/011M  
NEW PROJECT TITLE: The Perspectives of Technology Implementers about Information Communication  
Technology Deployment to Rural Communities in KwaZulu-Natal

**APPROVAL AND CHANGE OF DISSERTATION TITLE**

I wish to confirm that ethical clearance has been granted full approval for the above mentioned project:

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach/Methods must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years

Best wishes for the successful completion of your research protocol.

Yours faithfully

Professor Steven Collings (Chair)  
Humanities & Social Sciences Research Ethics Committee

cc Supervisor Professor Rembrandt Klopper  
cc Post Graduate Office



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## APPENDIX 2: QUESTIONNAIRE



### **VOLUNTARY QUESTIONNAIRE FOR IMPLEMENTERS OF INFORMATION COMMUNICATION TECHNOLOGY TO RURAL COMMUNITIES IN KWAZULU- NATAL**

*The Effective deployment of Information Communication Technology  
to Rural KwaZulu-Natal*

**Researcher:** Ntabeni Joseph Jere 208529551 (071 219 1931)

**Supervisor:** Prof. Rembrandt Klopper (084-4466662)

School of Information Systems and Technology

University of KwaZulu-Natal

#### **How to complete this questionnaire**

1. Please answer the questions as truthfully as you can. Be sure to read and follow the instructions of each section.
2. All responses in this questionnaire will be treated with confidentiality and consent will be sort from the respondents before making any the findings public if need be. If you do not feel comfortable answering a question you can indicate that you do not want to answer it. It would be highly appreciated if you could answer as many questions as possible.
3. You can indicate each response by making a tick or a cross, or encircling each appropriate response with a PEN (not a pencil), or by filling in the required words or number.

#### **Information about deployment of Information Communication Technologies (ICT)**

**Please read the following definition of e-Government:** E-government is defined as "utilizing the Internet and the World-Wide-Web for delivering government information and services to citizens". It may also include using other ICTs in addition to the Internet and the Web, such as "database, networking, discussion support, multimedia, automation, tracking and tracing, and personal identification technologies".

*(In the case of 1-2: please write the number representing the rate to which you agree or disagree in the answer spaces provided)*

Very well prepared	1	2	3	4	5	6	Not at all prepared
--------------------	---	---	---	---	---	---	---------------------

1. How prepared are members of rural communities in KwaZulu-Natal district prepared to participate in e-Governance? \_\_\_\_\_

2. Which government department is responsible overall for Information Technology policies in South Africa? \_\_\_\_\_

*(In the case of 3-6: please write the number representing the (extent) to which you agree or disagree in the answer spaces provided)*

Strongly agree	1	2	3	4	5	6	Strongly disagree
----------------	---	---	---	---	---	---	-------------------

3. Geographic location is very important when it comes to ICT deployment in rural areas? \_\_\_\_\_
4. An ICT policy document is a very important document when it comes to ICT deployment? \_\_\_\_\_
5. The slow pace in the development of an ICT policy document has been the major hindrance for the deployment of technology in rural areas in KwaZulu-Natal? \_\_\_\_\_
6. Current ICT policies do not deliberately address the rural communities? \_\_\_\_\_

*(Please tick only one option per question.)*

7. What is the motivation for ICT deployment in rural areas?
- ☐ Provide internet access
  - ☐ Improve digital inclusiveness
  - ☐ Reduce digital divide
  - ☐ Social inclusion
  - ☐ Financial sustainability
8. How would you assess the level of computer skills required to have access to ICTs in rural areas?
- ☐ Advanced computer skills
  - ☐ Intermediate computer skills
  - ☐ Basic computer skills
  - ☐ No computer skills

9. ICT deployment to rural areas is mainly intended for?	Yes	No	I don't know
a) E-Mail			
b) Internet			
c) Research			
d) Chat			
e) Instant messaging			
f) Access to information			

10. Use the scale below to indicate to what extent do you agree with the following statements by filling the appropriate number in the box.

Strongly agree	1	2	3	4	5	6	Strongly disagree
----------------	---	---	---	---	---	---	-------------------

a) The number of computers in rural areas is sufficient.	
b) Poor public key infrastructure such as lack of electricity etc is the cause of lack of ICT deployment in rural KwaZulu-Natal.	
c) Technologies such as WI-FI and mobile computing (emerging technologies) are the technologies of choice for rural KwaZulu-Natal.	
d) Culture has an effect on user acceptance of Information Communication Technologies (ICTs) in rural KwaZulu-Natal.	
e) Computers are of little importance in rural areas because there are other more important issues.	
f) Computers in rural areas should be used for financial benefit of the community members and restrictions should be placed on non-financial activities.	
g) Computers should be used in rural communities more than they are being used now.	

