



The role of telehealth in enhancing access to healthcare services in an under-resourced setting: A case of Mantunzeleni in Eastern Cape Province

by

Odwa Gazana

Thesis submitted in fulfilment of the requirements for the degree

Master of Technology: in Information Technology in the Faculty of Informatics and Design at the Cape Peninsula University of Technology

Supervisor: Prof Retha de la Harpe

Cape Town

December 2015

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DECLARATION

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ABSTRACT

The delivery of healthcare services should be of a high standard for everyone. For people in the location of Mantunzeleni this is not the case as there are still challenges that they go through in order to gain access to sufficient healthcare services. The location consists of four villages and the other nine which surround the four, in total this makes thirteen villages that are served by one clinic. These villages are divided by forest, rivers and mountains, people have to cross these and walk long distances to get to the clinic.

Gaining access to basic healthcare services in rural areas has never been easy, hence this study seeks to understand the role telehealth could play to help improve the situation. It has been reported in the literature that telehealth has potential to address some of the problems experienced by healthcare service providers located in the rural areas.

Research questions were posed to address the problem of limited access to healthcare services of under-served communities in rural areas. The study adopted an interpretive approach to understand how the people using healthcare services in the setting attach meaning to their experiences of the healthcare service. The study therefore seeks to understand how telehealth could improve healthcare service delivery through the participants' views, perceptions and experiences. The research strategy for this study is a single case study without attempting to generalise the findings. Qualitative data was gathered using unstructured interviews, observations and co-design methods. The current state of telehealth and challenges of healthcare services in rural under-served communities was established through a review of relevant literature. It was important to actively involve the respondents in the research process for them to feel a sense of ownership.

Data was analysed using a thematic analysis. The findings revealed the challenges currently hampering the delivery of healthcare in the research setting include poor infrastructure, high cost, the shortage of medical professionals, travelling distance, time management and lack of communication about the services. It was also revealed the role telehealth could play a role to improve access to healthcare and the findings indicate that the nurses feel that extending the healthcare service to include alternative access methods to health information, education and expertise could lead to a sense of appreciation, knowledge gain, dealing with distance problems and improved referrals, cost saving to improve healthcare service delivery.

ACKNOWLEDGEMENTS

Firstly I give thanks to God almighty for having providing me with strength and courage to successfully complete this research.

I wish to thank my wife Siba for the support she gave me throughout this research. To my supervisor Prof Retha de la Harpe, thank you for taking time to review my work and for the support and encouraging words you shared with me, God bless you.

To all those who participated in the research work, thank you for having made this study a success, especially to the late chief, (aaah Dubuligqanga) thanks for allowing me to carry out this study at the location and the people of Mantunzeleni. I would like to single out Golden Gwebityala Maqabi for organising church halls on my behalf to carry out interviews for the study.

To my family and friends I am grateful for your support thank you guys. Not forgetting my former colleagues at Metropolitan Health, team Vitel, thanks for giving me time to attend my studies during my time there. To Mr. Dale Isaacs, thanks for everything, sir.

The financial assistance of the University Research Funding towards this research is acknowledged. Opinions expressed in this thesis and the conclusions arrived at, are those of the author, and are not necessarily to be attributed to the University Research Funding.

DEDICATION

This thesis is dedicated to my mother, Nomatiletile Vivian Gazana and to the late Mr and Mrs Majiki. These are the people who groomed and were able to assist my mother financially when her parents could not. Today we at home are who we are because of the selfless souls that went out of their way to see an African child succeed. *Mthembu, Qhudeni, Mvelase, Mpafane, Ngoza, Mkhubukeli (Mr Majiki)*, not only did you groom my mother but you also gave your own home for the people of Mantunzeleni to have access to healthcare. *Dlamini, Zizi, Jama, Sjadu, Gudlani, Fakathi (Mrs Majiki)*, you could have said no to all that I have said, but you chose not to be a mother of just 6 children but a mother to the rest of the community. You could have easily said no to all but you did not.

GLOSSARY

Terms	Definition
ANC	African National Congress
ATA	American Telemedicine Association
CCHP	Centre for Connected Health Policy
COCIR	European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry
CPUT	Cape Peninsula University of Technology
ECDoH	Eastern Cape Department of Health
GDP	Gross Domestic Product
Health Services	Health services include all services dealing with the diagnosis and treatment of disease, or the promotion, maintenance and restoration of health (WHO)
Health Systems	All activities whose primary purpose is to promote, restore, and maintain health (WHO)
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
ICT	Information Communications Technology
IS	Information Systems
ITU	International Telecommunications Union
mHealth	mHealth or mobile health is a medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices (WHO, 2011:6).
MMS	Multimedia Messaging Services
MRCSU	Medical Research Council of South Africa
PDA	Personal Digital Assistance
SABC	South African Broadcasting Commission
SMS	Short Message Services
TB	Tuberculosis
Telehealth	The use of communication, diagnostic and information technology where patients are geographically separate from healthcare professionals providing healthcare services (Kluge, 2011)
WHO	World Health Organization

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Message to my fellow brothers and sisters

“Be the change you want to see in the world” – tata Nelson Rholihlahla Mandela

This is the message am passing to my fellow brothers and sisters whom come from the rural areas. Let's work hard to improve our background yards people. Better lives can only come with our help that is why we were sent to school to look after our people.

Chapter 1 – Introduction

1.1 Introduction

People need healthcare services but not everyone has the same access to them, specifically in rural and under-resourced settings. Obtaining basic healthcare for rural people is a challenge due to factors such as distance to travel, shortage of medical staff, infrastructure, limited resources in hospitals and clinics, etc. (Burger, Bredenkamp, Grobler & van der Berg, 2012; Eager, Cooke, Levin & Wolmarans, 2015). By adopting Information Communication Technology (ICT) innovations these barriers or challenges can be overcome in rural areas (Koch, 2006; Kluge, 2011). Ruxwana, Herselman & Conradie (2010) indicate that medical professionals and patients strongly believed that integrating healthcare with ICT in rural areas, useful benefits could be provided to the healthcare sector and that ICT could help resolve some of the challenges facing rural healthcare.

With successful implementations of ICT instances such as telehealth in urban areas and developed contexts, this study aims to explore the role telehealth, as an instance of ICT, could play to provide better access to healthcare services in under-resourced settings.

1.2 Background to the Research Problem

The background to the research problem is describing the factors of the research problem as reported in the literature to form the basis for the research problem statement. First the context of the research is provided followed by healthcare services and finally health technologies.

1.2.1 Context of the Research

Each person in South Africa is entitled to a long and healthy life and this is one of the key priorities of the South African government (South African Statistics, 2011b). Yet health remains a challenge with uneven performances across provinces with service providers confronted by several health challenges such as the burden of disease such as HIV, injuries and both communicable and non-communicable diseases (Statistics South Africa, 2011b). The biggest challenge is the structural inequality of the health system where rural areas have a greater need for healthcare due to the number of elderly people and children who are often very poor. Healthcare provision is also fragmented where hospital-based care that is mostly based in urban areas is given a priority over primary healthcare in rural communities (Eager et al. 2015). Although progress has been made to improve access to

healthcare facilities and fiscal equity, problems remain where patients complain about rude staff, long queues and lack of medicine (Burger et al. 2012). The national e-health strategy was released in 2012 by the Department of Health (Botha, Botha & Herselman, 2014) to guide health technology implementations.

In South Africa communities in resource-restricted communities are confronted by inaccessible and unaffordable healthcare services (Harris, Goudge, Ataguba, McIntyre, Nxumalo, Jikwana & Chersich, 2011). They indicate that it is important to document the demand side perspectives of the healthcare professionals and patients in such settings since it is difficult to determine the effectiveness of the healthcare services that are embedded within social norms and constructions of disease and health perceptions.

In African countries most people are living in rural and peri-urban communities with limited healthcare services (Kamsu-Foguem & Foguem, 2014). Challenges faced by communities in developing contexts are complex and can only be sufficiently addressed with a deliberate sustainable transformation agenda (Isabalija, Mbrika & Kituy, 2013). Challenges are: access to healthcare services due to long distances and transport problems; unavailability of drugs; cost of healthcare; limited health resources; poor attitudes of healthcare professionals; delay in seeking healthcare; medical and technical expertise; access to healthcare and technology; and infrastructure (Chan & Kaufman, 2010; WHO, 2012). Culture is a key aspect to the use of health facilities and the patients' experiences of the healthcare services (WHO, 2012). In general the WHO (2012) reports that in resource-restricted communities in poor areas healthcare services are generally of poor quality.

Communities expect greater transparency from governments providing healthcare services and want to participate more actively in healthcare service provision and decision-making (WHO, 2012). This can only happen once the people understand their right to health for them to contribute meaningfully since their perceptions of the services is a valuable source of information that could be used to improve services. It is important to create mechanisms to increase communities' awareness on the multi-dimensional and complex nature of healthcare services. Community participation could influence individuals' and communities' health and service knowledge and more research is needed to explore the manner in which communities can participate in designing relevant healthcare services relevant to their needs and appropriate to the context of the community setting (Nimegeer, Farmer, Munoz & Currie, 2016).

In a middle income country such as South Africa (World Bank, 2014), a lot still needs to be done to improve the lives of the people, especially those who live in areas that are similar to

developing contexts. South Africa is divided into nine provinces with the Eastern Cape being the poorest. This background will focus on rural locations situated in the Eastern Cape. The Eastern Cape was formed in 1994 by combining three house lands: Transkei, Ciskei and some parts of South Africa. Its capital city is Bisho, located between East London and King Williams Town. The province is known for producing world class leaders such as Dr Nelson Mandela, Thabo Mbeki, Steve Biko, Raymond Mhlaba (Home of Legends, 2014). The Eastern Cape province experienced a crisis in their healthcare services during 2000 - 2004 relating to poor leadership; staff shortages; failed financial management and lack of effective oversight and accountability (Overy, Somhlaba, Tetyana & Zepe, 2004).

Within the Eastern Cape, rural areas are widely spread across the province. This study will mainly focus on one rural location between Butterworth town and Nqamakwe town named Mantunzeleni location. The location is made up of four villages which are Mzantsi, Ziganini, Mkwezweni and Mpundu, its name came after the area was dominated by the Ntunzela clan. Mantunzeleni location is surrounded by nine rural locations that are controlled by their local chiefs. These villages are separated by rivers and forests from Mantunzeleni. People of this area face a number of challenges such as access to education, transport, water sanitation, and healthcare. Since healthcare is the most basic need for any South African citizen, this study will focus on the healthcare instance.

Healthcare is the most basic service everybody should have access to, but it is not clear to what extent such villages in the location experience the health care services delivery. Four villages and nine surrounding villages are served by one clinic situated at the tip of Zigadini village. The clinic serves approximately 100 patients daily. The clinic was built in 1998 by the Eastern Cape department of health (ECDOH). The clinic still uses a manual system of keeping patients' records and sometimes records get lost and patients are then at the risk of being given wrong treatment. Sometimes the clinic runs out of medication resulting in patients being sent home and the clinic closes. For patients coming out of Mantunzeleni location this becomes a burden/problem for them as they walked long distances for nothing.

1.2.2 Healthcare Services

Healthcare services in rural communities are affected by several factors, e.g. isolation from specialists; disparity between urban and rural care availability; communities with older, sicker and less educated than urban people and telehealth has the potential to overcome this isolation to support collaborative healthcare service provision (Gantenbein, 2012).

There is a need for more community participation in primary healthcare service provision to strengthen community empowerment but it is not easy to generate and sustain active

community participation and open dialogue to become part of the national health agenda (Cleary et al. 2015). Specific areas where communities can participate more actively in health services are in disease prevention, health promotion and community care services (ibid). However, there are no formal structures to facilitate community participation in primary care services and there is a need for policy to guide the engagement between healthcare service providers, community members and other health stakeholders (ibid). It is critical to consider local expectations and needs to expand the coverage of healthcare and community participation will rely on both tangible and intangible resources and capacities (ibid)

The complexity of health systems lies in the interrelations of the different components (Frenk, 2010). It is also important to regard healthcare services not only from the service providers' perspectives but also from the recipients - the patients' perspectives in terms of their needs, perspectives, views and experiences. Patients are not only recipients of a service for which they pay but have the right to access healthcare who can also become co-producers of health through care seeking, compliance to prescriptions and promoters of their own and others' health and wellbeing. Phelan, Link and Tehranifar (2010) argue that social conditions are fundamental causes of health inequalities and interventions are required to distribute across socio-economic status groups.

1.2.3 Health Technologies

The use of technologies such as telehealth, telecare and mHealth are supposed to complement and not replace existing models of care (Stowe & Harding, 2010). Such technologies can assist with more personalised care but with the healthcare professionals still playing a major role in healthcare services to patients in poor conditions (Varshney, 2014). It is important to address local constraints and it is then necessary to understand the context of the community setting and the views of the healthcare professionals, administrators and patients (Ekeland, Bowes & Flottorp, 2010; Varshney, 2014) for buy-in of telehealth (Taylor et al. 2014). Technology supported services should be driven by national health sectors informed by the relevant policies rather than by technology market pressure (Brinkel, Krämer, Krumkamp, May & Fobil, 2014).

It is important for telehealth systems to be compatible with the human goals of medical care (Kluge, 2011). It is important to specifically consider the relationship between informed consent, patient health professional relationship and electronic health records (Ekeland, Bowes & Flottorp, 2010; Kluge, 2011). It can facilitate increased access to community palliative care services but can raise an issue of gaining informed consent from patients who do not have the cognitive or literacy ability to understand what it means (Stowe & Harding, 2010).

Implemented technologies in developed contexts cannot be transferred to developing contexts and there is insufficient research about transfer issues beyond the technologies such as the institutional environment, for example understanding organisational work practices; social environment and donor involvement (Kaufman & Chan, 2010; Isabalija et al. 2013; Taylor et al. 2014). There is a lack of evidence to indicate the success of the incorporation of new technologies in health and social care services (Stowe & Harding, 2010). Telehealth has the potential to play a major role in addressing access and inequality problems in rural resource-restricted in Africa (Kamsu-Foguem & Foguem, 2014) but the complexity of telehealth innovations (Monteagudo, Salvador & Kun, 2014; Taylor et al. 2014) needs to be considered for how it can become embedded in complex healthcare organisations that will result in new behaviours and work practices (Monteagudo, et al. 2014).

The disparity between rural areas with less resources and well-resourced urban healthcare services remains a problem even though health policy makers continuously attempt to address this problem (Gantenbein, 2012). The provision of modern healthcare services in rural and poor communities is limited (Kamsu-Foguem & Foguem, 2014). Furthermore the implementation of technologies to facilitate healthcare services remains difficult in rural African settings (Kamsu-Foguem & Foguem, 2014) - due to cultural constraints and indigenous languages. It is necessary to reduce uncertainty and waste of resources during the implementation process since healthcare services are already provided in a challenged situation with limited resources and there will not be any capacity to deal with implementation of technologies (Chan & Kaufman, 2010).

Telehealth, a fast growing field, has the potential of cost-effective and efficient technology-mediated healthcare services but by focusing on the technical aspects ignoring the changes in the nature of healthcare and relationship between patients and health professionals may have ethical and legal implications (Koch, 2006; Kluge, 2011; Monteagudo et al. 2014; Taylor et al. 2014). Telehealth has the potential to turn patients and those involved in their care provision into active co-participants in healthcare service provision (Kluge, 2011) but then new knowledge is needed especially from patients' perspectives and a better understanding of complex collaborative achievements (Ekeland et al. 2010).

Most of the telehealth implementations are still in pilot stage with limited reach and it is important to engage communities in any technology developments (Chigona, et al., 2014; Kamsu-Foguem & Foguem, 2014; Taylor et al. 2014) with most projects not even extending beyond a year (Isabalija et al. 2013) and not really becoming part of healthcare services (Brownsell, 2009) or as anticipated and informed by health policies (Ekeland et al. 2010;

Taylor et al. 2014). Major research challenges still need to be addressed, namely in the following categories: patient, healthcare professional, IT and applications related (Varshney, 2014). More research in the following areas is also needed to understand: acceptance of telehealth; working in a changing environment; introducing telehealth to front-line staff; experiencing and understanding telehealth; technology and service design; and integrating it into daily care practices (Taylor et al. 2014). More specifically more research on patient-oriented health information technologies in resource-restricted community settings is needed to understand technology-mediated healthcare services (Chan & Kaufman, 2010).

The potential of health information technologies (HIT) remains largely untapped (Chan & Kaufman, 2010) and scientific evidence of the effects of home telehealth is lacking (Koch, 2006). It is important to understand the complexities of and variables associated with resource-restricted communities settings from different research areas and disciplines, e.g. public health, socio-medical sciences, information communication technology for development (ICT4D), human-centred design and human-computer interaction for development (UCD4D, HCI4D) (Chan & Kaufman, 2010). They propose a three-level framework where level one deals with the setting and its obstacles; level two with technology and health intervention aspects (access, use patterns, and appropriate culturally relevant interfaces providing for low literacy levels; and level three with empirical evidence for the potential application and research needs (Chan & Kaufman, 2010).

There is a need to explain the constraints that cause the mismatch between the design of information systems and the use of these systems in practice in developing contexts (Kamsu-Foguem & Foguem, 2014). It is also important to consider traditional knowledge specific to the community - human factors are important for technology adoption and it is therefore important to understand the current human environment, cultural, political and economic factors (Kamsu-Foguem, Foguem, 2014).

1.3 Problem Statement

The research problem statement is written according to the problem-based framework proposed by Ellis & Levy's (2008).

1.3.1 What is the problem?

Healthcare services to rural resource-restricted communities are inadequate to address their specific health needs since people do not have easy access to healthcare services relevant to their needs due to poor infrastructure, proximity to services and underutilisation of

technologies (Mberika, Martin, Oryema & Richard, 2007; Colvin, Mia Shim, Brock & Todd 2011; Statistics South Africa, 2011b; Eager et al. 2015).

1.3.2 How is it a problem?

Healthcare services in rural resource-restricted communities are affected by many challenges associated by the complexities of such a setting such as for example long distances to health facilities; limited availability of healthcare professionals; high burden of disease; poor infrastructure, etc. (Chan & Kaufman, 2010; Harris et al. 2011; Isabaliya et al. 2013; Kamsu-Foguem & Foguem, 2014). Although technologies have the potential to facilitate better health services, the adoption of such technologies remains low, especially in rural resource-restricted contexts (Martineau, Decker & Bundred, 2002; Stowe & Harding, 2010; Monteagudo et al. 2014).

1.3.3 Why is it a problem?

There is a paucity of research on telehealth implementations, especially in rural resource-restricted communities with an insufficient understanding of the views, perceptions, experiences and roles of the different stakeholders involved in the healthcare services and technology use (Ekeland et al. 2010; Kaufman & Chan, 2010; Kluge, 2011; Isabaliya et al. 2013; Brinkel et al. 2014; Kamsu-Foguem & Foguem, 2014; Taylor et al. 2014; Varshney, 2014).

1.4 Aim of the study

The aim of this study is to explore the role of the context of a rural resource-restricted community and the community's views on the potential of utilising telehealth to improve healthcare services in such a setting.

1.5 Conceptual Model Based on the Research Problem

Based on the literature reviewed the following conceptual model is proposed to frame the research problem:

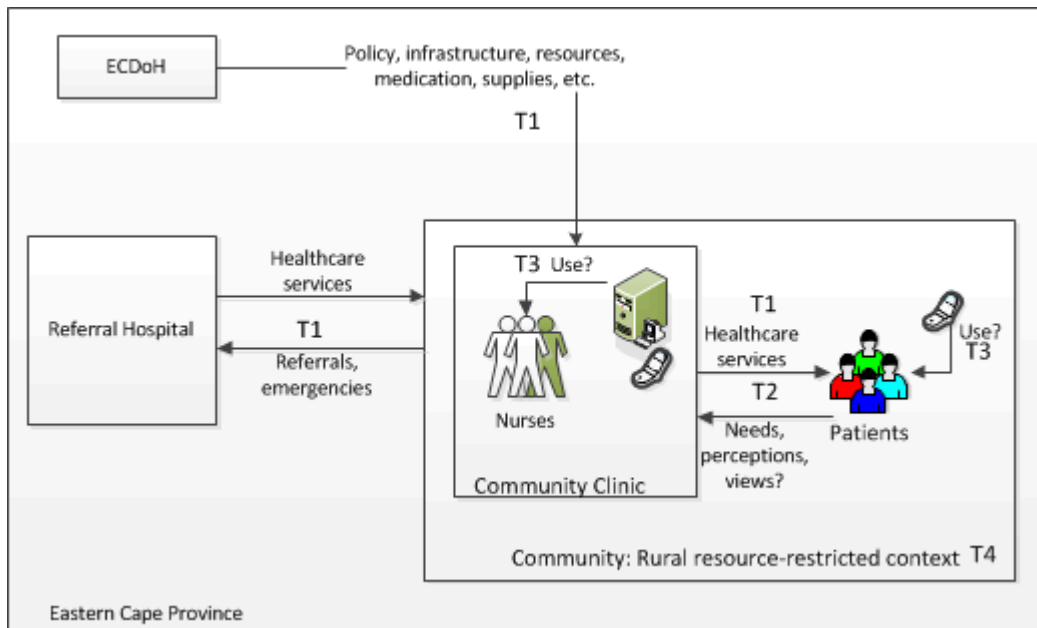


Figure 1, Conceptual model to frame the research problem

The following themes (indicated as T in the model) are proposed for this research:

Theme 1: healthcare services and systems

Theme 2: Needs, perceptions and views of healthcare participants

Theme 3: Technology

Theme 4: Contextual factors

1.6 Research Questions

To explore the role telehealth could play to provide better access to healthcare in a rural resourced-restricted setting. This study aims to answer the following questions:

Table 1: Summary of telehealth specialist's findings

<p>Research Problem: Healthcare services to rural resource-restricted communities are inadequate to address their specific health needs since people do not have easy access to healthcare services relevant to their needs due to poor infrastructure, proximity to services and underutilisation of technologies.</p>			
<p>Research Question 1: What are the challenges particular to the rural resource-restricted community's context that could influence the introduction of telehealth?</p>			
	Objectives	Methods	Theme
<p>Sub-research Question 1.1: How do community members in a rural resource-restricted community currently obtain healthcare services?</p>	<p>Conduct a baseline study of the community setting and healthcare services</p>	<p>Literature review, interviews, observations and co-design sessions</p>	<p>1</p>
<p>Sub-research Question 1.2: What are the experiences of nurses and patients in obtaining/providing healthcare services in a rural under-resourced setting?</p>	<p>Establish the experiences, views, perspectives and roles of the healthcare services</p>	<p>Literature review, interviews, observations and co-design sessions</p>	<p>2</p>
<p>Sub-research Question 1.3: What technologies are currently used by the patients and nurses in a rural resource-restricted community?</p>	<p>Establish the current state of technology use</p>	<p>Literature review, interviews and observations</p>	<p>3</p>
<p>Research Question 2: How can telehealth address the limitations of healthcare services of this particular community taking into account the views and technology perceptions of the healthcare service providers and recipients?</p>			
<p>Sub-research Question 2.1: How do the stakeholders' of healthcare service provision view the role of telehealth in a rural under-resourced setting based on the needs of such a community?</p>	<p>Identify the views of healthcare service provision stakeholders on the role telehealth could play to provide better access to healthcare services in a rural resource-restricted context</p>	<p>Literature review, interviews, expert interviews</p>	<p>1</p>
<p>Sub-research Question 2.2: What are the contextual considerations for designing</p>	<p>Determine the contextual aspects of suitable telehealth to</p>	<p>Literature review, interviews, co-design sessions</p>	<p>4</p>

technology solutions to play a role in improving access to healthcare services in rural resource-restricted communities?	improve healthcare services in a rural resource-restricted community		
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1.7 Significance of the study

The research will provide information about the current state of healthcare in an under-resourced setting of Mantunzeleni. Also the research would identify the aspects of telehealth that could potentially be used in this under-resourced setting. The study would also provide a basis for advance research studies of telehealth implementation in under-resourced settings. The findings of the study will also help decision makers in the clinic to seek interventions from the Eastern Cape Department of Health (ECDOH).

1.8 Research design

For this study an interpretative case study using qualitative data was chosen to answer the research questions. This is because the study attempts to interpret people's experiences in their world as they attach meaning to what they do (Woods, 2006). To gather data, qualitative methods such as interviews, focus groups, document analysis and co-design methods were used. Collected data was analysed and interpreted using thematic analysis.

1.9 Ethics

Livari (2007) describes ethics in research as the researcher's responsibility to consider the consequences of the research process and results. When conducting research, one has to take into account ethical considerations that may put participants' lives in danger. Babbie and Mouton (2002) state that research must be carried out in a manageable way that searches for truth but at the same time not abuse participants' rights.

Ethics clearance was obtained from the Research Ethics Committee of the University where the study is registered. Permission to conduct the study was obtained from the provincial department of health, the participating clinic and the chief who represents the community. The researcher assures that responders/participants' personal details or information provided during the interview will be kept strictly confidential and no patients' cards will be used for this research. An explanation of the study was communicated to the participant and if he/she agreed to participate, a consent letter was signed by both parties. Voluntary participation was encouraged and participants were free not to participate or withdraw at any

time. Collected data was protected and treated confidentially; access was gained by the researcher and the researcher's supervisor only.

1.10 Limitations

The researcher did not study the whole of the Eastern Cape as this would have incurred large amounts of traveling and only one clinic and the nine villages served by it was considered for this study. Also technological equipment and software used to provide telehealth was studied.

1.11 Thesis layout

The thesis is comprised of seven chapters.

Chapter 1: The first chapter introduces the proposed research. The problem statement is framed on the concepts derived from the literature. The research questions are posed to find the answers to the identified problem. The research aim and objectives are given as well as the research methodology proposed for the selected research approach. The chapter is concluded by indicating the significance and limitations of the study and a summary of the ethics.

Chapter 2: This chapter provides an overview of the literature reviewed that deals with health systems and services.

Chapter 3: This chapter provides an overview of telehealth as a specific instance of health technologies.

Chapter 4: This chapter describes the research methodology chosen for this study.

Chapter 5: This chapter describes the case used for the research and presents the findings for the sub-themes derived from the thematic analysis.

Chapter 6: This chapter presents a discussion of the findings where these are interpreted.

Chapter 7: This chapter concludes the study with the answers to the research questions, reflection, recommendations and conclusion.

Chapter 2 – Healthcare services

2.1 Introduction

This chapter looks at healthcare delivery in the African continent, particularly South Africa and the Eastern Cape Province. Issues tempering healthcare relating to this study are discussed in detail. Firstly healthcare services are discussed in general followed by healthcare services in Africa, South Africa and the Eastern Cape.

2.2 Healthcare Services

The term healthcare can be defined as the prevention and diagnosis of illnesses and other physical or mental sicknesses in humans by medical professionals (Merriam-webster, 2013). Torrey (2014) states the four levels of healthcare as: primary healthcare, secondary healthcare, tertiary healthcare and quaternary healthcare

- Primary healthcare:
the first point of contact for patients within the healthcare systems, usually spread in rural areas and locations.
- Secondary healthcare:
this level specialist provides health needs to patients upon referrals by primary care professionals. Usually found in regional areas.
- Tertiary healthcare:
highly trained professionals with advanced healthcare equipment are found in this level. Patients are referred by secondary or primary care professionals. Mainly spread provincially or nationally.
- Quaternary healthcare:
this is an extension of tertiary care with advanced equipment. This level of healthcare is offered at a limited number of regional or national health systems.

Implementation of the above healthcare levels varies depending on the financial state of a country. The World Health Organization (2013) supports the above statement by stating that healthcare implementation varies from country to country. It further explains that a healthcare system of each country needs to be robust in terms of financing; must have qualified skilled and adequate medical professionals; rightly equipped information centre for decision making; right policies in place and facilities that are well maintained to be able to deliver medicine and technologies. A study carried out by Alharthi (2012) between eight

countries found that each country's healthcare implementation varied due to policies, and socio-economic features. Below is the comparison done by Alharthi (2012):

New Zealand has a big industrial economy such as dairy farming, agriculture, tourism, etc. Society is made up of different ethnic groups, this leads to the country having a general cultural atmosphere. Technology is very advanced in the country with government institutions, healthcare institutions and banks all being computerised. Healthcare systems in this country are available for all citizens and permanent residents. Hospitals are managed by district health boards, this leads to healthcare delivery being free of charge. However with all these benefits, New Zealanders are unhappy with the healthcare systems. This leads to New Zealand adopting telehealth to ease the pain for its citizens. New Zealand has infrastructure and economy power to implement telehealth. Telehealth in New Zealand is regulated as follows:

- Communication with patients
- Quality of clinical care
- Statement on internet and electronic communications
- Patients' confidentiality.

Australia has an economic freedom score of 82.5 and is ranked 3rd in the world. The country has a very strong economy because of its ability to survive internal and external events such as droughts and Asian financial and economic crisis. The country has good technology infrastructure with 80 per cent of users having access to the internet. Healthcare is divided into two sectors: Medicare and private health services. Medicare was introduced in 1984 by government for all Australians to have access to free to low cost healthcare services. These are funded by taxation called Medicare levy. Private health services are for those who can afford private healthcare provided by expensive healthcare institutions. Telehealth was implemented because access to healthcare was unequal and healthcare in rural and remote areas was poor.

United States of America (USA) is considered as one of the most developed countries in the world and also may be the most technically advanced in the world. USA is a leading nation in the development of science and technologies. Healthcare in the country is mostly owned by private organizations but there are those provided by the state which are open to the public. Alharthi (2012) states that there are three major trends of healthcare in USA:

- Healthcare is financed by both the state and private funding making it the most expensive healthcare system in the world
- Its healthcare system has lower accessibility because of its high cost

- Doctors are restricted due to restriction on physician training.

Canada is geographically the second largest country in the world. Canada has an economic freedom ranked 6th in the world which indicates that the country has a good environment for business and trading. Canada has an impressive local and international telecommunication infrastructure. Healthcare services are provided in each province. Healthcare is solely funded by the state. Private insurance that duplicates services provided by the state are prohibited. Private insurance is given the role of only filling up the blanks in the healthcare systems. Each province is responsible for looking after its own health plan. However, the national government regulates the healthcare system. According to Alharthi (2012) Canada has made use of its telecommunication technology to improve access to health facilities for rural and remote communities

The United Kingdom's head of state is the queen and the head of government is the prime minister. UK is one of the best globalised countries and is number 8 on the list of largest economies in the world. UK is made up of four countries meaning there are different ethnic groups. Telecommunication infrastructure is one of the best both locally and internationally. Healthcare is a universal system, with the DOH providing almost free healthcare and personal social services. The DOH determines the policies for public health. National health pays 86 percent of public health funding and 76 percent of that comes from taxation. Telehealth implementation has evolved and is regarded as well adopted in the UK

Malaysia has a multi-party system guided by the constitution. In terms of business accommodation, Malaysia has a fair environment for business and trading. Technology is well improving in the country having built a modern telecommunication network. Healthcare is divided into two sectors: private and public. The ministry of health provides healthcare services to the public. The public sector has four different types of hospitals: the state general hospital, district hospital, national referral centre and special institution and non-MOH hospitals. These hospitals have different sizes and number of beds throughout the country. The private sector is serviced by registered private practitioners. Public healthcare is funded by taxation. Telehealth in this country is well improving with some aspects already implemented in some hospitals. Aspects already in use include cardiology, radiology, neurosurgery and dermatology.

China has a very large population. Government invested in healthcare by building hospitals in rural and remote areas and community hospitals in cities and initiated insurance schemes to reduce cost for its people. Healthcare has been in the past years one of the worst, and the development of healthcare is lagging behind. The GDP expenditure in healthcare remains

lower compared to other developed countries. Challenges to the healthcare system in China include access to an affordable healthcare, efficient use of healthcare resources and high quality patient care. In terms of telehealth, the government has no strategy to promote telehealth even though it exists.

India has one of the biggest democracies in the world. The state maintains the healthcare system. India has a fast growing economy and healthcare is divided into private and public healthcare. Private healthcare is growing rapidly covering 80 per cent of the healthcare systems. Healthcare in India is a universal system covering all citizens. Healthcare is monitored by the state with public hospitals providing the best healthcare services. Medical drugs are free of cost. Primary healthcare is provided free by the city as well as by district and rural clinics. Telehealth is implemented using a three tier hierarchical structure including primary health centres linked to district hospitals. District hospitals are then connected to selected hospitals at the state level and hospitals and the state levels are connected to the super speciality hospitals at the national level

2.3 Healthcare in Africa

Africa is regarded as the second largest most populous continent with a number of states adding up to 54 countries. According to the World Population Data Sheet (2013), Africa has approximately 1.1 billion people and this number is about 15% of the world's human population. Africa is well-known for its natural resources, however it still remains the poorest and most under-developed continent. Issues faced by African people include poverty, diseases, illiteracy, malnutrition and poor healthcare services (Shine, 2001; Dohan, Abouzahra & Tan, 2014). According to Samake and Mbarike (2007) African countries face many challenges, these challenges include civil wars, dread disease and hunger. These challenges affect the delivery of healthcare to citizens both poor and rich. Africa faces severe shortages of trained medical personnel with just 3 percent of the world's trained personnel deployed in this region, while 24 percent of the global diseases burden occurs in this continent (International Finance Corporation, 2012). According to a study carried out by Klynveld Peat Marwick Goerdeler (KPMG, 2012), the burden of the diseases killing Africans include HIV/AIDS, Tuberculosis (TB) and Malaria. It is further argued that nearly 2.5 million lives are lost yearly due to these diseases.

Healthcare in certain parts of Africa is divided into two categories namely: private and public healthcare (Mostert-Phipps, 2011). Private healthcare is accessible to people who can afford the services and who often also belong to medical aid schemes, while public healthcare is accessed by the poor having to rely on government or donor funded services. Due to a wide

range of resources in the private sector, medical professionals are diverting to it. Expactica.com (2014) lists these resources as better salaries, better working conditions, and the latest high-tech equipment. Public healthcare is funded by government and services provided seem to be not of good quality. Aderibigbe et al. (2006) state that public healthcare problems in developing countries include inadequacy and inaccessibility of healthcare facilities for the poor and also loss of medical staff to the private healthcare sector. Funding for public healthcare is limited hence it is dominated by private healthcare in developing countries for people who can afford such services. Public healthcare in developing countries is under-funded especially in rural areas with poor infrastructure, lack of medical resources, transport and clean water in hospitals and clinics (Martineau et al., 2002; WHO 2006).

The majority of the African people live in rural areas where poverty is a dominating factor. The World Urbanization Prospects (2009) estimated that 60 percent of African people live in rural areas and experience difficulties in obtaining access to healthcare services. This can be attributed to poor infrastructure, transport and location barriers, status, limited medical staff and facilities, race and poverty (Mberick el al., 2007; Harris et al., 2011; Heckerman et al., 2011).

The issue of medical professionals from developing countries leaving their country of birth to go to work for developed countries is also a challenge that Africa is facing. Literature discloses reasons as to why healthcare professionals are leaving the continent and public sector is due to lack of financing, lack of medical equipment and poor working conditions (Erasmus, 2014). Alice (2012) also states that about 25 percent to 50 percent of African medical professionals work overseas. He further explained that Zimbabwe and South Africa have the most doctors living abroad. Developed countries such as Australia, Canada, United Kingdom and United States of America were the main beneficiaries of these doctors.

To help curb the situation in the continent, the Economist Intelligence Unit (2012) conducted a research study that looks at the future of healthcare in Africa. The results showed that African countries need to reform their healthcare systems in the following manner:

- Focus more on preventive healthcare than curing and keeping citizens healthy.
- Local communities to have more control over healthcare resources.
- Improve access to healthcare using mobile technologies.
- Improve distribution of medicines and medical devices.
- Reduce dependency on international aid to help develop local supplies.
- Universal health insurance to cover the poor.

Economist Intelligence Unit (2012) believes that these reforms could have a strong influence to shape the future of healthcare in the African continent.

2.4 Healthcare in South Africa

South Africa is situated at the bottom of the African continent and is one of the leading countries in Africa in terms of financial growth; it is regarded as one of the most developed countries in Africa. According to Statistics South Africa (2014), the GDP increased by 0.6 percent in the second quarter of 2014, however the unemployment rate increased from 25.20 percent to 25.50 percent resulting in the poor having limited access to economic and basic services (World Bank, 2012).



Figure 2: Map of South Africa with its nine provinces

Figure 2 depicts the nine provinces of South Africa with an indication of the location of the Eastern Cape Province for the study setting. South Africa is located at the most southern part of the African continent and forms part of the Southern Africa Region, the portion generally south of -10° latitude.

Before South Africa held its first ever democratic voting election, black people were segregated and had difficulties in obtaining basic services such as healthcare, education, etc. Apartheid played a major role that saw people of colour having poor access to infrastructure and other services; this was due to the fact that certain groups were located in geographical disadvantaged areas (Prince, 1986). Maharaj and Cleland (2005) argue that apartheid policies caused healthcare services to be fragmented and were discriminatory. On the other hand white people had better access to services because they had higher income that gave them an advantage to access health insurance subsidised by their employers to pay for private healthcare services (Bloom & Macintyre, 1998; Wadee et al., 2003);

After the 1994 election, the ruling party, the African National Congress (ANC) under the leadership of former president Nelson Rholihlahla Mandela introduced transformation which saw that everyone had equal access to healthcare facilities (South Africa.info, 2012). The South African constitution adopted in parliament 1996 in section 27a states that everyone must have access to quality healthcare including reproductive healthcare (Constitution of the Republic of South Africa Act, 1996). However, due to several challenges most people are still relying on under-resourced public services in practice. News24 (2012) and Harris et al. (2011) listed these challenges as rural healthcare worsening, high HIV/AIDS infections, lack of medicines and medical equipment, shortage of qualified medical professionals, poor infrastructure in medical facilities, travelling distance, high cost of travelling, queues and long waiting times at health facilities.

In South Africa, healthcare is divided into two sectors, namely the public and private healthcare sector. Public healthcare is offered free by the state. Private healthcare is well resourced, highly specialized and available to people who can afford the services and who also often also belong to medical aid schemes. The public healthcare is very far behind in terms of delivering on its promise, it has a shortage of resources to operate effectively and this is despite the fact that the South African government contributes about 40 percent of all its expenditure on health (SouthAfrica.info, 2012). The researchers further argue that about 80 percent of the countries' population make use of the public healthcare services that results in a highly imbalanced situation where the largest percentage of people are serviced by the least number of healthcare professionals. For the public healthcare sector it is estimated that there is only 1 doctor for every 49 188 of its citizens (news24, 2012). The private sector with all its advanced resources brings a strain to the public healthcare sector as medical professionals divert to it. South African.info (2012) estimates that 80 percent of doctors work in the private sector. This has led to the DOH introducing clinical healthcare associates and mid-level healthcare to work in rural areas.

According to Jobson (2015) South African public healthcare is divided into three levels of healthcare: primary healthcare, secondary healthcare and tertiary healthcare. Below is the discussion of the levels.

2.4.1 Primary healthcare

This is the basic foundation entry provided by public healthcare. Clinics and rural hospitals are considered to be the first line of access. Services are provided free for disadvantaged people. Services provided by primary healthcare clinics include diagnosis and treatment, health education prevention and screening and counselling. Jobson (2015) also states that the quality of services provided by primary healthcare has fallen especially in rural remote areas.

2.4.2 Secondary healthcare

The secondary healthcare level is where patients from the primary healthcare are referred to. This means patients are cared for by medical professionals who have more specific expertise in whatever problem they have. In this level, this is where district hospitals belong and are always opened.

2.4.3 Tertiary healthcare

These are academic hospitals that provide advanced diagnostic procedures and treatments; they also provide training to medical graduates. They are more conserved provincial hospitals with services like rehabilitation and psychiatric trauma.