11. Please tick the appropriate option for each of the questions below:	Yes	No	I don't know
a) In your view, are computers evenly distributed in rural areas?			
b) Is the infrastructure to support ICT deployment available in rural areas? E.g. electricity supply			
c) Do you think e-Learning is a priority?			
d) Do you think e-Governance is a priority?			
e) Is cost of access an inhibiting factor?			

f) Does the South African Government consider rural areas a priority area in ICT deployment?			
g) Are there initiatives to deploy ICTs in rural areas?			
h) Is internet access part of those initiatives?			
i) Do you think the current rural deployments of ICT initiatives are sufficient?			

#### **Your Personal Information**

12. My gender is:

- ☐ Female  
☐ Male

13. I grew up in:

- ☐ A rural area  
☐ A semi urban area  
☐ An urban area

14. I live in:

- ☐ A rural area  
☐ A semi urban area  
☐ An urban area

15. I belong to the following ethnic group:

- ☐ An African / Black  
☐ Indian / Asian  
☐ White  
☐ Coloured  
☐ A member of another ethnic group

16. My age falls within the range:

- ☐ 20 to 29  
☐ 30 to 39  
☐ 40 to 49  
☐ 50 to 59  
☐ 60 or older

17. I have the following number of years of experience in Information Technology:

- ☐ 3 or less  
☐ 4 to 9  
☐ 10 to 19  
☐ 20 or more

18. I belong to the following group in the organization:

- ☐ Management  
☐ Consultant  
☐ Technical  
☐ Other

*Thank you again for completing this questionnaire.*



## APPENDIX 3: CONCEPT MATRIX

Prof. Rembrandt Klopper and Prof. Sam Lubbe© 2005. Any researcher may use this matrix with acknowledgement to the authors.

Each cell below of the electronic document contains a white tick mark (✓). To activate it highlight the cell and use the “font colour” icon (top right) to colour it black.



Concepts References	Deployment	Policy	Liberalisation	Literacy/Education	Development	Access	Telecentre	Culture	Internet	e-Readiness	ICT	ICT Benefit	Diffusion	Digital divide	Local Content	e-Government	Old ICT	New ICT	Telecommunication	Population	Digital Inclusion/Inclusiveness
Torero & Braun, 2006											✓										
Harris, 2003							✓				✓										
Melody, 2002			✓								✓										
Department of Education, 2004						✓					✓										
Rambowen, Lubbe, & Klopper, 2003						✓				✓		✓									
Unwin, 2009											✓										
ECA, 1999											✓										
Commission, 2001						✓					✓										
Department of Education, 2004											✓										
Pigato, 2001											✓		✓	✓							
Adeboye, 1998						✓					✓			✓	✓						
Butcher, 1998	✓				✓		✓				✓			✓							
Benjamin, Stavrou, Burton, & McCarthy, 2000	✓					✓	✓				✓										
Emberg, 1997						✓					✓					✓					
Anderson, 1999	✓										✓										
Kenny, 2002																	✓				
Canning, 2000																	✓				
Kling, 1996																		✓			
CIA, 2011											✓					✓	✓		✓	✓	
James, 2007						✓								✓							
Langa, Zakes, Conradie, & Roberts, 2006														✓							
Pressly, 2009					✓									✓							
Blignaut, 2009				✓		✓					✓										
Billon, Margarita, Marco, & Lera-Lopez, 2009						✓						✓		✓							
bridges.org, 2001						✓				✓		✓		✓							
Fuchs, 2009						✓						✓		✓							
Van, 2003						✓															
Likkanen 2002						✓															✓
McConnell Institute, 2001										✓				✓							
Quaynor, 2002										✓											✓
Guermezi, 2003						✓					✓								✓		
Rogers, 1983													✓								

[illegible]

## APPENDIX 4: INFORMED CONSENT LETTER

**University Of Kwazulu-Natal  
School of Information Systems & Technology  
Informed Consent Document**

Dear Respondent,

**Master of Commerce Research Project**  
**Researcher: Joseph Ntabeni Jere (071 219-1931)**  
**Supervisor: Professor Rembrandt Klopper (021 446-6662)**

I, Joseph Ntabeni Jere an Information Systems and Technology student, at the School of Information Systems and Technology, of the University of Kwazulu Natal. You are invited to participate in a research project entitled The Perspectives of Technology Implementers on Information Communication Technology deployment to rural communities in KwaZulu-Natal. The aim of this study is to: make a modest but valuable contribution to the growing field of Information Communication Technologies (ICTs) hence supporting academia in general and also to ensure that government departments, policy makers and regulators in the ICT field are provided with findings which can be used to better understand the deployment and strategic use of ICTs to rural communities of KwaZulu-Natal.