An estimation of 36 per cent of South Africans live in rural areas (World Bank, 2014). Obtaining healthcare services for rural people is a problem as they have to walk long distances to reach healthcare facilities. News24 (2012) reported that on average HIV/AIDS patients living in rural areas of South Africa have to travel 96 kilometres or 60 miles to get to their nearest health facilities. This is caused by the scarcity of medical facilities and also shortage of medical professionals. The South African Institute of Race Relations (2013) reported that the country had 56 per cent of vacant positions for doctors and 46 per cent positions for nurses. In developing countries a shortage of medical professionals leads to the risk of having high rate of diseases infections. According to South Africa.info (2012), HIV/AIDS, Tuberculosis and Cholera have a tremendous strain on South African healthcare. It further revealed that one out of five of South African women in their productive age are HIV positive with the overall population of people living with HIV being 2.38 million.

After 20 years of democracy, the South African government under the leadership of President Jacob Zuma has planned to improve the public healthcare by implementing a new and well improved healthcare system known as the National Health Insurance (NHI). With this system, government aims to improve hospital infrastructure and procurement of health equipment also trying to stop doctors from diverting to the private healthcare sector and leaving for developed countries. The main aim of NIH is to ensure that people, especially the disadvantaged, have access to healthcare services (DOH, 2011).

2.5 Healthcare in Eastern Cape

The Eastern Cape Province is situated on the eastern part of South Africa. It is known for producing great leaders such as the world icon Nelson Mandela, Walter Sisulu, Thabo Mbeki and many more. The province lies between KwaZulu Natal and the Western Cape Province and the Indian Ocean. With a population of 6 562 053, it covers an area of 168 966 m². The area covered by the province is estimated to be about 13, 9 per cent of South African land (census, 2011). The province is widely dominated by rural locations with majority of the people being Xhosa speakers. The location of Mantunzeleni lies between Nqamakwe town and Butterworth town. The location consists of four villages and is surrounded by nine other villages (see figure 2). Figure 3 provides an aerial map to show the layout of the villages and the density of the population in that area.

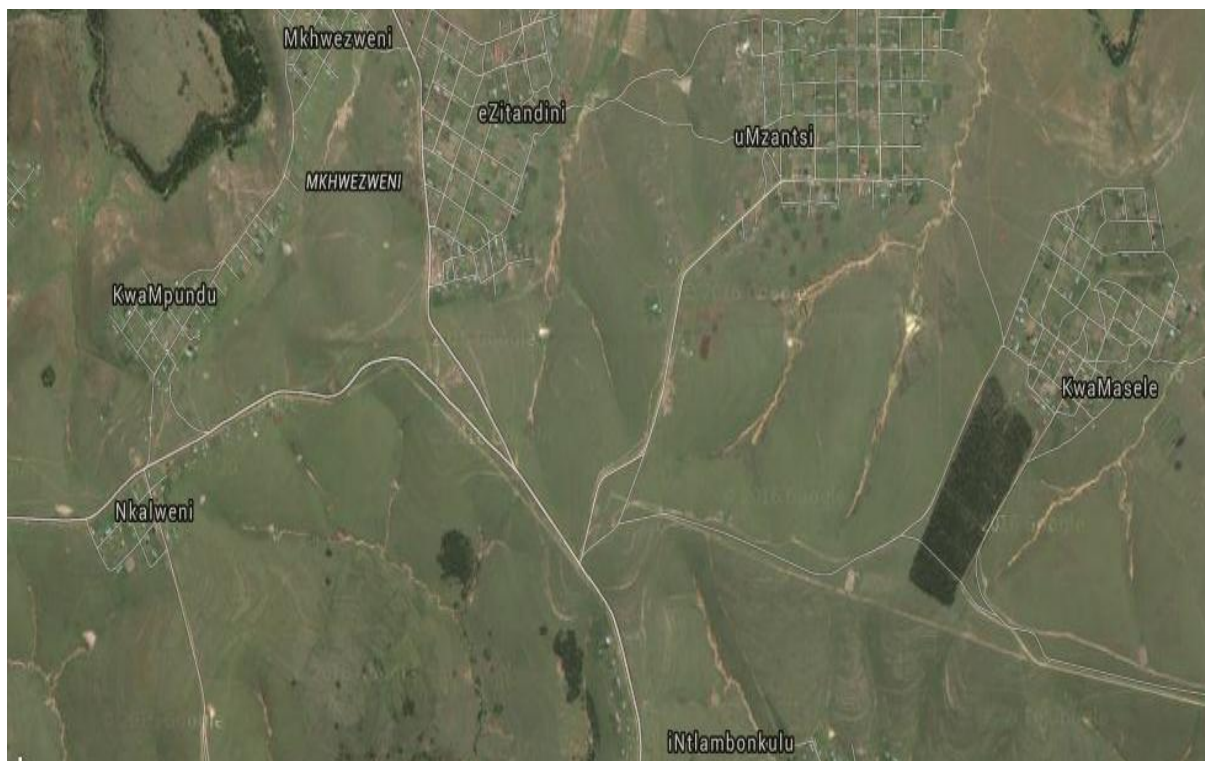


Figure 3: Mantunzeleni location and its surrounding villages

The province's primary healthcare system (provided by the government) is in dire state, facing many challenges including HIV/AIDS, TB and circumcision deaths (Thom, 2014). According to SouthAfrica.info (2012), the Eastern Cape Province has 29.3 per cent of people living with HIV/AIDS virus. Obtaining medication for people living with this virus in the province is difficult as at time, patients are referred back due to shortage of medication. The province also faces infrastructure problems. The Treatment Action Campaign (TAC, 2013) stated that a number of hospitals in the province are failing HIV/AIDS patients when it comes to handling of medication. TAC explained further to say that a large number of hospitals and clinics needed to be renovated as they did not have water, sewage, electricity and equipment. This on its own impacts the delivery of healthcare services to the people.

With many complaints and bad publicity, the ECDOH conducted a research on selected hospitals which were perceived to be poorly performing. The findings revealed that lack of equipment, lack of supplied oxygen, poor storage of records and staff attitude had a negative impact on service delivery. The above-mentioned factors have caused the public healthcare in the province to be among the worst in the country and in some places healthcare facilities have collapsed due to negligence by the province's government (TAC, 2013; Blacksash, 2015). After it was disclosed that the province's healthcare was in crisis and needed to be rescued, the Eastern Cape Health Crisis Action Coalition threatened to take the provincial's health department to court. This was after the coalition conducted a survey "Death and dying in Eastern Cape" where patients had to give their views and experiences when being attending/attended by healthcare professionals. The report revealed that family members lost their loved ones due to the province's failing healthcare system. The report detailed problems faced by patients as: state of healthcare facilities, shortage of medications, patient transport, emergency services and shortage of equipment (Blacksash, 2015).

Many of the people in the province live in rural areas. Rural areas can be defined as the areas located outside a town. With rural population being unemployed, it is eminent that diseases will spread easily as there is not enough income to get to town where people can get help. Rural people have limited access to healthcare due to the shortage of healthcare professionals and scarcity of healthcare facilities. Literature has identified the following factors as the causes of low number of healthcare professionals working in rural areas. The factors include: infrastructure and facilities, limited number of workers, support and development, longer and less productive hours, lower income, distance to travel to work, fewer choices and opportunities for specialization, blurred division between personal and professional life, lack of medicines and equipment and nurses, retarded development,

working environment and workplace security (Rickards 2011; & Public Health Association of South Africa, 2013). A clinic serving about 19 rural villages issued a statement on a daily dispatch newspaper revealing that the rural villages has had a significant increase of TB and HIV/AIDS infections. This, according to the head nurse of the clinic was due to the fact that most of the villages were 20 kilometres away from the clinic and patients had to walk long distances to reach the healthcare facility (Daily dispatch, 2014). The location of the clinic fell outside of the department of health's standard of clinics being within 5 kilometres radius of communities. In addition the paper detailed that patients had to cross rivers and walk in places where there is a high rate of crime to get to the clinic.

Due to the report by Blacksash, the premier of the Eastern Cape in his opening of the province's parliament said that plans to help curb the dire state of healthcare in the province included revamping 2 new hospitals, an extension of Nelson Mandela academic hospital, 17 clinics which were built at R332.2 million and investing in healthcare professionals (Masualle, 2015). These statements were supported by the health MEC in the province. In his budget vote, he outlined that 1.577 billion was to be made available for HIV/AIDS program, a further 1.221 billion was allocated for medication (Somyo, 2015).

2.6 Conclusion

Issues hindering healthcare delivery in Africa, South Africa and the Eastern Cape Province were discussed in full details. It is evident that healthcare deliveries in rural areas need an improvement in order to meet the standards of healthcare delivery in urban areas. Primary healthcare provided by the state is in dire state due to the factors mentioned above.

Chapter 3 – Introduction to telehealth

3.1 Introduction

The chapter seeks to explain health information systems and telehealth and the role it plays in the African continent, focusing more on South Africa and the Eastern Cape. The aim of the chapter is to give a clear view on the development and utilization of telehealth Africa, South Africa and the Eastern Cape.

3.2 Health Information System (HIS)

A Health Information System (HIS) is an information system that integrates the process of data collection, processing, analysis of information in the healthcare domain to facilitate healthcare services (Shrivastava , Shrivastava & Ramasamy, 2014). Since the HIS is used for the healthcare service provision in a particular country its use will differ from the one setting to the next with information about patients at different levels of details with aggregated information used for reporting purposes (Lau, Kuziemy, Price & Gardner, 2010). It is important to streamline the collecting, analysis and interpretation of health information to improve healthcare service provision. Lau et al. (2010) found, for example, that there is evidence of improved quality in preventative care reminders for medication management. However, they cautioned that more research is needed to understand how HIS should be designed.

HIS is made up of six components (Health Metrics Network, 2005). Below is an explanation of each component.

1. Health information system resources:
These are resources needed for the system to operate effectively. These resource include staff, finances and ICT.
2. Indicators:
HIS plans and strategies is composed of a set of indicators. These indicators need to have determinants of health, system inputs, outputs and also health status.
3. Data sources:
These are divided into two types: population based and institution based. Population based includes surveys of population and census. Institution based includes personal records, service records and resources records.

4. Data management:
Management of data deals with the collection of data, its storage and analysis to get the desired results.
5. Information products
Data is processed to produce sensible information as an outcome to be used as knowledge to build health systems.
6. Dissemination and use
Health information must be accessed by decision makers, so that they can make decisions that will provide for both the clinical staff and patients.

HIS has its advantages and disadvantages, below is an explanation of these as described by (Wordpress, 2009).

Although HIS and electronic records are more in use today, adoption still seems to be low and healthcare professionals have not really accepted these technologies as part of their work practices (Khalifa, 2013). He identified the following barriers of HIS adoption: Human (beliefs, behaviours and attitudes); professional (nature of healthcare jobs); technical (ICT); Organisational (management); financial (money and funding); and legal and regulatory (laws, regulations and legislations).

3.3 Health records

The Medical Dictionary for the Health Professionals and Nursing (2012) describes a health record as a “comprehensive compilation of information traditionally placed in the medical record but also covering aspects of the patient’s physical, mental and social health that do not necessarily relate directly to the condition under treatment”.

A health record is used to keep information about a patient’s health status, next of kins and demographic information. Health records are very confidential and only the patient and medical staff should have access to it. There are two types of health records, paper-based and electronic-based, although they both serve the same purpose. Both record types have been found to be problematic in terms of storage, usage, adoption and access (centres for Medicare & Medicaid services, 2015). Below is a description of each type to distinguish between the two types.

3.3.1 Paper-based health records

Paper-based is a traditional or older method of keeping patients information. Paper-based records are still in use in many healthcare institutions all over the world. Mikkelsen and Aasly

(2011) state that paper-based records make it easy for information to be added as only hand writing is required and there is no need for additional training. This is done by clinicians who add more information about the patient's health status when a patient has visited the health institution. Paper-based records are easily organised in numerical or alphabetical order, which allows for easy retrieval and usage (ibid). Van Dyk (2002) states that paper-based records are light weight and can be easily carried around. With the benefits mentioned above there are also issues with paper-based healthcare records and these issues are addressed below.

The following issues with paper-based records were identified from the literature review: According to Sanbar (2007), the main issue with paper-based records is that they can be easily destroyed by water and/or fire. Access to folders is very easy as the key to the store room can be cloned. If there is any destruction of the existing record, data integrity is lost as accuracy, correctness and validity have been compromised (Beimel, Malkin, Nissim & Weinreb, 2007). Once the files have been lost, a new one has to be created, this compromises the accuracy of the patient's health information because the new data may not be the same as in the lost file (Cline & Luize, 2013). It is also possible to think that the files are lost whereas they have been misplaced (Mchunu & Mlitwa, 2010). Once duplicate files belonging to the same patient exist, medical staff would not know which ones are accurate.

3.3.2 Electronic-based health records

Due to issues found in paper-based health records, electronic records were invented in order to improve the traditional recording system. These are digital records stored in computer holding patient's residential, demographic and medical information.

3.3.2.1 Advantages of electronic-based health records

Electronic-based health records have potential advantages over paper-based records. One advantage is that more accurate information is kept and can be accessed instantly for those who have access to the computers or network on which the records are stored. By using emails or a particular application, security is guaranteed if security measures are properly put into place. Electronic-based records save storage as these are stored electronically which limits the physical space that paper-based records occupy. Electronic-based records allow patients and medical staff to access data from anywhere by using push technology (Friedman & Wyatt, 1997).

3.3.2.2 Issues of electronic-based health records

Electronic-based health records might be helpful in some ways but they also have some drawbacks which are discussed below.

One of these is security; security is an important aspect of any electronic system but gaining unauthorised access to the system compromises the privacy of patients' personal information (Hau, 2003). Although security was mentioned in the previous sub section as an advantage, this can only be the case of proper security mechanisms being in place, otherwise it becomes an issue. Without proper security mechanisms it can lead to the information being shared online, for example, Stone (2009) shares a situation where patients' information was shared online, and these files were hacked in servers of Frere hospital in East London. Just Associates (2005) state that corruption of data is also a huge problem in healthcare systems. They also provide an example of patients in public healthcare institutions and clinics finding themselves with having more than one electronic record with their names spelt wrong. This leads to institutions having more than one version of electronic record for patients, leading to unnecessary duplication and integrity problems that can also be a cause of a wrong treatment for patients (Power, 2009).

Next telehealth and its application are discussed.

3.4 Defining Telehealth

ICT has drastically advanced in terms of improving people's lives globally. The healthcare sector around the world has adopted ICT in order to improve the manner in which healthcare is delivered. Both the developed and developing worlds have engaged in the adoption of ICT into healthcare (Kerr & Norris, 2004). The adoption of ICT can also be telehealth, telemedicine and mHealth. This research study looks specifically at telehealth which is a broad term that telemedicine and mHealth extend from (COCIR, 2011).

Telehealth is defined as the use of communication, diagnostic and information technology where patients are geographically separate from the healthcare professionals providing healthcare services (Kluge, 2011). It can be used as a tool in the management of long-term and home care of patients in the community (Stowe, Harding, 2010). Its objective is to complement various healthcare services despite geographical and economic barriers (Kamsu-Foguem & Foguem, 2014).

Many researchers have defined telehealth in different ways and there is no universally accepted definition of telehealth. According to Koch (2006:2) telehealth originated from

telemedicine with the meaning “usage of audio, video and other communications and electronic information processing technologies for the transmission of information and data relevant to the diagnosis and treatment of medical conditions, or to provide health services or aid healthcare personnel at distant sites”. WHO (2010) indicates four elements that telehealth must have to be relevant:

- It must provide clinical support information
- It must limit cost and distance barriers by connecting users who are separated in terms of location.
- It must utilize ICT equipment and applications.
- It must have a common goal, namely to improve healthcare delivery.

Nwaubueze et al. (2009) state that telehealth can be used to improve the quality of healthcare delivery using ways such as e-education, knowledge-based management, control of diseases and control of epidemics facilitated by ICT.

Telehealth can be classified depending on the media type used for interaction by users. Communication between users can be of three types. The first type is live interactions used in real-time between users/patients and medical professionals. Live interactions are more used in conferences where parties concerned interact together. The second type is monitoring patients from a distance by medical professionals which means that medical professionals do not have to be with the patient physically since with telehealth a patient can be monitored at a distance. The last type is the storage and forwarding of transporting videos, images and audio. Storage and forwarding are important where dermatological and x-rays images can be transferred via email as an example.

The main aim of telehealth development was to limit geographic barriers, cost reduction and provide good quality healthcare services (Heizelman, Lugh & Kvedar, 2005). This was done to simplify peoples’ lives by integrating technology with healthcare. Depending on the services and application used the term telehealth is categorised into four aspects, namely teleconsultation, telemonitoring, tele-surgery and tele-education (Norris 2002).

Teleconsultation – a process where two or more healthcare professionals separated by distance make decisions. This can occur with or without a patient involvement. It can be done with the use of telephone or video conferencing.

Telemonitoring – a process where users can gather data on a patient’s condition using a telecommunication link. Store and forward as a media type can be used to transfer the information gained.

Tele-surgery – is used when a surgery is performed on a patient. This is done at a distance with other surgeons guiding the others who are physically performing the surgery.

Tele-education – a process of gathering information from the online resources such as the internet or video-conferencing by healthcare professionals and patients. Any health related information found online can be categorised as tele-education.

Telehealth can help improve healthcare service provision in places with limited resources, especially in rural areas where there is a shortage of nurses and doctors. Telehealth can then limit the distance and cost barriers. WHO (2002) recommends that telehealth be used as a tool to assist areas where there is limited healthcare resources, they further explained that telehealth is not a substitute for medical professionals.

According to the European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR, 2011) telehealth is different from telemedicine. Telemedicine extends from telehealth, but telehealth is composed of broader implementations of technology to remoteness, training and other implementations, while services offered by telemedicine reflect the clinical specialities, examples: radiology, dermatology, cardiology and pathology (American Telemedicine Association, 2006). ATA (2006) state that telemedicine can be seen as an instrument used by healthcare professionals to provide traditional healthcare services outside the walls of medical institutions. Cureton (2012) distinguishes between the two innovations by stating that telehealth is a general term and means the transmission of patient's medical information from one healthcare professional to another or from patient to a professional healthcare. This includes clinical issues, training and monitoring purposes. Telemedicine is specifically the usage of technology to provide care/services to the patient.

3.5 Telehealth in developing countries

Developing countries by definition are countries that have low economy growth and low standards of living. These countries have many challenges that they must address in order to improve the lives of the people (World Bank, 2012). Healthcare is a very important aspect of life that everyone must have access to, but in many developing countries this is not so as the countries face many challenges that hinder the way healthcare services are delivered to the people. Ojo et al. (2007) describe the challenges associated with major socio-economic developments. Simake and Mbarika (2007) list these challenges as wars, hunger and diseases. To help curb this situation WHO (2002) recommended that technology be incorporated with healthcare especially in developing countries to help deliver healthcare

services to rural areas. Wotton (2008) outlines reasons as to why developing countries should adopt telehealth since developing countries have large rural areas and have fewer medical professionals.

Even with the recommendation by the WHO, the majority of developing countries have had little success when it comes to adopting and implementing telehealth. Literature discloses that the low success can be attributed to high cost technological equipment; electronic supply instability; poor internet connectivity beyond urban areas; low acceptance, insufficient health infrastructures and legal and privacy issues (Kifle et al., 2008; Alajmi et al., 2013).

However, some developing countries that implemented telehealth have had a positive response with the implementations. Patients living in rural areas in these countries have access to better healthcare services. Wotton and Bonnardt (2010) list these countries as Nepal, South Africa, Pakistan, Malaysia, Uzbekistan and India. They further reveal that these countries are able to provide better healthcare services in rural areas through telehealth. According to Alharthi (2012), Malaysia is at the forefront of implementing telehealth amongst the developing countries. Since 1997 the country has a national level strategy for the development of telehealth. He further explains that although India was at the pilot stage of implementing telehealth, it is in the right direction to improve delivery of healthcare services, especially for rural people.

Edworthy (2001) states that telehealth has more impact in developing countries than developed countries because it provides access to services available in developed countries that are typically not available in developing countries or contexts. In a world with a burden of diseases; shortage of medical professionals and poor healthcare infrastructure; telehealth is a solution to connect patients with medical professionals and to provide better access to healthcare services (Eccles, 2012).

3.6 Telehealth in Africa

Much has been written about the benefits/potential of telehealth in Africa, but still the implementation has been low by the African countries (Wamala & Augustine, 2013). Telehealth requires ICT infrastructure, a consistent supply of electricity and people to be able to use it and to have the necessary devices to connect from a remote area. Poverty has left Africa in a poor state especially when it comes to technology adoption. This is indicated by The International Telecommunications Union (ITU, 2013) that states that only 6.7 percent of African households have internet connectivity at their homes, about 16.3 percent of Africans make use of the internet and broadband penetration is said to be 0.3 percent. ITU

further urges that because Africa has poor ICT infrastructure, the challenges that the continent is facing need to be addressed before telehealth can be better utilised in healthcare services. In the literature high technology equipment cost, the lack of policies by the governments of African countries and the unwillingness to use the technology by medical professionals have been stated as the barriers to the successful implementation of telehealth in the continent (Kokdemir & Gorkey, 2002; Jambusaria, 2013). However, some African countries have utilised telehealth to improve the manner in which healthcare services are delivered to their citizens. The following section summarises the different telehealth projects utilized in some African countries.

Rwanda makes use of telehealth to address its challenge of very few medical professionals and scarcity of medical facilities. The project was seen as a solution to the delivery of healthcare services especially in rural areas (Nzeyimana, 2012).

According to Khartoum-Sudan (2013), Sudan's telehealth project was provided by Ashrafcom. Ashrafcom promotes access to healthcare for consumers and healthcare professionals using ICT. Khartoum-Sudan (2013) states that Ashrafcom limits barriers of not having easy access to healthcare by bringing groups from medical researchers, traditional medicine, government, technology companies and societies together in order to improve healthcare delivery to the people of Sudan.

Satellife, an American company, piloted a telehealth project in three African countries, Ghana, Kenya and Uganda. The project used Personal Digital Assistants devices (PDA's) which were carried by medical professionals to survey patients. The PDA's have the ability to use medical references from textbooks to provide easy access to information about healthcare (Chetty, 2005).

Mozambique makes use of teleradiology to initiate a connection between Maputo and Beira hospitals. The system uses two personal computers that have radiological technologies that allow images of patient records and scans to be transmitted across the telecommunications link. Chetty (2005) states that the system allows the hospitals access to specialists' opinions depending on the information transmitted and this was found to be cost effective.

Mali has a project called RAFT that has also been implemented in 10 other African French speaking countries. The project makes use of video-conferences, teleconsulting, etc. to allow interaction between medical professionals in different countries (Geissbuhler, Raetzo & Bediang, 2012).

Telehealth in Africa needs to be fully implemented by all countries so that they can expand the required services to rural areas where they are needed the most. Mars (2014) argues that even though some African countries have made use of telehealth, very few of these benefit rural people. This needs to be further investigated to identify the barriers.

3.7 Telehealth in South Africa

After the general elections of 1994, the South African government had an aim of improving the lives of the people and making healthcare accessible to all South Africans. A lot of strategies were put into place to help with the improvements and accessibility of healthcare. Four years after the country obtained independence, the department of health (DOH) formed a task team that was tasked to look at the introduction of telehealth within the South African context. The telehealth approach was to make healthcare accessible especially more to rural areas South Africans (Mars, 2009). This strategy was planned to be implemented in three phases within a period of five years. The first introduction of telehealth was piloted in 28 sites in six provinces. The piloted projects were based on tele-radiology, tele-ultrasound, tele-pathology and tele-ophthalmology.

The objective of adopting telehealth and integrating it with healthcare was to deliver healthcare services of high quality but cost effective to South Africans especially for women and children located in remote rural areas. According to the then minister of health Tshabalala-Msimang (2007), the project was to support the remote rural medical centres and strengthen the way in which referrals are made.

Since the introduction of the technology in 1998, the progress of utilising telehealth to deliver healthcare services showed an improvement in the country. Telehealth became an important aspect of the department of health, prompting the department to invest more than 15 million rands in the project (Mostoaledi, 2010). This investment resulted in the country to be considered to have the best telehealth project (Chowles, 2014). However, the adoption, implementation and usage of the technology in the country is still relatively low with only 34 percent roll-out (Jack and Mars, 2008; Mostoaledi, 2010; Van Dyk, Fortuin & Schutte, 2012). South Africa has 86 sites where telehealth is provided, but only 32 are operating. Literature discloses that the poor adoption of the technology is not only present in South Africa but also in other developing countries (Ovretveit et al., 2007; Kifle et al., 2008; Mars, 2012). Known factors that hinder the adoption of telehealth within developing countries contexts are poor power supply; connectivity issues; not enough support from healthcare professionals; lack of training and most importantly, which this study sees as a gap, is not involving the end users

(Fortuin & Molefi, 2007; Jack & Mars, 2008; Mars, 2012)). Although South Africa is not classified as a developing country but instead as a middle income country, the context of public healthcare services that this study investigates is similar to the contexts of developing countries.

In 2010 the minister of health, Dr. Mostoaledi, stated that South Africa is the only country that spends more of its budget on healthcare compared to other developing countries but the outcomes are the same. He gave five reasons as to why that is the case. The reasons are:

- Leadership in healthcare is lacking.
- Corruption within the health department.
- Lack of ICT tools and connectivity.
- Shortage of medical professionals in provinces (public healthcare)
- Lack of communication and support by stakeholders.

To improve the above-mentioned factors, government and various stakeholders, including the national broadcaster SABC, came with a decision to televise a program called HELLO DOCTOR. The programme allows viewers to call, send a sms or email attachments of their sicknesses. A panel of doctors review and offer their opinions to the callers. The program is supported by MTN South Africa which is a telecommunications company providing connectivity to mobile users. The aim of using the television station is to provide live consultation, expert driven results and clinical medical emergencies responses (Bateman, 2011). The following section summarises the success of implemented telehealth projects around the country.

An initiative was started by the children's hospital in Tygerberg Cape Town to provide support to district hospitals. The Tygerberg hospital is one of the two specialised hospitals in the Western Cape. The district hospitals referring patients to the Tygerberg hospital are connected through an email by making use of the intranet provided by the Western Cape's department of health (Chetty, 2005). The system allows doctors to send/receive x-rays images and some other tests to Tygerberg hospital where specialists can provide a second opinion after which the results are sent back to the hospitals which required the expert opinions.

In the Free State province, the department of health initiated a system known as the ICAM. The system uses touch screen technology to provide the department with 40 video-based interactive classrooms for learning and teaching purposes. The system uses a bi-directional interactive technique that allows users to interact freely with it and also allows for effective communications. The system recorded benefits that included cost reduction and improved productivity (Sorenson, 2010).

Numanoglu (2010) states that the Red Cross Children's hospital in Cape Town upgraded its systems to use digital technology that could be used for training medical professionals at a distance. He further states that the advantage of the digital technology includes decreased surgery time for patients; less mistakes made by medical professionals and increased visual teaching experiences.

A Short Message Services (SMS) was initiated by the City of Cape Town in partnership with the Compliance Company Service. The SMS system reminds TB patients as to when they can collect their medication. According to Chetty (2005), this is an important system as it prevented patients from getting multi resistant TB.

The KwaZulu Natal province, which is considered to be a leading province in terms of telehealth adoption in South Africa, has its hospitals fitted with telehealth facilities that allow doctors to refer cases to a Virtual Telehealth Centre (VTC). At the VTC a group of general practitioners, dermatologists and radiologists provide consultations and provide opinions to sites connected remotely over the network (Chowles, 2014). According to Mars (2007) teledermatology and teleophthalmology in the province are gaining maturity. This is an advantage to patients as the travelling to Durban over a distance has been eliminated. In 2011 a Mobile Telehealth Laboratory was unveiled in the province. The project was aimed at detecting illnesses such as TB, HIV/AIDS (Presidency, 2011).

Next telehealth in the Eastern Cape Province is discussed since it is the focus of this study.

3.8 Telehealth in the Eastern Cape

The Eastern Cape Province's healthcare has many problems which impact its operating functions. Due to this, in 2004, the Eastern Cape Department of Health (ECDOH) took a decision to establish 29 sites that would help improve the delivery of healthcare services in the province (Eastern Cape Business News, 2004). Telehealth in the province is integrated into the National Health Information System of South Africa Committee (NHIS/SA).

Research studies needed to be conducted for telehealth designed projects before it could be deployed in the province. The ECDOH had to come up with a strategy of implementing telehealth. The strategy is in line with the National department of health strategic goals based on healthcare service delivery (Telemedicine Operational Plan E-health (2009). The three main objectives that the strategy operates under are:

- Management and administration
- Education and training
- Academic and clinical support.

According to the Telemedicine Operational Plan E-health (2009) to achieve the above objectives, the strategy must include the following:

- Telehealth must be part of the ECDOH managerial structure.
- E-health education centres must be established
- Research must be conducted
- Consultation sites are required to provide district hospitals and clinics with telehealth equipment.

The introduction of telehealth in Eastern Cape was to assist in the ECDOH to provide better healthcare services over a distance and to improve maternal health, HIV/AIDS, TB and child health (Telemedicine Operational Plan E-health, 2009).). The following section summarises the success of implemented telehealth projects around the province.

In 1995 Walter Sisulu University (formally known as the University of Transkei) and the ECDOH initiated a link between USA, Croatia and Germany to enable the university to provide connectivity to local hospitals and clinics (Brauchli, Oberli, Hurwitz, Brauchli, Oberli, Hurwitz, Kunze, Jundt, Banach, Wirdnam, Mihatsch & Oberholzer, 2004). This led to the University to initiate a project connecting the St Elizabeth hospital located in Lusikisiki with Mthatha general hospital. Since the initiation of this project, 5 district hospitals, 1 regional hospital and 25 clinics have technology to support telehealth.

However, with the technology in place, usage levels are still very low according to Cilliers and Flowerday (2013) in six district hospitals and 25 clinics providing telehealth in the province. The technology rolled out was underutilised or not utilised at all due to the shortage of training and not having enough skilled medical professionals.

The first village in the province to have telehealth services in its local clinic is Tsiliwa village. Literature discloses that the project had issues when it has to be utilised by the clinics' staff. Some of the issues include regular power cuts and the shortage of staff who knew how to use the system effectively (Chetty, 2005). Despite these challenges the project also produced good results in terms of the quality of voice calls after the voice-over internet phones (VOIP) were removed, these VOIP were installed at the initial stage of the project. However Loots (2010) reports that the project was no longer in use due to financial constraints and support from different stakeholders.

The Uitenhage and Cicilia Makiwane hospitals had teledermatology services established in 2005. The system helped to improve referrals by 80 percent where pictures sent for referrals had good quality for easy diagnosis. According to William et al. (2007) a project called MUTI

that allowed doctors to make use of a wireless Internet-protocol system to conduct referrals for patients, ask for ambulances and place medical suppliers orders was piloted in Qumbu. The system's goal was to prevent patients from travelling long distances to clinics and hospitals when referred. The project was initiated by the CSIR in 2002. MUTI has 3 versions, MUTIv1.0 started working in 2004, it provided synchronous voice, asynchronous messages; and images. MUTIv1.0 was not user friendly because the user interface made it difficult to train staff. In 2005 MUTIv2.0 was introduced and was piloted in Libode not far from Qumbu. This version was an improvement of MUTIv1.0 but the new version still used synchronous voice, asynchronous messages with just the user interface being improved. In 2006 MUTIv3.0 was established, the new version used WIFI and had SMS services incorporated into it. The two previous versions were run on a single laptop but this was giving problems as only one person could work on it a time. MUTIv3.0 was then put to run on mobile devices to allow more users to work at the same time. The three versions were intended to be used only by the nursing staff and doctors.

In 2010 the University of Stellenbosch, in conjunction with the Medical Research Council (MRC) of South Africa initiated a project in the province, named Monitoring and Evaluation of Telemedicine in the Eastern Cape. Surveys were provided by MRC SA team and the surveys had to be completed by medical professionals, patients and technological support staff. The results of the project highlighted that people and management at the sites did not understand the implementation of the technology used. Some of the services provided were not used at all due to training issues (Hauman, 2010).

3.9 Stakeholders in telehealth

In every project or initiative being put into place to improve the quality of how people gain access their basic needs; should consider user involvement that must be carefully considered. Literature discloses that cooperation between the people involved in the project is important from the initial stage up to the closing stage (Avison & Fitzgerald, 2006; Schwalbe, 2007; Hosman & Fife, 2008; Shelly et al., 2008). Stakeholders are therefore considered the pillars of the success of an organization or project at hand. Heath and Norman (2004) describe stakeholders of telehealth as an individual or a group of people who have the power to influence the outcome or success of the project by taking an approach that is best for their needs.

ICT has the power to influence the manner in which healthcare providers deliver healthcare services. Telehealth stakeholders have therefore taken full advantage of this technology

because of the benefits it provides (Ouma & Herselman, 2008). Dansky and Gamm (2004) listed telehealth stakeholders as the following:

- Management and staff within the health department.
- Medical professionals, board of directors.
- Competitors, government officials, patients, managed care and insurance companies.

Miller (2007) further reveals that telehealth researchers cannot be left outside the domain of tele-health stakeholders.

It is evident that telehealth stakeholders include researchers, medical professionals, patients and government bodies. Figure 3 illustrates the information flow between the different stakeholders (Archangel, 2007).

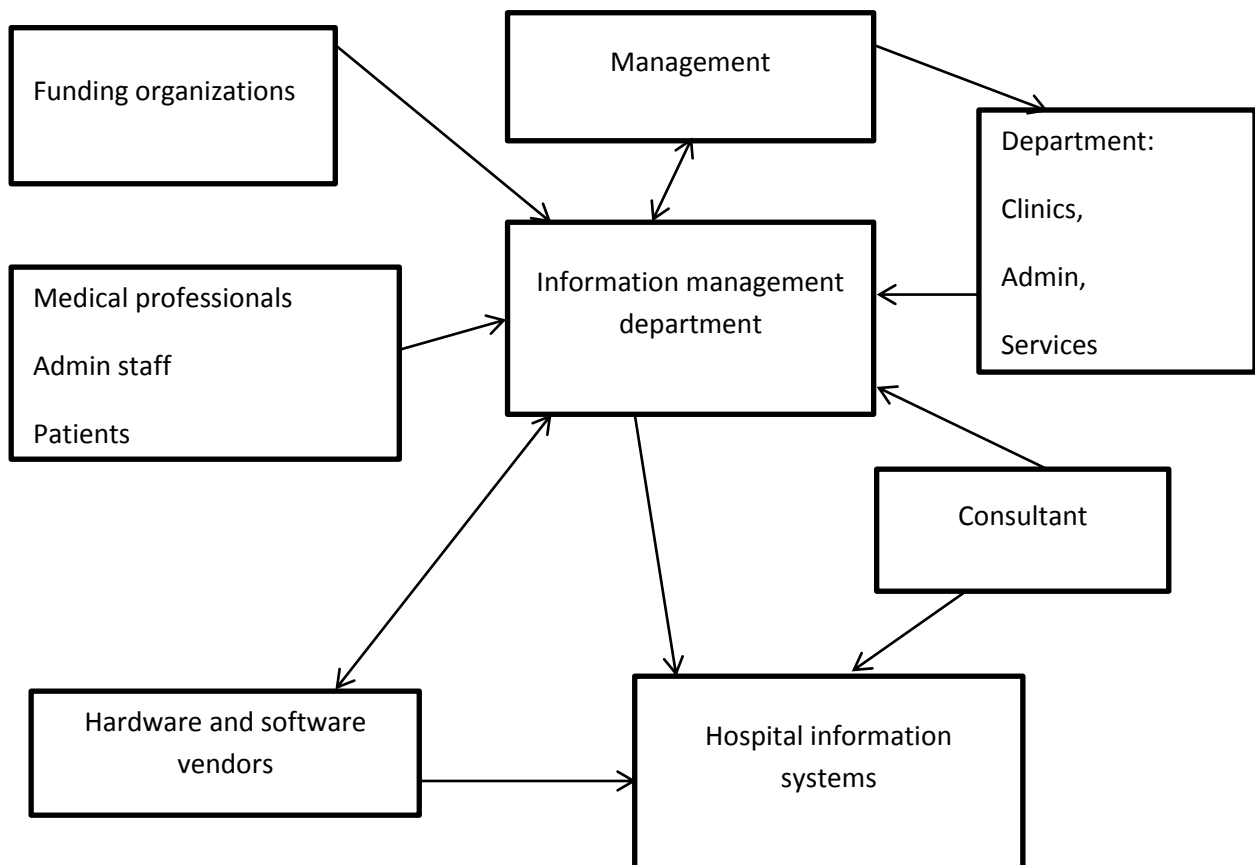


Figure 4: Stakeholders' information flow (Archangel 2007).

All these stakeholders have different roles and needs. With their involvement telehealth projects produce products that meet their requirements.

3.10 mHealth

mHealth is an emerging research area, even more so in developing countries, that still needs more research to understand the technical, socio-economic, cultural, political, infrastructure and regulatory barriers and there is a lack of clarity on the status or direction of such research (Chigona, Mudenda & Metfula, 2013). More research is needed to understand mhealth in terms of the quality of decision making, care and healthcare processes as well as reduction of cost (Varshney, 2014) and to explore benefits of new ICTs in healthcare services (Brinkel et al., 2014).

3.11 Conclusion

Chapters 2 and 3 both deal with the related literature reviewed to identify the issues relevant to this study. Here I looked at previous studies' views that are relevant to this particular topic. Firstly, an overview of healthcare services in general was explained then narrowly moved down to South Africa and the Eastern Cape. Further an introduction if telehealth was provided with certain instances that are already used both countrywide and the Eastern Cape Province.

The next chapter discusses methodologies used in the study.

Chapter 4 - Research design and methodology

4.1 Introduction

This is a very important chapter for any research as it outlines the strategies used to collect and analyze data. The research methodology should depend on the objectives and purpose/aim of the study carried out and should assist the researcher to find the most appropriate answers to the research question(s). For this study I chose an interpretative research philosophy using qualitative data to answer the research questions. This is because the study attempts to interpret people's experiences in their world as they attach meaning to what they do (Woods, 2006).

4.2 Research Methodology

This study applied the research onion's techniques to present the research methodology used for this study. Proposed by Saunders, Lewis and Thornhill (2011), the research onion consists of layers in which the study has to go through in order to find answers to its questions. The layers of the research onion are selected based on the research study at hand. The next section discusses the different layers of the model.