Through your participation I hope to understand Information Communication Technology (ICT) deployment. The results of the survey are intended to contribute to academia in growing field of ICTs and the applicable government departments.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey. Confidentiality and anonymity of records identifying you as a participant will be maintained by the University of Kwa-Zulu-Natal.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.

The survey should take you about 15 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Investigator's signature \_\_\_\_\_ Date \_\_\_\_\_

University Of Kwazulu-Natal  
School of Information Systems & Technology  
Informed Consent Document

Master of Commerce Research Project  
Researcher: Joseph Ntabeni Jere (071 219-1931)  
Supervisor: Professor Rembrandt Klopper (021 446-6662)

CONSENT

I.....(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT

DATE

.....

**APPENDIX 5: TABLES**  
**DESCRIPTIVE STATISTICS**

	Mean	Median	Mode	Std. De- viation	Vari- ance
Preparedness to participate in e-government	4.43	5.00	5	1.485	2.206
Department in charge of ICT policy	4.66	4.00	1	3.460	11.969
Importance of geographical location	3.23	3.00	1	1.925	3.707
Importance of ICT policy document in deployment	2.72	2.00	1	1.856	3.444
Slow pace of ICT policy document development	3.21	3.00	2	1.718	2.953
ICT policy addressing rural areas	3.23	3.00	3	1.645	2.707
Motivation for ICT deployment	3.09	3.00	4	1.235	1.526
Level of computer skills required	2.77	3.00	3	.677	.459
Intent of ICT deployment to rural areas: e-mail	1.16	1.00	1	.479	.230
Intent of ICT deployment to rural areas: Internet	1.18	1.00	1	.495	.245
Intent of ICT deployment to rural areas: research	1.36	1.00	1	.685	.469
Intent of ICT deployment to rural areas: chat	1.82	2.00	2	.691	.478
Intent of ICT deployment to rural areas: instant messaging	1.73	2.00	2	.694	.482
Intent of ICT deployment to rural areas: access to information	1.02	1.00	1	.152	.023
Number of computers is sufficient	5.13	5.50	6	1.166	1.360
Poor key public infrastructure is the cause of lack of ICT	3.26	3.00	1 <sup>a</sup>	1.782	3.175
Choice of technologies in rural areas	3.46	3.00	3	1.643	2.698
Effect of culture on user acceptance	3.46	3.00	6	1.810	3.276

There are other more important issues in rural areas	3.78	4.00	6	1.750	3.063
Computers should be used for financial benefit	4.39	5.00	5	1.819	3.310
Computers should be used more in rural areas	2.30	2.00	1	1.685	2.839
Are computers evenly distributed?	2.17	2.00	2	.529	.280
Is infrastructure to support ICT available?	2.07	2.00	2	.442	.196
Do you think e-learning is a priority?	1.52	1.00	1	.752	.566
Do you think e-government is a priority?	1.50	1.00	1	.753	.567
Is cost of access an inhibiting factor?	1.63	1.00	1	.826	.683
Does the government consider ICT to be a priority?	2.07	2.00	2	.704	.495
Are there initiatives to deploy ICT in rural areas?	2.07	2.00	3	.884	.781
Is Internet access part of those initiatives?	2.12	3.00	3	.956	.915
Are current ICT deployment initiatives sufficient?	2.19	2.00	2	.500	.250
My gender	1.68	2.00	2	.471	.222
I grew up in	2.39	2.50	3	.689	.475
I live in	2.70	3.00	3	.594	.353
Ethnic group	2.23	2.00	2	.985	.970
Age	2.41	2.00	2	1.064	1.131
Experience in ICT	2.68	3.00	2 <sup>a</sup>	1.073	1.152
Group in the organisation	2.75	3.00	3	1.081	1.169

**DEMOGRAPHIC DATA (GENDER, ETHNIC GROUP AND AGE) OF RE-  
SPONDENTS**

		<b>%</b>	<b>Frequency</b>
<b>Gender</b>	Male	29.8	14
	Female	63.8	30
	Unspecified	6.4	3
<b>Ethnic group</b>	African / Black	23.4	11
	Indian / Asian	38.3	18
	White	19.1	9
	Coloured	12.8	6
	Unspecified	6.4	3
<b>Age</b>	20 to 29	21.3	10
	30 to 39	29.8	14
	40 to 49	27.7	13
	50 to 59	12.8	6
	60 or older	2.1	1
	Unspecified	6.4	3

# AREAS IN WHICH RESPONDENTS GREW UP / LIVE

		%	Frequency
<b>Grew up in...</b>	Rural area	10.6	5
	Semi-urban area	36.2	17
	Urban area	46.8	22
	Unspecified	6.4	3
<b>Live in...</b>	Rural area	6.4	3
	Semi-urban area	14.9	7
	Urban area	72.3	34
	Unspecified	6.4	3



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