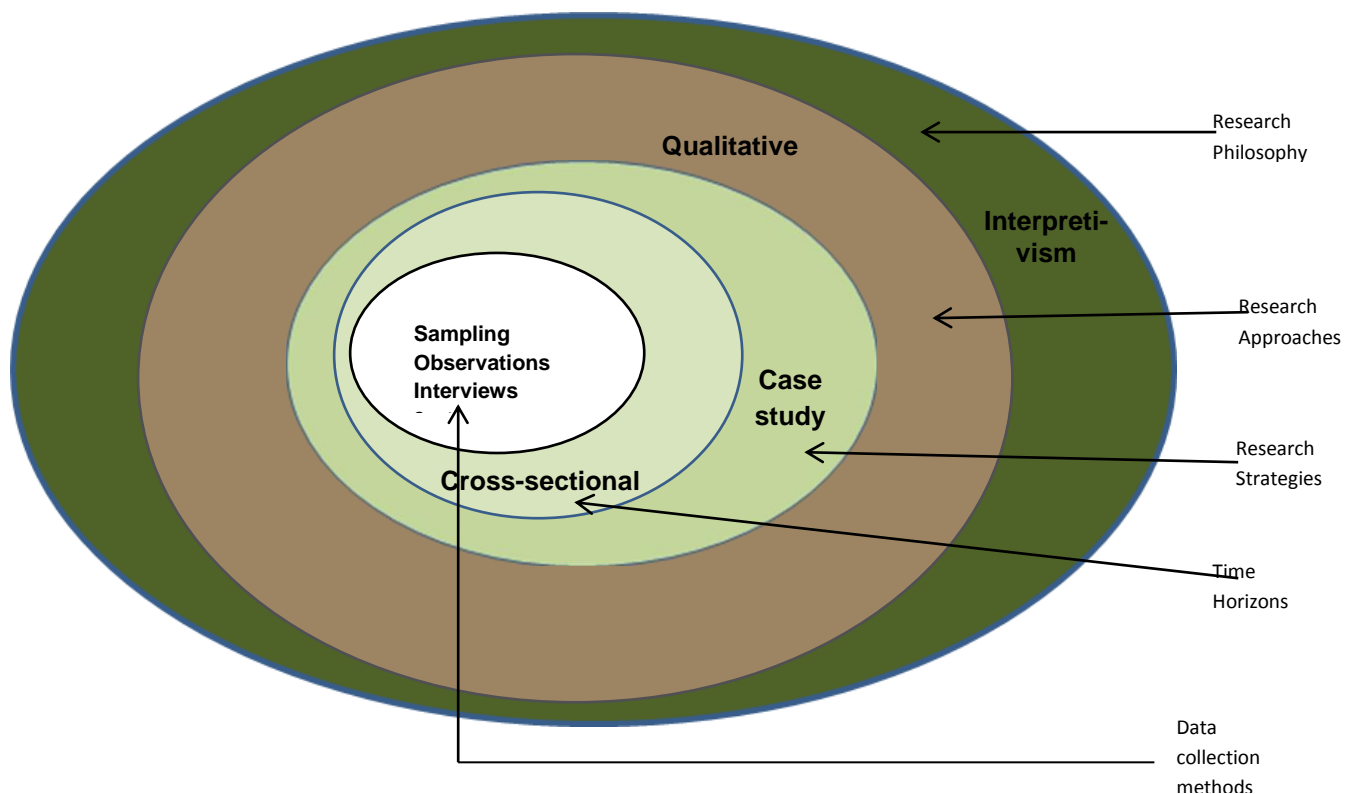


Figure 5: Research Onion: (Saunders et al., 2012)

4.3 Research Philosophy

The study applied a phenomenological research approach based on an interpretive philosophy. The other philosophies are: positivism, pragmatism and critical realism. According to Lester (1999), phenomenological approach in research seeks to understand and interpret people's perceptions or experiences through qualitative methods such as observations, interviews and document analysis. This study seeks to understand people's perceptions or experiences from rural villages of Mantunzeleni about how telehealth can help improve the current way in which they access healthcare services. This is in line with Creswell's (1998) statement that a phenomenological research seeks to understand the meaning of a group or individuals' lived experiences in real life scenarios.

In order to interpret the participants' answers on how telehealth can improve access to healthcare in the villages, the researcher applied an interpretivism. Walsham (2006) describes interpretive methods of research to focus on how people seek to understand their world and how they attach meaning to their experiences through social constructs such as language influenced by the individual's context. An interpretive research is well-suited for information systems research to gain deep insights of human action in the context of the study from a social perspective (Klein & Myers, 1999). Walsham (2006) emphasises the role of the researcher who is never completely objective to the study but uses his own background, knowledge and prejudices to interpret the data.

4.4 Research Approaches

Robson (2011) states that there are two basic approaches a research study can adopt namely: qualitative research approach and quantitative research approach.

To differentiate between the approaches, Stoop and Berg (2003) state that quantitative approach focuses on numbers or quantities. They further state that this research approach is suitable for studies that focus on determining the size or duration of a particular phenomenon. Cohen and Manion (1980) define a quantitative research approach as a social study where empirical methods and statements are used that can be quantified. Further they state that empirical statements refer to questions that focus on present situations rather than the future. Methods used to collect data in quantitative approach include experiments and surveys. This approach is suitable for studies that involve quantitative data such as statistics, measurements, experiment and figures. Since this study does not look into numbers as its outcomes, the approach was not suitable for this study.

Stoop and Berg (2003) also reveal that qualitative research seeks to find answers to questions that allow the participants to express their views, perceptions and experiences. This approach focuses on the social phenomenon in real world scenarios. In a qualitative approach data is collected using interviews, observations and document analysis or case studies (Kaplan & Maxwell, 1994; Robson, 2002; Stoop & Berg, 2003). With a qualitative approach findings are represented in the form of words and not numbers. The following table summarizes the two approaches.

Table 2: Qualitative vs Quantitative (Stoop & Berg, 2003)

	Qualitative Research	Quantitative Research
Objective / purpose	<ul style="list-style-type: none"> • To gain an understanding of underlying reasons and motivations • To provide insights into the setting of a problem, generating ideas and/or hypotheses for later quantitative research • To uncover prevalent trends in thought and opinion 	<ul style="list-style-type: none"> • To quantify data and generalize results from a sample to the population of interest • To measure the incidence of various views and opinions in a chosen sample • Sometimes followed by qualitative research which is used to explore some findings further
Sample	Usually a small number of non-representative cases. Respondents selected to fulfil a given quota.	Usually a large number of cases representing the population of interest. Randomly selected respondents.
Data collection	Unstructured or semi-structured techniques e.g. individual depth interviews or group discussions.	Structured techniques such as online questionnaires, on-street or telephone interviews.
Data analysis	Non-statistical. Thematic analysis or using a theoretical lens to analyse data.	Statistical data is usually in the form of tabulations (tabs). Findings are conclusive and usually descriptive in nature.
Outcome	Exploratory and/or investigative. Findings are not conclusive and cannot be used to make generalizations about the population of interest. Develop an initial understanding and sound base for further decision making.	Findings are in the form of: <ul style="list-style-type: none"> • Representative pictures • Estimated patterns • Prediction of probability

The study employed qualitative research approach. The purpose of using the approach was to gather non-numerical data to explain the role telehealth could play in improving the lives of the people of Mantunzeleni when it comes to accessing healthcare services. To collect data the researcher used interviews, observations and document analysis. Also the approach was chosen because it made it easier for the researcher to understand

participants and their social perception within the world they live in (Holloway & Wheeler, 2002).

4.5 Qualitative Interpretative Approach

Klein and Myers (1999) state that qualitative research can take three forms, namely positivist, interpretative and critical. Since this study adopted an interpretative approach, I will briefly discuss this approach as it provides means of accessing people, data and issues through the usage of interviews, observations (Forsythe, 1999).

According to Trauth (2001), interactive research studies assume that people often create and attach their meaning as they interact with their world. Trauth further states that the meaning behind interactive research is to understand the structure of the phenomenon being studied. In order for this study to understand the role telehealth can improve healthcare service delivery for the people of Mantunzeleni, a qualitative interpretative research was adopted. Orlikowski and Baroudi (1991) state that interpretative researchers often seek to understand the phenomena being studied through the participants' experiences.

4.6 Research Strategy

This study adopted a case study as its research strategy in order to answer its research questions. For the study data was collected in a single case. Case study as a research strategy is discussed in the following section.

According to Bromley (1990), a case study refers to a systematic inquiry into an event or a set of related events with the aim to describe and explain the research problem. Case study research provides an in-depth research of a particular topic in a real-world context. A case study is defined as an empirical enquiry that investigates the research problem in its real-life context especially when the boundaries between the problem investigated and context are not clear (Yin, 2003).

Literature discloses that in Information Systems (IS) research, the case study strategy is the most used research strategy (Crowe, Crosswell, Robertson, Huby, Avery & Sheikh, 2011; Alavi & Carlson, 1992). Data collected through case study methods can either be used to build a new theory or expand an existing theory. Case study methods of collecting data include interviews, observation and document analysis.

According to Kratwohl (1993) and Soy (1997), there are six steps of conducting a case study research:

- Research Question(s) and purpose of the study must be determined.
- Select case(s) and determine which data collection and data analysis methods will be used.
- Prepare a database to store large amounts of gathered data.
- Collection of data by researcher.
- Use appropriate methods to evaluate and analyze the collected data.
- Prepare a research report and present the data and findings using qualitative methods.

Oates (2006) states that a case study can focus on one or more instances, this can be an individual, a group of people, an organization or a department. This study used a single instance which is the Mantunzeleni location as a case to understand the role telehealth can play in improving access to healthcare services. Case studies provide in-depth information about a single person, group of people or organization (McLeod, 2008).

4.7 Time Horizon

Variables(s) were measured in a short period of time, the study made use of a cross sectional time horizon (Baltes, Nesslerode & Reese, 1988; Creswell, 1998) from 2014 to 2015. Longitudinal time horizon was not considered as the study was not looking at changing variables or patterns over time.

4.8 Data collection methods

Before doing the data collection process, the researcher had to come up with a plan on how the interviews were going to be conducted. The planning process had three phases. Phase one was to meet with the nurses of the clinic, phase two was to meet with the villagers and for phase three was to meet with telehealth experts from Walter Sisulu University (WSU) with the purpose to establish which telehealth applications would best suit the village. WSU provides telehealth services to certain part of the Eastern Cape, hence talking to them would provide a greater insight on how the technology can be implemented and so forth.

With phase two the researcher planned to use co-design sessions since the villages have no idea what telehealth is, with this technique it is easy to explain the concept using videos and other visual materials.

Before visiting the villages for data collection, the researcher had to get permission from the chief's village. Two letters one in English and the other in Xhosa, the one in English was for the chief to sign and the other was to explain in a language he understands the purpose of the visit.

A letter from the ECDoH was produced to the interviewees by the researcher; the clinic was half full with patients. The research implemented qualitative methods to gather data. Methods used are explained below.

4.8.1 Observations

Kawulich (2005) states that observations allow researchers to view the routines of participants, how they communicate, how they use tools and it also helps to record non-verbal information of their work practices.

Robson (2011) writes that there are two observation methods. He mentions them as participant observation and non-participant observation. With participant observation, the researcher becomes part of the participants and participates in the study. Non-participant, the researcher does not take part in participating but watches the participants from a distance, i.e. being in the same space but not part of the work practices (Robson, 2011; Cohen & Manion, 1980). I chose to be a non-participating observer and collected data as the events were occurring. The reason for choosing non-participating observation is because I would not participate in the observations as a patient. I would not join the queues and will not participate in any consultations. During the co-design sessions my participation was in the role of design facilitator where I contributed the design methods and process and the community members participated by responding to the design activities to obtain insights in their own views, perspectives and experiences.

4.8.2 Interviews

I could only interview two nurses from the clinic. Before the interviews began, I explained the purpose of the study, gave participants the consent letter to read and sign if they agreed. An opportunity for them to ask questions where they did not understand was granted. I then asked participants for their permission to record the conversation as we were speaking in order to reflect when analyzing data. I also took notes as we were speaking to aid when analyzing data. I used unstructured interviews with open-ended questions to gather data. This allows the interview to be flexible and not be tense as that may cause interviewees tension and not answer questions at the best of their ability (HistoryLearningSite.co.uk, 2014).

4.8.3 Literature reviews

Literature review studies provide an understanding or a background of the topic being investigated. This process involves searching for relevant documents, collecting and reading them. This is an important part for collecting data as most of the information is found on previous published documents. For this study academic journals were downloaded from the internet and academic databases located in the library using key words, read and analyzed. This was done to gather what was produced of the topic to find relevant information.

4.8.4 Co-design

When interviewing villagers, co-design methods were used and in this section the reason for using these methods in conjunction with interviews will be explained.

Co-design methods assist with explaining the concept at hand to people who are new or have no idea what is being discussed. This is done by using suitable design probes in this case to get insights from the villagers' experiences on how telehealth could help to improve the manner in which they currently access healthcare services . Design probes for this study are videos and other materials, such as stickers, which were used to explain what telehealth is and how it works.

The aim of co-design is to allow experts and end-users to come together and co-operate effectively (Visser, Van der Lugt, Stappers & Sanders, 2005). Co-design allows users to participate from the start to the end of the project. Through co-design methods, a system is built depending on the users' experiences (Mager, 2008). Alam (2002) and Kujala (2003) state that including end-users from the starting phase is very important as it proves good quality of the system requirements, sense of ownership to users; satisfaction of users regarding the system and education for users. Even though the actual design of a telehealth solution falls outside the scope of this study, it was valuable to obtain the end-users views on their current and future experiences of healthcare services in their community.

4.9 Sampling

Bhattacharjee (2012) describes sampling as a statistical procedure for selecting from a group or population a subset in which the researcher has interest to observe and provide statistical report about that population. According to Babbie and Mouton (2002), in qualitative research studies, a sampling technique is chosen on the basis of the researcher's knowledge of the population or is chosen on the aim of the study.

Convenience sampling was used to select participants. I chose this sampling method because it is the chief who summons his subjects to attend a meeting, so I worked with those who were present at the meeting. Crossman (2014) describes convenience sampling as simply the use of any subjects available to participate in a research study. Knowing the a research study has to strictly adhere to ethics, the researcher explained to the available participants how the university ethics work, this was done to make them understand that even though they were summoned by the chief they did not have to participate in the study. One of the participants stood up and spoke for everyone (after discussing among themselves) that would like to participate on their own peril because they needed intervention. The sample size was eight participants, this number could have increased if there was a traditional ceremony at one of the villages as people that did not attend a meeting are not allowed to attend the ceremony.

Tools used to capture data were a tape recorder, cellphone and a note book. I used a tape recorder and cellphone so that if one had bad audio I could have an alternative source. As the participants were talking I also took notes. After capturing the recording, they were transferred into my laptop for safe storage.

4.10 Data Analysis

Raw data was analyzed using thematic analysis. Braun and Clarke (2006) state that thematic analysis is a qualitative method for identifying, analyzing and reporting patterns within data. Thematic Analysis is suitable for questions related to people’s experience or views which is what this study is considering. It is also used to analyse the qualitative data by first coding the data and then creating themes. A thematic analysis was chosen because it is flexible, easy and quick to learn for a novice qualitative researcher (Braun & Clarke, 2006). The unit of analysis for this study was the participants’ involvement in healthcare services in a rural community and the unit of observation was the persons providing and using the healthcare service.

Table 3: Thematic steps (Braun& Clarke, 2006)

Steps	Summary of the step
familiarize myself with data	Repeatedly read the data
Generate codes	Code the data, highlighting interesting points
Search for themes	look for common words and categorizing them
Review themes	check if themes represent what is in the raw data
Define and name themes	Ensure that themes are easily read and understood
Compile report	Present a report about the actual finding by relating to the research question

After following the steps above, themes were identified, categorized and interpreted to establish the meaning of the findings.

An example of how thematic analysis works: A thematic analysis network offers a web-like network as an organizing principle and a representational means. It provides means of how data is interpreted to make sense. Thematic analysis network works as follows:

1. Basic Themes
2. Organizing Themes
3. Global Themes

Themes are represented as a web displaying a connection of how themes connect to each level.

Basic Themes simple data characteristics, basic themes must be read with other themes to make sense and when grouped together they form organizing themes.

An Organizing theme is a collection of basic themes relating to a similar instance. They reveal what is in the text. They group basic themes to one organizing theme.

Global theme is a set of organizing themes which reveals what the text as a whole interprets to make more meaning of the result of the study. These are much fewer than basic and organising themes.

Thematic analysis network involves starting from the basic themes, and working up to global themes. Basic themes are derived based on what is needed to form organizing themes. From there organizing themes are combined together to form global themes. These themes are then displayed in a web like format that would make more sense than when they were individually written.

Before the analysis was done audio tapes were transcribed, the transcripts were then analyzed using the six steps proposed by Braun and Clarke (2006) of thematic analysis. The first step was for me to familiarize myself with the data, this included going through the transcripts more than once in order to get an understanding of the data. The following step I had to code the data, this included looking for common words and categorizing them. The next step was to search for themes. According to Braun and Clarke (2006), a theme is an idea that has an important aspect of data related to the question. Searching for themes was an ongoing process in the study. I then had to review themes to check if they represented what is in the raw data. This step allowed me to refer back and also rectify mistakes I made

whereby I misinterpreted a theme. I then had to define and name themes, which is very important because the name must be accurate and must represent what the theme is about. Finally a report had to be prepared; the report must communicate with a reader in a manner that makes sense. This is done by having themes that are easy to read and understandable. Below is a summary of the steps followed to analyze data:

- familiarizing yourself with data
- generate codes
- search for themes
- review themes
- define and name themes
- produce a report.

After following the steps above, themes were identified, categorized and interpreted to establish the meaning of the findings.

4.11 Ethical considerations

The researcher is responsible for the research process and results and the consequences for those involved in the research as a result of the research (Livari, 2007). When conducting research, one has to take into account ethical considerations that may put participants' lives in danger. Babbie and Mouton (2001) state that research must be carried in a manageable way that searches for truth but at the same time does not abuse participants' rights.

Ethics clearance was obtained from the Research Ethics Committee of the University where the study is registered where the proposed research was reviewed to ensure that the research will be conducted in an ethical manner. Permission to conduct the study was obtained from the Eastern Cape Department of Health (see appendence D) as well as the chief who represents the community (see appendence C). The researcher assured that the respondents/participants personal details or information provided during the interview would be kept strictly confidential and stored in a safe secure place. No patients' cards were used for this research since the actual patient was not relevant but rather the views of the patients of the service. Although the research is dealing with healthcare services the clinical aspects were not considered at all. An explanation of the study was communicated to the participants and if they agreed to participate a consent letter was signed by both parties (see appendence E). Voluntary participation was encouraged and participants were free not to participate or could withdraw at any time. Collected data was protected and treated confidentially and accessed only by the researcher and the researcher's supervisor.

4.12 Limitations

The researcher did not study the whole of the Eastern Cape as this was going to incur large amounts of traveling and only one clinic and the nine villages served by it were considered for this study.

4.13 Conclusion

The chapter explained procedures followed to conduct the study. A qualitative interpretive approach was used to gather and analyse the data to derive findings. In the next chapter the data and findings of the case study are discussed.

Chapter 5 - Data analysis and findings

5.1 Introduction

The purpose of this study is to understand the role telehealth could play to provide better access to healthcare services in an under-resourced setting of Mantunzeleni location. In Chapter 4, I explained the methodology used to gather data. Data was collected using qualitative tools such as observations, focus groups and semi-structured interviews. Nurses, patients and a telehealth specialist were interviewed for the study. Real names of the participants were not used for confidentiality purposes. The study design was done in Mantunzeleni location, where the clinic is located. Findings were derived from the sub questions of the study. The findings are presented in the form of themes; to get themes and the 6 steps of thematic analysis were followed.

5.2 Background of the clinic

The clinic is situated in Mantunzeleni Location, Zigadini village to be more exact. This is a rural clinic that serves approximately 100 patients daily. For referrals, the clinic uses Butterworth hospital which is about 20 kilometers away. Health services provided by the clinic include:

- Immunization
- Family planning
- Antennal care
- PTB (Asthma)
- Diabetes
- HIV/AIDS

The clinic was built in 1998 by the Eastern Cape Department of Health (ECDOH). This was because people were served in huts before since the clinic had no proper infrastructure. It has three consulting rooms with one bed in each. In terms of technology usage, the ICT available in the clinic is not working. Only one computer which is used for typing notes is working. Patients' health records are kept in a separate room used by the manager as her office. For water storage, since there is no clean running water in the location, the clinic uses tanks. About three tanks are used and when they run dry life becomes difficult for patients and nurses. Figures 5 and 6 show the clinic in the village.



Figure 6: Structure of the clinic.



Figure 7: Example of the water supply for the clinic.

5.3 Gaining access to the research setting

As young man from Mantunzeleni myself, taking from my experiences when a chief receives a letter, he sends it to all his headmen in different villages to notify his people of what the letter proposes. Depending on the verdict of his subjects he then responds to whoever has sent the letter. In this study's case the chief responded well as he gave the researcher permission in writing to visit the villagers and to conduct the study there. The researcher then had to obtain permission from the department of health in the province; this was to enable the researcher to visit the nurses at the clinic. To get hold of the DOH's contact numbers, the researcher visited their website. Fortunately the receptionist was not living far from village in which the study is carried. She for a consent letter explaining research study; the letter from the Higher Degrees Committee was then sent to the ECDOH. The department responded within three weeks giving permission to go ahead with data collection (consent letter attached). Now that all the required documents were gathered, a date to meet with participants was chosen. During February 2015, the researcher went to the village to meet with the nurses. Arrangements to meet with the clinic's staff were made in January. A date for the visit was the 27th of February 2015 was confirmed. Interviews were conducted during lunch time as the nurses were busy with patients during the day.

The findings specific to gaining access are:

- Being from the community made it easier for the researcher to gain access to the village with the chief more willing to give permission
- The researcher is able to interact with the chief and participants in their own language since he is familiar with context of the study
- It is time-consuming to obtain permission from the Eastern Cape Department of Health.

5.4 Collecting data

Both nurses were interviewed separately as I did not want to distract them from their routines. One nurse was interviewed at her office and the other outside as he wanted to be in the sun because it was freezing inside. The recordings were transferred to my laptop and deleted from my phone in case I lost them. The interview with the first nurse took 27 minutes to complete and with the second nurse took 24 minutes.

When it was time to meet with the villagers, interviews with the villagers were also conducted the same way as the nurses except that a group of people were interviewed together and

design probes were used. This was some kind of a discussion with villagers as each gave each other a chance to speak. It was agreed that males and females not be separated as that would cause the process to be long. The interviews were held at a local church as the villages do not have a community hall. Before the interview commenced a prayer session was held to ask God to guide the meeting as is the practice in the village for any community gathering. Only 8 people were available and all villages within Mantunzeleni location were represented. When the community meets and some people did not attend the meetings, a decision was taken at the chief's place that people who did not attend a meeting do not drink if there is a traditional ceremony on that day, hence there was a small number of participants. Interviews with villagers were conducted using co-design methods which are explained later in this chapter.

The interview with the telehealth specialist was held telephonically since I was in Cape Town and could not go home. We agreed that a telephonic interview would best suit both of us. Fortunately the person I was speaking to had been in the clinic before and knew exactly what I wanted from her. Before we began the interview I had to explain to her the purpose of my study and what I wanted to achieve, I also asked for her permission to record the interview for the purpose of data analysis. Unfortunately after 4 months I had no response from the contact person from Walter Sisulu University who promised to contact me. I had to find another potential person to interview who knows and has worked with telehealth technologies. I contacted telemedicine Africa via email and submitted my proposal and ethics from CPUT but had no response. Fortunately my supervisor gave me the contact details of a telehealth researcher who made it possible for me to talk to a suitable telehealth expert who had also visited the clinic in the village before.

Findings specific to the data collection are:

- The location of the data collection sessions (interviews and co-design sessions) is dependent on the context that is influenced by environmental condition, e.g. it was cold inside the building; or availability of venues where the local church was used as a meeting place
- Participation depends on the chief's instruction to the community people and is affected by local events
- The community sessions were constructed according to the community's cultural practices, e.g. the meeting was opened with a prayer

5.5 Data analysis of collected data

Raw data was analyzed using thematic analysis based on the 6 steps proposed by Braun and Clarke (2006).

Searching for themes was an ongoing process in the study. I had to review themes to check if they represented what was in the raw data. This step allowed me to refer back and also rectify mistakes I made whereby I misinterpreted a theme. I then had to define and name themes. Naming themes is very important because the name must be accurate and must represent what the theme is about. Below table is a summary of the steps followed to analyze data (Braun & Clarke, 2006):

Thematic analysis was used in this research because it was relevant and feasible for this study. At the time data was collected from the location, basic themes were identified, these were then organized to form organizing themes. Organizing themes made more sense than basic themes since they were then combined to form a more meaningful approach of the results.

The interview questions and co-design activities were based on the themes identified from the literature that were linked to the research questions. These themes are:

Theme 1: Health systems and services

Theme 2: Needs, perceptions and views of healthcare participants

Theme 3: Technology

Theme 4: Context

5.6 Results from the nurses' interviews

With regards to nurses' interviews the study had two objectives to fulfil. The themes explained below fulfils the first objective which is:

Identify challenges nurses experience when providing healthcare services in the under-resourced setting of Mantunzeleni location.

For this objective, the following sub-themes were identified: poor infrastructure, shortage of staff and lack of skills, cost burden, access to transport and shortage of facilities. The sub-themes are discussed in the following section and observation results are presented in this next section.

5.6.1 Poor Infrastructure

This sub-theme brought light into how the clinic's and the area's infrastructure affects delivery and access to healthcare services. From the in-depth interviews conducted, it was revealed that the clinic and the area of Mantunzeleni is in a poor state with leakage of ceilings, cracked walls, bad roads and walking distance. Respondent1, a nurse and manager of the clinic said:

“During rainy seasons it is hard to work as the building is filled with water. Patients come here for help but instead leave here worst because of the cold they get”.

The statement was supported by respondent2, also a nurse from the clinic.

“When it is raining, we suffer because we have to run around helping patients. With water all over the place you can also slip and break a leg. I am here to help the sick not get myself sick or injured”

There is a fear that the clinic may collapse on people at times as the walls have cracks. When it comes to the area's infrastructure, both respondents mentioned the poor construction of roads, being surrounded by rivers and mountains. Respondent1 echoed the following:

“Roads are very bad, and many of the nurses who have worked here before left complaining about their condition. My husband often asks when am I moving from this place, he also complains about the poor construction of the roads. People have to cross rivers and overcome mountains to get to the clinic, it is frustrating”

Both respondents shared the same sentiments with regards to infrastructure in the area describing it as a setback. They believe that the clinic loses nurses due to the poor working and living conditions of the area.

The finding from this sub-theme is that the infrastructures are inadequate exposing the staff to undesirable environmental conditions

5.6.2 Shortage of staff and lack of skills

Shortage of staff and lack of skills was also identified as a theme based on the data obtained from both nurses and patients. In total the clinic has 4 nurses that have to serve 9 villages, there are no doctors for the clinic. According to respondent1:

“There are 3 nurses in general, but I also count myself in because in busy times I also assist. This is double work for me as I have to stop with my management duties.

One of the nurses is new here and she's also a trainee, she still needs to be taught some things."

Respondent1 emphasised that her staff is under tremendous pressure and the department of health knows of the problem but nothing has been done. Respondent2 also pointed out that at times the queues get so long up to the point where they are unable to take lunch.

Respondent2: *"we work under pressure all the time, you feel that you are tired but still there is a long queue of patients waiting to be served."*

Both nurses pointed out that there are patients who leave their local clinics and rather seek help at the clinic of this village. According to the respondents, these patients complain of shortage of medication and other things so they come to this clinic for help. This then increases the number of villages they serve. Respondent1:

"The district department knows that we serve more than 9 villages, and when I ask them to hire more staff, they say they are not hiring. We need skilled nurses to come and rescue us. One of my nurses is still a trainee, even though she's new she has to grow fast for the sake of the people".

The finding from this sub-theme is that the healthcare services are under pressure due to staff shortages, lack of skills and medication that lead to an over demand for available services.

5.6.3 Cost Burden

Cost burden was said to be the most challenging theme as the manager of the clinic was using her own money to ensure the clinic was active at all times. She uses her own car to fetch medication from suppliers as the department takes time to deliver. Respondent1:

"I make means to ensure that there is always medication available. I use my car to fetch it, the department at times does not deliver in time and since we have no dedicated transport for emergencies such as these my car then becomes the only option."

Some of the services that cannot be provided due to the shortage of supplies respondent1 takes responsibility and runs the clinic from her own pocket. This cost negatively affects her pocket as she has to ensure that everything needed is available at all times. She also provides airtime to call patients who need to come for treatment.

Respondent2 also highlighted that at times they depend on their manager for the clinic to function. Running of the clinics seems to be more dependent on staff with regards to financial support.

The finding related to this sub-theme is that the staff members have to supplement services from their own private funds to main the healthcare service provision.

5.6.4 Access to transport

Respondent1 said that transport in the area was scarce, especially for nurses living in town. It was also affecting the patients' pocket when nurses have to hire private transport for patients to get to the hospital. It was revealed by respondent2 that ambulances are only called for patients who are seriously ill.

For the nurses transport was a worry as they stressed that it is one of the challenges that caused nurses to leave. Respondent1 said:

“People want to work where there is reliable transport to work and going back home, here that is not the case. At times nurses want to go to town after work but they cannot. Here if you miss transport in the morning then you have to pray for something to come up. We have to walk about 4 km to get transport to town”

Both respondents agreed that transport is a problem in this part of the province. They pointed out that at times patients, when transferred to the hospital, prefer to go the next day, because they know that early in the morning transport will not be difficult to find.

The finding related to this sub-theme is that access to transport is a huge problem for the healthcare service providers and patients that this has a cost implication for them.

5.6.5 Shortage of facilities

During the interviews the following points were raised: shortage of consulting rooms and shortage of beds. Electricity breakages were also mentioned in this section.

Respondent2 mentioned that they need back-up when load shedding occurs and they cannot work. He suggested that a generator could help with the load shedding problem for them to continue with their work. With regards to the consulting rooms, both respondents emphasized that it is very difficult for them as they have to take turns to service patients where they also make use of toilet rooms when the rooms are all occupied. Respondent1 said:

“Since we have a shortage of consulting rooms, patients are sometimes seen in the toilet rooms when it is very busy. We as nurses have a routine to take turns to use the available rooms”

According to respondent1 at times it happens that one nurse is still busy with a patient when the other requests to use the room. Since patients cannot be served in one room, the one who entered first has to leave and find an alternate space to work. According to the respondents, patients often leave without being served because they are too shy to share rooms with others. Respondent1 said:

“Young girls who come to prevent pregnancy sometimes leave without being attended to. They are scared of queueing for the same room with their parents”

With bedding respondent1 highlighted that there is a huge shortage. She said the clinic does not provide sleep-ins for patients but there is a need for beds to be in place so they can be prepared for any future problems that may rise.

The finding relating to this sub-theme is that the shortage of rooms and beds has serious service implications that also affect the right to privacy and dignity of patients.

After identifying the challenges that nurses face daily, I then asked for the reason(s) that led to the interviewees not to consider leaving to a place with better facilities. Their answers are discussed in the following sub-themes discussed next:

5.6.6 Community friendliness

According to the nurses, this sub-theme is the reason they have decided to stay in the village or the clinic even though the above-mentioned themes make their lives difficult when performing their duties. Both nurses mentioned that the reason they do not leave their current job place is the kind treatment, love and respect they receive from the community. Respondent1 remembered a scenario where the villagers were divided with some wanting them (nurses coming from outside the village) to leave because villagers said the nurses were there to take their children’s jobs. Respondent1:

“Some of the people here wanted us gone because we were outsiders, they would send letters to the chief accusing us of not treating them well and that we sometimes closed the clinic early. We were fortunate to have some people backing us, they stood by us through that time. It wasn’t easy at all, my other colleagues left because there were threats to make us go.”

Respondent1 has been working in that clinic for 24 years, she emphasizes that she never thought about leaving because she felt she is part of the community. At times patients at the clinic would provide her with gifts, but she maintains that even though the gifts symbolized good relations between her staff and the patients, patients felt offended when they (nurses) told them that they were not allowed to take from patients.

Respondent2 has been working at the clinic for 5 years and shares the same sentiments of praising the friendliness and protection from the community. Staying at the nearby village respondent2 says even though he walks about 3 kilometers to and from work, he has never encountered any danger, at times young men from the village would walk home with him. Respondent 2:

“People around here are welcoming; they are not rude and demanding as compared to some areas I have worked at. I get respect from both old and young people, this encourages me to serve these people with dignity and respect and even walk out of my way to ensure they have everything they need.”

Respondent2 further explains that there are many opportunities to work in town but does not think about these as he is happy at the clinic. Respondent2 further states that the appreciation they have for the community can be attributed to Respondent1 spending her own money to ensure that services are always available to the community.

The second objective for the nurses is the following: *Identify the views of nurses on the role telehealth could play to provide better access to healthcare services in an under-resourced setting of Mantunzeleni location.*

The finding related to this sub-theme is that the nurses are willing to endure the challenges because they feel that they are accepted, valued and respected by the community people.

5.6.7 The role of Telehealth

This sub-theme was outlined as an expression of relief. Both respondents highlighted that they would feel appreciated of the work they do and have the conditions they work under improved. Respondent1 said:

“Introduction of telehealth in our clinic would be a great help to us, it will improve the way we work and the conditions we work under. This would be a sign of recognition and recognition is very important, it promotes one’s confidence and brings out the best to always do your work with joy.”

Respondent2 is very positive that telehealth would eliminate many challenges they currently face. Respondent2 said:

“Telehealth would help us eliminate some of the challenges we work under. The department knows about these challenges, only if they can give us this technology, I believe things would be better.”

Respondent2 further stated that the introduction of the technology would also attract staff to the clinic. Respondent2:

“Personally speaking, to me this can bring more staff to the clinic. People do not want to work like slaves anymore, and things have been made easier since the inception of combining technology with healthcare.”

According to respondent2, people need some kind of encouragement in order to perform at their outmost best, he goes on to say their struggle for better access delivery would be achieved if they can have telehealth equipment.

Both respondents are adamant that the departments need to have this technology implemented especially in areas like Mantunzeleni location. They both agree that with telehealth technology their efforts of providing access to healthcare would be appreciated. Respondent1 mentioned the services (offered by telehealth) that would best suit her and her staff are: live interactions with doctors, using SMSs to keep in contact with patients and email for attaching images.

The finding relating to this sub-theme is that the nurses have a good understanding of the potential of telehealth in improving their healthcare service provision to the community.

5.6.8 Knowledge gain

Telehealth will not only improve the way healthcare services are delivered but will also provide education for nurses. According to Respondent1, the education aspect would come from speaking to people who are experts like doctors. Respondent1 :

“Doctors have more knowledge than us nurses, through life interaction, we can learn a lot from them. Take for example I have learned how to treat a certain condition from one doctor. The next day if another patient with that same condition comes, I will not have to contact the doctor again. From what I have learned I could then treat that patient.”

Respondent1 says that even patients would learn a lot, as they would get to ask doctors questions. Respondent2 stated that having telehealth would enhance their communication skills and also get to exchange knowledge and opinions with the best. He further states that they would get a chance to learn how to operate new technologies which would be a great experience as he has never worked on it.

The finding relating to this sub-theme is that nurses regard the introduction of telehealth as an opportunity for self-development in the form of knowledge gain and increased access of patients to doctors.

5.6.9 Cost saving

According to the 2 nurses, the current way is very expensive for them as they sometimes have to use their own money to contact patients, fetch medication from suppliers and attend workshops. Respondent1 said:

“I will not have to use my money to contact patients. I will also have the backup of experts to influence the department to deliver medication on time using their own transport, this would save me petrol.”

Respondent2 said that there would be no need to attend workshops at their own cost. He said that with conferencing provided by the technology only a few workshops would need face to face discussions. This would save them money as they travel at their own cost.

The finding relating to this sub-theme is that the nurses feel that telehealth would result in a cost saving for them because the experts could influence the department to respond better to the community's needs.

5.6.10 Improved healthcare delivery

Respondent1 said patients would get a fast diagnosis especially for skin conditions. Instead of them telling patients where to go, nurses can just by a click of a button communicate and send pictures of patients to experts whom then would help with identification of the problem. She says this would enable them to serve more patients than they currently do a day. Respondent2 said:

“currently our work is slow because we do everything ourselves, for example if you do not seem to know or help the patients, you ask a colleague who is also busy with other patients to also assist, that slows us down in terms of duty performance, but with telehealth I will not have to distract someone else, all I have to do is make a call to an expert.”

Both nurses agreed that patients would have accurate results as there would be a second opinion from different experts. They both stated that currently for second opinion they sent patients to Butterworth hospital, which took time, and nurses did not get feedback from contacted doctors and the patient did not return to them to give feedback, but with telehealth this would be eliminated.

The finding relating to this sub-theme indicates that the nurses feel that the healthcare services can be improved because they will have access to experts when needed.

5.6.11 Observation results

During the observations the procedure patients follow to obtain healthcare, how nurses provide healthcare services to patients and the state of technology used by the nurses in providing these services were considered.

It was recorded that when a patient comes to the clinic no registration is done. The patient comes in and queues without being registered. A nurse would then come and take the first patient in the queue and attend to the patient. After helping, the nurse goes to the store room to fetch medication for the patient. Before taking the medication, the nurse first records what medication was given to the patient in a manual file. This file is only accessed by nurses to protect patients' information. He/she then records the patient's sickness and the medication given to the patient.

With regard to technology used in the clinic, the clinic has two computers, one used by the secretary to type notes. The other is placed at the manager's office but is not operational. Both computers are not connected to the internet. The clinic also has two traditional phones but the phones are not operating. Respondent1 said:

"When we were given these, we were told that we would be able to communicate with patients and also be able to send and receive emails. They have been here for 2 years now and have never been in operation. Only the secretary's computer is working and is used for typing notifications."

When it comes to nurses' phones, I managed to view some of the cell phones which are mostly smartphones. Network connectivity is not an issue for them, the phones have the capability of sending and receiving images and video clips.

The findings derived from the observation are:

- The is no appointment system and the patients are served in the sequence they have arrived regardless of the seriousness of their condition

- The two computers provided by the ECDoH are only used for notifications typed by the secretary in spite of promises that the technology could be used to increase communication to patients
- All the nurses own mostly smart phones and connectivity is not a problem.

5.7 Summary of nurses findings

The following table summarizes the above explained themes. It also outlines which theme(s) were recognized as having the most negative or positive impact on the delivery of healthcare by nurses. Themes found to be common with those of patients have been summarized separately.

Table 1: Summary of nurses' findings

Theme	Sub-theme	Finding	Very Good	Good	Bad	Very bad
1 & 4	Infrastructure	the infrastructures are inadequate exposing the staff to undesirable environmental conditions				X
1 & 4	Shortage of staff and lack of skills	the healthcare services are under pressure due to staff shortages; lack of skills and medication that lead to an over demand for available services				X
1 & 4	Cost burden	the staff members have to supplement services from their own private funds to maintain the healthcare service provision				X
4	Access to transport	access to transport is a huge problem for the healthcare service providers and patients because this has a cost implication for them				X
1 & 4	Shortage of facilities	the shortage of rooms and beds has serious service implications that also affect the right to privacy and dignity of patients				X
2 & 4	Community friendliness	the nurses are willing to endure the challenges because they feel that they are accepted, valued and respected by the community people	X			
2 & 3	Role of telehealth	the nurses have a good understanding of the potential of				

		telehealth in improving their healthcare service provision to the community	X			
2 & 3	Knowledge Gain	nurses regard the introduction of telehealth as an opportunity for self-development in the form of knowledge gain and increased access of patients to doctors	X			

5.8 Results from the patients' interviews

The objective was to identify the current processes patients use to obtain healthcare services.

Next the challenges patients experience when being provided with healthcare services in the under-resourced setting of Mantunzeleni location are identified.

For this objective, the following sub-themes were identified: time management, fewer medical staff and medication, cost, transport and distance, lack of communication and infrastructure. These sub-themes are discussed in the following section, observation results are also presented in this next section.

5.8.1 Access to health facilities

Currently patients have to walk to the clinic or hire private transport if one does not own horses. According to participants it becomes a burden to have access to healthcare when one is referred to the hospital. They are only given a letter stating a medical condition, it is then the patients' responsibility to make means of how to get to the hospital they have been referred to. Participants are hereby referred to as R(number), to distinguish between them.

R2 "when we are referred only a letter with the clinic's stamp is given to us, then transport wise you are on your own. It is either you wake up early in the morning or face the burden of spending R500 on private transport."

R6 "going to the clinic for people with horses is easy as they ride their horses but when being referred then it is a different story. One must spend hours just to get to Butterworth, it becomes worst when Butterworth hospital refers one to East London."

According to what the participants articulated, there are two ways to get to the clinic, one is to walk or if one has a horse one can use it as means of transport. The second one is to hire private transport which brings a cost burden to patients.

The finding derived from this sub-theme is that access to the local clinic is easier than to the referral hospital due to the distance, lack of transport and cost to get there.

5.8.2 Time management

Patients were concerned about the way nurses conducted their business day. They claim that bad time management by the nurses is one of the factors that negatively affect them most when it comes to access healthcare services.

R1 "time management by nurses is very poor, the clinic opens at 9:00,

You get there early in the morning and you'll only be served at 12:00. Because nurses are either late or only one nurse is on duty while others are busy walking up and down."

Patients pointed out that when the clinic was officially opened, it was said that the clinic was going to be a sleep in and would operate 24/7.

R2 "at times when people get sick during night, we cannot go to the clinic because it is closed. We were told that nurses would work shifts. That is not happening and it has never happened. If a member of your family gets sick during the night you are on your own, you cannot even come and knock here because the nurses do not even stay in the clinic."

It was also revealed that during weekends the clinic closes. According to the respondents the clinic was declared a sleep in meaning if one gets sick at night, the clinic could accommodate that particular patient as it had all necessary resources installed.

The finding related to this sub-theme is that the time to obtain healthcare services is taking long due to long queues or closing of the facility without notice.

5.8.3 Cost of transport

The cost of hiring private transport to take the sick to Butterworth hospital was a sensitive issue, where respondents had real life stories to tell.

R2 "as I said that sometimes sickness comes at night, since the clinic is not operating, the family of the sick have to hire private transport to take the sick to hospital. There is no standard fee charged, it depends on the owner of the transport. I once had to pay R500 for my child."

R3 shared similar sentiments, he also stated that since there is no dedicated transport at the clinic and also Butterworth hospital had limited ambulances, they had to pay +-R 500 to get to a healthcare facility that could serve them. Cost seemed to be a sensitive issue as respondents pointed out that they are not employed and depend on social grants to make a living. The money they have to pay for private transport was too high for them.

R3: *“we do not have jobs, our children also do not work they depend on us, to get this R500 we have to go to loan sharks, who also have a high interest.”*

Participants had real life stories to tell when this theme was brought up.

R4: *“when I was transferred to East London, Butterworth hospital provided us with transport to and from East London, but when I was transferred by the clinic, I was only given a letter to give to the doctor at the hospital, I had to look for my own transport and at that time I struggled to walk, finding your own transport which comes at a high cost in this area.”*

R6: *“when patients are transferred to East London, family members have difficulties when it comes to visiting their loved ones. East London is far and people have to take 3 taxis to get there. The cost issue is a challenge for us, not all of us in this location can afford such things.”*

The finding related to the sub-theme is that the cost of transport to health facilities is too high due to their sensitive financial situation affected by unemployment and dependency on social grants

5.8.4 Distance to the Community Clinic

The clinic serves about thirteen villages. Most of these villages are remote and transport to and from the clinic is very scarce. People have to walk long distances to obtain healthcare services.

R1: *“I have seen people come as far as Mgomanzi, that village is about 5 – 6 kilometres away from the clinic. People have to walk that distance twice. Now think of the older people, again something we touched on, they hire private transport.”*

R4: *“distance and lack of dedicated transport have caused issues in the past. Women have given birth going to the clinic before. When ambulances are called it takes them 2 – 3 hours to get here in this location.”*

All respondents echoed similar statements. Their main concern was that for people coming out of the location, this was really a burden for them as there was no other clinic in the area to help them. The clinic tried to intervene in this case but that did not succeed as the people who were hired to go to remote villages to serve on behalf of the clinic also complained about the travelling distance they had to walk every day.

R2: *“my brother’s wife was part of the people chosen to attend people at remote villages, she always complained about the distance they have to walk. Our lives have been difficult for too long, government must intervene.”*

The finding related to this sub-theme is that the distance to get to the community clinic is too far to walk which is mostly the only means of moving around and this is especially a problem for the elderly, very sick patients and pregnant women.

5.8.5 Lack of communication

Respondents pointed out that there is no communication between the nurses and patients.

R1: *“with all the bad things happening to that clinic, we have never tried once to sit down with the nurses and talk about how we feel as patients. They also do not come down to us and ask what we need and what we do not like, that on its own is very bad.”*

R5: *“we need to have a platform to engage with the nursing staff or management of the clinic, we have been struggling for too long now.”*

Lack of communication by both parties was reckoned to have worsened in the manner the clinic operates.

Some respondents claimed that the issue of having community engagement was once tried and it never worked, instead individuals were pointed as to having jealousy of some nurses.

R3: *“the only way to solve our problems with the clinic’s staff is to have a platform where we can engage with each other. This lack of communication has led to certain groups of people getting favours from the nursing staff.”*

Respondents highlighted that when they hold meetings where they also talk about the challenges they have regarding the way the clinic operates, certain people would take the discussions to the nurses. This resulted badly for some people as they would not get a dignified service, hence the discussions about the clinic were no longer relevant at community gatherings.

The finding relating to this sub-theme is that patients feel that they do not have an opportunity or platform to communicate their views with the healthcare service providers.

5.8.6 Lack of Doctors and Medicine

The clinic has no doctors coming to assist nurses. Also medication is very scarce, sometimes the clinic closes due to shortage of medication.

R2: "major issue is that the clinic has no doctors, we used to get a dentist every Thursday but today that no longer happens. We were never told why the doctor stopped coming, with the shortage of medication one has to buy from the pharmacist and those who know traditional medication treat themselves."

A shortage of staff was according to the respondents caused by the area's infrastructure and other challenges that were mentioned before e.g. limited transport. The respondents also highlighted that it does not matter what your sickness, is when there is no medication they are given Panado as medication.

R1: "many of us have diverted to using pharmacists due to the way the clinic operates. The shortage of staff is not new to us, we have been experiencing that ever since the clinic was opened. Some nurses have left this place due to transport issues."

R5: "there is no clinic with medication, we get into long queues when we are there only to be told that there is no medication. The only thing you'll get and that is if you are lucky is Panado."

The respondents however mentioned that the head nurse does everything in her power to ensure there is medication at all times. They mentioned that she sometimes fetches it using her own car, however that was not enough as the respondents highlighted that at times she comes back with nothing from the department.

The finding relating to this sub-theme is that there are no doctors to serve them and limited medicine although the nurses are making an effort to address the medication shortage.

5.8.7 Infrastructure and Environment

The condition of the clinic and that of the location was heavily criticised by participants. They articulated that they have once tried to take this matter into their own hands since their calls were not heeded by government.

R1: *“Due to our government carelessness, a committee was established consisting of location members to go and represent us in Bhisho. They were given a mandate by the villagers, the mandate was about the poor conditions we have and the issue of not having running water.”*

Participants complained about the clinic’s state of medical rooms being few. They revealed that being served in toilet rooms for them was a usual thing.

R4: *“our clinic needs improvements, we need more rooms, we cannot be served in toilet rooms. At times while a nurse is attending you, another one comes in and asks the one serving you to find another room as his/her patient is critically ill.”*

R2: *“we have once called our councillor to a meeting, we addressed him about the clinic’s infrastructure, during the rainy season we cannot obtain healthcare because the road is bad and the rivers run full and we cannot cross to the other side to where the clinic is situated. This place is surrounded by mountains, imagine being critically ill and the private transport you hired cannot leave the location because it is muddy. That is how we live here, we have no one to help us, but by God’s grace we are still here alive.”*

Cracked wall and ceilings were also mentioned. Participants also revealed that the infrastructure problem was also bad for the nurses especially at the clinic.

R4: *“the surrounding area does not attract anyone to come and work here. The clinic itself does not either. I would not want to work in a place where there are cracked windows too, even for those working there the environment is not accommodating them but we are happy that they have not left us. I hope they do not because we have lost nurses in the past due to the clinic’s poor conditions.”*

The findings relating to this sub-theme are:

- The community members feel that the healthcare service provision by the ECDoH is inadequate and they have even approached the government to convey their dissatisfaction
- The facilities at the clinic are inadequate and the patients are sometimes serviced in the toilets and feel their privacy is compromised
- The environmental conditions exacerbate the infrastructural problems, e.g. in the rainy season the roads are impassable and the full rivers mean that patients cannot cross them to reach the clinic

- The environmental situation also exacerbate the health situation of the community members
- The patients are worried that the poor infrastructure may result in nurses leaving

5.8.8 Potential of Telehealth to address distance and referral problems

Distance was seen as one of the barriers that proves as a challenge by participants when it comes to accessing healthcare. After watching videos of how telehealth works, participants identified that there would be no need to walk long distances to and from the clinic and hospital. Also referrals would be made easier just by a video call and live interactions between the clinic and hospital.

R3: “ we would not have to travel hours to the clinic and hospital, just by a click of a button one is already at the clinic or hospitals, by this way one also has saved a lot of money and spending too much time queueing.”

R7: “referrals would be easier as one would be at the clinic physically but be serviced from a remote hospital. Having written letters by nursing staff would be a thing of the past.”

Participants were very amazed that there was something which they never knew it existed that could change their lives for the better. Some articulated that if they had means and knew of telehealth, they would have asked for help from the district’s department.

R1: “this technology could also save us time in terms of dealing with our personal problems. We have struggled a lot in this area. People have walked long distances seeking medical help. Distance has always been the issue we the people of Mantunzeleni have had to deal with, at times you just do not want to go to the clinic because of distance. Some have their own transport by means of horses but when it comes to being referred to Butterworth hospital how would a horse get there. By having this piece of technology all these problems would be eliminated.”

The findings related to this sub-theme are:

- Patients can see the potential of telehealth to reduce the need to travel and for referrals
- Patients were surprised to learn about telehealth and were able to see the potential of it to address some of the healthcare service provision problems they experience

5.8.9 Improved healthcare service delivery

The current method used by nurses to serve patients was seen as not being effective by participants. Having telehealth they claimed that the fact that they have to be served in toilet rooms and sometimes not getting medication would be a thing of the past.

R2: "nurses' jobs would be made easier as they would have something to assist them with their daily duties. By this way services rendered to us would be improved, there would no longer be excuses that one cannot be assisted due to shortage of medication or take long hours queueing due to the shortage of nursing staff."

R1: "I think this would improve our current way of living as we will not be struggling to have access to healthcare. When one is sick and it is at midnight, we could easily contact the clinic and an ambulance from the clinic would come to fetch the patient doing away with paying R500. This would also lead to the clinic having its own dedicated transport, breaking the barrier of being limited to transport."

Having access to doctors was also seen as a possibility even if they would not have to be physically located at the premises. Participants also recognized that having telehealth at the clinic could also lead to attracting more nursing staff to the location.

The finding related to this sub-theme is that patients see the potential of telehealth to supplement the current healthcare services to assist the nurses with also increased access to healthcare experts.

5.8.10 Cost saving

Participants showed a great relief when it came to cost saving, as they mentioned that there would no longer be private transport hiring for all village people.

R4: "I am very happy when it comes to this one as we have and still are struggling to find money when something bad happens to one of our family members. The times of having to borrow money from local mashonisas will be no more."

R7: "We are living in poverty and when it comes to giving someone this huge amount there are problems because at first you like asking yourself how come this person (transport owner) be so unreasonable then you wonder that if you do not pay you might die in this village. Also travelling to East London will be limited."

Participants all agreed that if there would be dedicated transport then there would be no need for them to spend huge amounts which they cannot afford as they depend on social grant money.

The finding related to this sub-theme is that patients see the potential of telehealth as a huge cost saving benefit that is currently a massive concern due to their poverty problems.

5.8.11 Technology used by Patients

From the observations of the patients, they had the old version of Nokia phone. None had a smart phone which made me ask them the following question: if telehealth was to be provided for the clinic, since you saw on the videos that some applications require smart phones, will you upgrade? Answers to the question were positive with some saying their children have modern phones they could borrow while they have not yet bought them for their own use. None of the participants had a computer with internet connectivity at home, and to my knowledge in all homes in the village there is no single home with a computer. Network connectivity in the location is very strong, this being caused by the network tower poles installed in four corners of the village. All mobile networks are well connected.

The finding related to this sub-theme is that patients still have mostly feature phones but are not currently accessing the Internet although there is good connectivity in the community.

5.8.12 Telehealth use for nurses and patients

When it comes to telehealth instances the patients would want to have, they mentioned live interactions with nurses and hospital staff, especially doctors. They said this would save them time and cost.

R7: "talking to a nurse and a doctor at the same time could also provide accurate results. At most times, nurses do not make accurate diagnoses hence there are referrals to private or hospitals doctors. Patients could also learn from this as we would be present also communicating with both parties and not having a letter speaking on behalf of the nurse who is located at the clinic."

The other instance(s) participants mentioned would be having the ability to send a SMS and MMS.

R1: "having those would be a great advantage as that could lead to consistent communication for both parties. If one has a skin condition, he/she could take a photo and send a MMS with the description of what led to the condition. Results would then be sent back to the sender via SMS."

R4: "with SMS communications we as the patients could also receive reminders from the clinic. Communication would always be there at all times at one's finger tips."

Through the usage of SMS and MMS instance(s), participants felt that this would provide them with consistent communication with nurses especially having reminders of their next date to visit the clinic.

The finding related to this sub-theme is that patients and nurses would prefer to use telehealth for live interactions with experts for immediate assistance.

5.9 Summary of Patients' findings

The following table summarizes the above explained themes. It also outlines which theme(s) were recognized as having the most negative or positive impact based on what the participants said. Themes found to be common with those of nurses have been summarized separately.

Table 5: Summary of patients' findings

Theme	Sub-theme	Finding	Very Good	Good	Bad	Very bad
4	Access to health facilities	access to the local clinic is easier than to the referral hospital due to the distance, lack of transport and cost to get there			X	
1 & 4	Time management	the time to obtain healthcare services is taking long due to long queues or closing of the facility without notice				X
1 & 4	Cost of transport	the cost of transport to health facilities is too high due to their sensitive financial situation affected by unemployment and dependency on social grants				X
1 & 4	Distance to clinic	the distance to get to the community clinic is too far to walk which is mostly the only means of moving around and this is especially a problem for the elderly, very sick patients and pregnant women				X
2	Lack of communication	patients feel that they do not have an opportunity or platform to communicate their views with the				X

		healthcare service providers				
1 & 2	Lack of doctors and medicine	there are no doctors to serve them and limited medicine although the nurses are making an effort to address the medication shortage				X
1, 2 & 4	Infrastructure and environment	<ul style="list-style-type: none"> • The community members feel that the healthcare service provision by the ECDoH is inadequate and they have even approached the government to convey their dissatisfaction • The facilities at the clinic are inadequate and the patients are sometimes serviced in the toilets and feel their privacy is compromised • The environmental conditions exacerbate the infrastructural problems, e.g. in the rainy season the roads are impassable and the full rivers mean that patients cannot cross them to reach the clinic • The environmental situation also exacerbate the health situation of the community members • The patients are worried that the poor infrastructure may result in nurses leaving 				X
2 & 3	Potential of telehealth addressing distance and referral problems	<ul style="list-style-type: none"> • Patients can see the potential of telehealth to reduce the need to travel and for referrals • Patients were surprised to learn about telehealth and were able to see the potential of it to address some of the healthcare service provision problems they experience 		X		
1, 2 & 3	Improved healthcare services	patients see the potential of telehealth to supplement the current healthcare services to assist the nurses with also increased access to healthcare experts		X		
3 & 4	Cost saving	patients see the potential of telehealth as a huge cost saving benefit that is currently a massive concern due to their poverty related problems		X		

3	Technology used by patients	patients still have mostly feature phones but are not currently accessing the Internet although there is good connectivity in the community			X	
2 & 3	Telehealth use by patients and nurses	patients and nurses would prefer to use telehealth for life interactions with experts for immediate assistance			X	

5.10 Summary of common themes from nurses and patients

Table 6: Summary of common findings between patients and nurses

<i>Theme</i>	<i>Sub-theme</i>	<i>Summery finding</i>	<i>Very good</i>	<i>Good</i>	<i>Bad</i>	<i>Very bad</i>
1 & 4	Poor infrastructure and facilities	Inadequate infrastructure provided by the ECDoH; Not enough rooms sometimes patients are being consulted in toilet;				X
1, 2 & 4	shortage of staff and lack of skills	Outlines the number of nurses at the clinic and also provides an insight into the skills they possess. Nurses and patients feel that there is a need to increase the number of staff with people who have the required skills; No doctors to consult				X
1 & 4	Cost burden	Nurses and patients have to use their own money to supplement the service; pay for expensive transport; most people are unemployed and depend on social grants			X	
1 & 4	Access to healthcare service, referral hospitals	Access to the local clinic is easier but only in good weather because they walk to it; access to hospitals is difficult due to the distance to travel, lack of transport and cost to get there; clinic not always open as expected.			X	
1, 2 & 4	Community friendliness	Nurses are well respected and appreciated by the patients because they are willing to endure challenges	X			
1, 2, 3 & 4	Potential of telehealth	The nurses and patients could see the potential of telehealth to overcome the healthcare service challenges, specifically result in cost saving, access to expertise; saving time; supplement current healthcare services	X			

5.11 Results from telehealth specialist interview

During the analysis of Respondent9's data, 2 sub-themes were identified and are explained below.

5.11.1 Potential for Telehealth

The purpose for this sub-theme was to get a grasp on which technology application could best suit the clinic and its patients. The respondent was a suitable expert not only because of her telehealth expertise, especially in the Eastern Cape province, but she has already been to the clinic in the village considered by the study.

R9: "having visited the location you are studying, I would say the connection for mobile devices is very good. For instance a wifi technology can be provided at the clinic to connect patients and nurses".

Respondent9 recommended that tablets be provided for nurses to communicate with connected sites. Also a central database was needed to keep track of everyone's healthcare problems for the purpose of referrals. Through this, doctors at remote sites can easily access patients' information online using that particular patient's ID number.

Short Messages (SMS) and Multimedia messaging (MMS) services were also recommended with tele-conferencing between nurses at the clinic and doctors at a remote site. A Whatsapp (or similar social media) group between nurses in the district was recommended so that they could communicate challenges they faced, they could then construct a report for the department on what their challenges were.

The finding related to this sub-theme is that the telehealth expert indicate the suitability of telehealth for this particular community with specific suggestions about how telehealth could be utilised, e.g. nurses with tablet; a central database with patient details; and teleconferencing options.

5.11.2 Convenience

According to Respondent9, places that already have telehealth have the following benefits:

- Patients do not travel long distances to access healthcare services
- Patients have access to treatment in time and referrals are made easily through the use of the technology provided
- Nurses have consistent communication with experts in the region

The finding related to this sub-theme is that telehealth has the potential to address problems typical to this type of setting such as: distance to health facilities; increased access to treatment and referral facilities; and ability to communicate with health experts.

5.12 Summary of telehealth’s specialist findings

Table 7: Summary of telehealth specialist’s findings

<i>Theme</i>	<i>Sub-theme</i>	<i>Finding</i>	<i>Very good</i>	<i>Good</i>	<i>Bad</i>	<i>Very bad</i>
3 & 4	Potential for telehealth	the telehealth expert indicated the suitability of telehealth for this particular community with specific suggestions about how telehealth could be utilised, e.g. nurses with tablet; a central database with patient details; and teleconferencing options	X			
1, 3 & 4	Convenience	telehealth has the potential to address problems typical to this type of setting such as: distance to health facilities; increased access to treatment and referral facilities; and ability to communicate with health experts	X			

5.13 Future of telehealth in Mantunzeleni Location

The future of telehealth in the village looks a bit dark for Mantunzeleni location. This is due to the fact that technology usage in the village is very low. With respondents having cell phones that do not cater telehealth applications, this innovation would for now be a waste of money.

Also the ECDoH needs to budget huge amounts of money to actually acquire, implement the technology solution and train users so a lot of time is needed to go through processes and more research would also need to take place. With the current situation the clinic is not yet ready for the technology.

5.14 Conclusion

Some of the sub-themes identified in this study have already been identified by the literature. The studies identified that shortage of staff and resources, cost burden, poor infrastructure,

access to transport hinder the delivery of healthcare services in the location, and this is supported in the literature review that people living in rural areas have many challenges that need to be addressed especially when it comes to accessing healthcare services (Wotton, 2008, Kifle et al., 2008; Alajmi et al., 2013).

It is also documented in the literature that telehealth could be of great help in areas where there is a lack of medical resources and medical staff (Nwaubueze et al., 2009). This is in line with the findings of this study that with the implementation of telehealth in the location, nurses would enhance their skills, deliver quality healthcare services, and improve referrals. The study also identified that telehealth would also reduce travelling distance and provide cost reduction for patients. Heizelman, Lugh & Kvedar (2005) agree with this research, they state that the main aim of telehealth development was to limit geographic barriers, cost reduction and provide good quality healthcare services. The following chapter provides decisions and recommendation based on the results presented in this chapter.

Chapter 6 – Discussions

6.1 Introduction

Chapter 6 focuses on the overall study interpreting the findings of the nurses, patients and telehealth expert. The discussions will be explained using the objectives of the study mentioned in Chapter 1. The aim of this chapter is to get an understanding of the study and to interpret the findings. The objectives of the study were:

- Conduct a baseline study of the community setting and healthcare services
- Establish the experiences, views, perspectives and roles of the healthcare services
- Establish the current state of technology use
- Identify the views of healthcare service provision stakeholders on the role that telehealth could play in providing better access to healthcare services in a rural resource-restricted setting
- Determine the contextual aspects of suitable telehealth to improve healthcare services in a rural resource-restricted community

6.2 Objective 1.1: Conduct a baseline study of the community setting and healthcare services

This objective focuses on how patients in the location obtain or access healthcare services. In Chapter 5, respondents mentioned that they either walk to the clinic or hire private transport at a cost of R500 when transferred to the hospital, horses are also used as means of transportation by those who own them. Respondents mentioned that when they are transferred one has to pay for himself/herself and the amount depends on the driver/owner of the vehicle. It was also highlighted that when patients are transferred to East London at Frere Hospital or Cicilia Makiwane, the hospital in Butterworth provides transport for patients. The difficult part in this is when the family members of the patients want to visit them where East London is approximately 120 kilometers away from Butterworth. The cost to get there for people who are unemployed is high and they borrow money from moshonisas/loan sharks in order to visit their sick relatives.

For those who live in remote villages, during the rainy season accessing healthcare becomes a burden as the rivers would be sometimes full. Respondents said they have to go to town or use traditional medication and wait for the water levels to decrease. Some have to walk about 4 kilometers to get to the clinic, at times patients walk these long distances only to find that the clinic is closed.

Due to poor living conditions and people in the area being unemployed, accessing healthcare services in Mantunzeleni location is a bad experience, this limits accessibility to proper healthcare. This is consistent with the findings of the literature review (Chapter 2) that indicate that difficulties in accessing healthcare services in rural areas of developing countries can be attributed to poor infrastructure, transport and location barriers, status, limited medical staff and facilities, race and poverty (Mberick et al., 2007; Heckerman et al., 2011; Harris et al., 2011).

It is clear that patients from these villages have to rely on the healthcare services of the only clinic servicing these villages. The first point of care is the clinic and if needed, patients are referred to the nearest hospital in Butterworth or the next level hospital in East London. Both are far away from the villages. The current healthcare service is only available during day time and there is no provision for emergency cases or for sick people after hours. Patient records are still paper-based. People from these villages have limited access to healthcare services. This is confirming the findings from the literature review.

It is clear from the findings that the current healthcare service is inadequate with limited infrastructure not enough rooms in the facility; insufficient transport to deal with the distance from the health facilities; additional cost to the nurses and patients; not enough medicine. The situation for the people in the villages of the rural community is consistent with what is reported by the literature. This means that in spite of existing knowledge published and the government's commitment to prioritise the individual's right to health the problems experienced by the community remain. It can therefore be assumed that the situation is just too complex to find any easy solution. It is clear from the findings that the contextual factors are relevant to the findings, e.g. access due to long distances and high cost of transport; the reach of the healthcare services does not extend to the community due to the distance from the healthcare service providers that are still located in the urban areas.

6.3 Objective 1.2: Establish the experiences, views, perspectives and roles of the healthcare services

This objective is explained in two ways as follows:

- Challenges faced by nurses when providing healthcare services
- Challenges faced by patients when accessing/provided with healthcare services.

6.3.1 Challenges faced by nurses when providing healthcare services

Challenges faced by nurses are grouped into sub-themes; here I discuss how these challenges impact their lives and jobs. Challenges mentioned included poor infrastructure, shortage of staff and lack of skills, cost burden, access to transport and shortage of facilities.

During interviews with the nurses, it was highlighted that when it rains, the clinic's floors are flooded with water. This is caused by leaking ceilings and cracked walls. Nurses mentioned that cracked walls were the most worrying part as at any time the building could fall on them.

Bad condition of roads to and from town where nurses live, the area being surrounded by huge rivers and mountains, grazing fields and forests were also revealed as challenges, this is because some nurses live in remote villages and have to walk to work. Shortage of staff is another challenge, according to the data highlighted, the clinic only has 4 nurses that serve 9 villages and their surroundings. The clinic has no dedicated doctor, the dentist that used to come no longer comes. Cost for the nurses was high as they have to travel from Butterworth to the village daily. Nurses mentioned that medication is rarely delivered by the department hence the head nurses uses her own car and money to fetch it. The issue of transport being scarce also came up this is because nurses at times walk about 4 kilometers to get transport. Shortage of facilities, the clinic consulting rooms and bedding are not enough to serve 9 villages, nurses disclosed that they sometimes serve patients in toilet rooms or take turns to use consulting rooms.

The challenges experienced by the nurses are the same as a healthcare facility in an under-resourced setting. These challenges are: not enough nurses to deal with the demand of the villages; insufficient space in the facility; no support from doctors or other healthcare professionals who can assist with difficult cases; insufficient medicine and medical supplies and equipment; environmental and climate factors; difficulties to facilitate referrals with lack of transport; lack of support from the provincial department of health.

6.3.2 Challenges faced by patients when accessing healthcare services

Patients identified the following themes as their challenges: time management, fewer medical staff and medication, cost, transport and distance, lack of infrastructure to support communication.

Respondents were unhappy about time management by nurses, they mentioned that the clinic does not open during weekends and at night there is no help even though the clinic was declared as an overnight facility meaning that it was to serve patients who become sick at night. They mentioned that the clinic would open late in the day but close early. Cost when

transferred was high, one has to hire private transport at his/her own cost because the clinic does not have a dedicated transport for this purpose. According to the respondents those who live in remote villages have to walk long distances to get to the clinic. These people have to cross rivers and when it is raining and the river is full, they then have to wait for water levels to decrease while the sickness is worsening. Respondents revealed that there was no communication between the nurses and their patients to address these issues and find ways of working together. They said they have once tried to have a forum where they could exchange ideas with the nursing staff but it did not work out as some took things personally.

Fewer medical staff, shortage of medication and poor infrastructure was also mentioned. Respondents highlighted that when referring to poor infrastructure they are not only talking about the clinic only but the area as a whole. Due to this transport was not accessible, with the clinic's infrastructure where the respondents echoed the same sentiments as the nurses as they mentioned shortage of rooms and leaking ceiling.

Both challenges by nurses and patients seem to go hand in hand. Taking into account that South Africa is a middle income country (World Bank, 2014); these challenges are not new. In Chapter 2, the literature review has highlighted some of these challenges. Aderibigbe et al., (2006) state that public healthcare problems in developing countries include inadequacy and inaccessibility of healthcare facilities for the poor and also loss of medical staff to the private healthcare sector which then leaves a shortage of staff in the public sector. Public healthcare in developing countries is under-funded especially in rural areas; hence there is poor infrastructure, lack of medical resources, transport and clean water in hospitals and clinics (WHO 2006; Martineau et al., 2002). In Chapter 2 reasons for the shortage of medical staff in rural areas are identified as infrastructure and facilities, limited number of workers, support and development challenges, longer and less productive hours, lower income, distance to travel to work, fewer choices and opportunities for specialization, blurred division between personal and professional life, lack of medicines and equipment and nurses retarded development, working environment and workplace security (Rickards 2011; ; Public Health Association of South Africa, 2013).

The challenges experienced by patients can be summarized as: insufficient healthcare services to meet their healthcare needs in the village; high cost and difficulties to gain access to more advanced healthcare services; vast distances to the clinic and referral facilities; poor infrastructure in that area and insufficient space and equipment at the clinic; insufficient communication between patients and healthcare service providers; and lack of

response and initiatives from the department of health to meet their promises. These challenges are consistent with the challenges reported in the literature for similar settings.

6.3.3 Needs, experiences and views of nurses and patients

The nurses and patients have strong views on the inadequate healthcare services because they feel that the situation is not acceptable. They feel that the state of the clinic is unacceptable and that it could be better maintained. The patients are sensitive about their financial situation and reliance on social grants and feel that they are confronted with extra expenses for a service that they need that they could ill afford. They feel that their privacy is compromised due to the lack of rooms for consultations that are sometimes shared. The patients' dignity is important to the nurses and they sometimes feel overwhelmed by the situation. There is a very strong sense of community where the nurses are willing to go beyond their normal duties to deal with some of the challenges. It is clear that the formal healthcare services by the ECDoH fail the community and that they are doing their utmost to deal with the challenges themselves in the absence of government support.

6.4 Objective 1.3: Establish the current state of technology use

For this objective to be achieved I had to observe which technology is used by respondents, also I was required to test the connectivity of the mobile phones. The results revealed that the clinic has two computers. One is used by the clinic's secretary to type notifications which are then printed in town as the clinic does not have a printer. The other computer, which according to the head nurse when it was brought, they were told that it was for them to be able to communicate with remote doctors, but the computer has never worked and nurses were never trained or told how it was going to work. Both computers are not connected to the Internet, the one that is working is operating as a standalone. The clinic also has two traditional phones which are also not operating. All nurses at the clinic had smart phones which are suitable for telehealth purposes. Connectivity in the location is not an issue as mobile companies had network poles installed for mobile phones to have connectivity. The draw back when it came to technology used was with the patients as they were still using the old mobile phones which only send SMSs. Young people had smart phones, but may not live in the community; none of the respondents (patients) had a computer connected to the internet at home, and this can be generalized to the rest of the villages in the location.

Although the technologies used by the people are not yet the latest mobile phones, the infrastructure for connectivity is sufficient. The nurses already use smart phones. It should

therefore be possible to introduce technologies to facilitate better healthcare service provision.

6.5 Objective 2.1: The views of healthcare service provision stakeholders on the role that telehealth could play in providing better access to healthcare services in a rural resource-restricted setting

This objective applied to 3 different respondents for this study, firstly the nurses, secondly the patients and thirdly a telehealth specialist. In Chapter 2, Heath and Norman (2004) describe stakeholders of telehealth as an individual or a group of people whom have the power to influence the outcome or success of the project by taking an approach that is best for their needs. Hence all the respondents mentioned above had to be interviewed. The following is the discussion of the respondents' answers.

All respondents agreed that telehealth can be of great use to the area and has the potential to improve healthcare accessibility in the location. Nurses said that to them if it was to be installed it would show appreciation by government for the work they do and could lead to the bad conditions they work under being improved. All respondents agreed that having telehealth in the clinic could attract new staff to come and work in the location. Education was also seen as a possibility as the nurses and patients would be able to talk to experts in the field, this could also provide them with a chance to learn new technologies. Respondents echoed that telehealth could save cost for both the nurses and patients in the location as there would be no need for nurses to attend workshops, they could be done via conferencing using the technology. For patients referrals would be made easy as live interactions with remote experts would take place. This would also remove the burden of fetching medication for the head nurse. The telehealth specialist said that this could also improve healthcare delivery in the location as the technology would be there for referrals, diagnosis, especially skin conditions and medication would always be available as there would now be a bond between the nurses and the hospital. The findings of the literature review (Chapter 3) are consistency with these results as Nwaubueze et al., (2009) state that telehealth can be used to improve the quality of healthcare delivery using ways such as e-education, knowledgebased²³ management, control of diseases and control of epidemics. The aim of having telehealth in the location is to improve accessibility to healthcare by limiting distance and also deliver good quality. In Chapter 3, Heizelman, Lugh and Kvedar (2005) indicate that the aim of telehealth development is to limit geographic barriers, cost reduction and provide good quality healthcare services. As a middle income country, South Africa needs to adopt telehealth for rural areas in order to improve healthcare service delivery and because most of its people live there and there is not enough medical staff working in these areas. In his

research Wotton (2008) outlines the reason why developing countries should adopt telehealth is because they have large rural areas with fewer medical professionals.

All the participants involved in the healthcare services to this community, both nurses as providers and patients as recipients of the service, are positive about the potential of telehealth to facilitate better services. They were able to provide specific examples of how such a service could support them to provide a better service. The expert also indicated that telehealth is not only possible but has been successfully deployed elsewhere in the province.

It is clear that the nurses and patients know what they need and they are able to see the potential of telehealth. It is not a foreign concept to them although the patients did not know of it before they very quickly were able to see how it could be applied to their situation in terms of the challenges they experience. The nurses, patients and telehealth expert were in agreement that telehealth has huge potential and could already make suggestions about possible applications.

6.6 Objective 2.2: Determine the contextual aspects of suitable telehealth to improve healthcare services in a rural resource-restricted community

Both nurses and patients mentioned that they would like to have live interactions and an ability to send and receive images. An application that works as an electronic record was also mentioned by both parties. Nurses said this would help them ease their job when it came to storing files, help with referrals and prevent loss and duplicates. Video calls for nurses to communicate with experts remotely where the patients can also get a chance to ask questions. The telehealth specialist recommends to have wifi to connect patients with the nurses at the clinic. Provide tablets for nurses to communicate with each other and other healthcare professionals at other sites. It was recommended that a database was needed to keep track of everyone's healthcare problems for the purpose of referrals. Doctors on the other side could also get a patients' information online using an id number. SMS and MMs were also recommended with tele-conferencing between nurses at the clinic and doctors at a remote site.

The needs for telehealth in this setting is basic for obtaining advise, for education purposes, reminders for appointments, etc. There are several examples of telehealth and mobile solutions that are already deployed in similar settings and reported in the literature. There is also already a telehealth strategy for the Eastern Cape province (2009) that should address the needs of people in rural villages and it is necessary to establish the reasons for the delay in implementation.

It is clear from the findings that the context plays a major role in the healthcare service provision. Any technology solution will need to adapt to the local context and it is therefore important to identify the contextual aspects relevant to the proposed technology solution. It is also clear the people living and working in the community know exactly what they need and how it could best serve their needs. It is therefore crucial to create a platform for community representatives and healthcare professionals working in the community to engage with the relevant government and technology bodies. Without their voices being heard and their active participation any technology or proposed telehealth solution will probably just become another doubtful implementation.

It is also clear that that the physical environment contributes towards the challenges experienced and it is therefore important to consider the environmental aspects that could affect the technology solution.

The third aspect is the people themselves who are familiar with the cultural and work practices relevant to the community's needs and preferences and whose input in the technology proposal will be important.

The fourth aspect is the technology itself that needs to be appropriate for the peoples' technology preferences to ensure that the technology will support and not require changes to the services.

6.7 Conclusion

This chapter discussed the key findings, both findings from the study and literature revealed the difficulties of accessing healthcare services by people living in rural remote areas. The advantages of using telehealth were also considered to establish how the healthcare needs of patients can be better addressed.

Chapter 7 – Conclusion and Recommendations

7.1 Introduction

A synopsis of each chapter is provided and the research questions and sub-questions are also revisited. The chapter also proposes recommendations that can be taken to intervene in this situation which is under study.

7.2 Chapter review

Chapter one: Introduction

Introduces the research topic and also explains the methods used to carry out the study. Research problem, research questions and objectives framed in the literature are outlined in this section.

Chapter two: Healthcare Services

Outlines healthcare services focuses in the African continent and narrows it down to the Eastern Cape where the study is carried. Challenges of healthcare in developing countries are addressed in the section.

Chapter three: Introduction to telehealth

Focuses on the roles played by telehealth in the continent narrowing down to South Africa and the Eastern Cape Province. Aspects used in the country and the province are also provided.

Chapter four: Research design and methodology

Explains methods used to carry out the study. The introduction of co-design sessions is explained stating the reason of the choosing this approach and how it suits the study.

Chapter five: Data analysis and findings

The chapter presents the findings of the study according to the objectives. Themes are presented and explained in this section.

Chapter six: Discussions

The chapter discusses findings derived from the empirical data after the thematic analysis in chapter five and also relates them to chapter two and three which fall under literature review.

7.3 Revisiting the research problem and research questions

In this section the research problem and research questions are revisited by using the interpretation to answer the questions.

7.3.1 Problem statement

The problem statement and research questions are repeated here to indicate how they were used to guide the research.

Table 8: Research problem, questions and objectives

Research Problem: Healthcare services to rural resource-restricted communities are inadequate to address their specific health needs since people do not have easy access to healthcare services relevant to their needs due to poor infrastructure, proximity to services and underutilisation of technologies			
Research Question 1: What are the challenges particular to the rural resource-restricted community's context that could influence the introduction of telehealth?			
	Objectives	Methods	Theme
Sub-research Question 1.1: How do community members in a rural resource-restricted community currently obtain healthcare services?	Conduct a baseline study of the community setting and healthcare services	Literature review, interviews, observations and co-design sessions	1
Sub-research Question 1.2: What are the experiences of nurses and patients experience in obtaining/providing healthcare services in a rural under-resourced setting?	Establish the experiences, views, perspectives and roles of the healthcare services	Literature review, interviews, observations and co-design sessions	2
Sub-research Question 1.3: What technologies are currently used by the patients and nurses in a rural resource-restricted community?	Establish the current state of technology use	Literature review, interviews and observations	3
Research Question 2: How can telehealth address the limitations of healthcare services of this particular community taking into account the views and technology perceptions of the healthcare service providers and recipients?			
Sub-research Question 2.1: How do the stakeholders' of	Identify the views of healthcare service	Literature review, interviews, expert	1

healthcare service provision view the role of telehealth in a rural under-resourced setting based on the needs of such a community?	provision stakeholders on the role telehealth could play to provide better access to healthcare services in a rural resource-restricted context	interviews	
Sub-research Question 2.2: What are the contextual considerations for designing technology solutions to play a role in improving access to healthcare services in rural resource-restricted communities?	Determine the contextual aspects of suitable telehealth to improve healthcare services in a rural resource-restricted community	Literature review, interviews, co-design sessions	4

7.3.2 Research Questions

The answers for the sub-research questions are discussed next after which the main research questions will be answered.

7.3.3 Sub research questions

Sub-research Question 1.1: How do community members in a rural resource-restricted community currently obtain healthcare services?

Patients walk to the clinic and for referrals they hire private transport at one's own cost. For those who live in remote villages within the location, during the rainy seasons, they wait for water levels to decrease when the river is full. The people from the village have to overcome several challenges to gain access to healthcare services that are currently insufficient for their needs. Access to hospitals for referrals and emergencies is problematic due to long distances and lack of transport.

Sub-research Question 1.2: What are the experiences of nurses and patients in obtaining/providing healthcare services in a rural under-resourced setting?

Challenges that both nurses and patients face include poor infrastructure, cost, time management, shortage of facilities, shortage of medical staff and medication, transport being scarce, lack of communication and walking distance to the clinic. These challenges are typical to under-resourced settings and although the nurses are going beyond their work requirements the healthcare needs of the people in the villages are not met. In spite of these challenges being known nothing has been done to address them in a meaningful manner. Nurses and patients are resilient and find ways to overcome the challenges. They feel that

their dignity and right to privacy is not valued and that their views are not heard by the government.

Sub-research Question 1.3: What technologies are currently used by the patients and nurses in a rural resource-restricted community?

The clinic has two computers, both are not connected to the internet, one is used by the secretary and the other is in the manager's office and has never worked. It also has two traditional phones. Nurses have smart phones that can work well with telehealth. Patients have the older mobile phones. Connectivity in the location is very good as mobile networks had network poles installed for mobile phones to connect to the network.

Next the first main question will be answered.

Research Question 1: What are the challenges particular to the rural resource-restricted community's context that could influence the introduction of telehealth?

The challenges particular to the rural resource-restricted community context are: inadequate access to healthcare services that are even more the case for referrals and emergencies; cost of transport; long distances to walk or travel; environmental factors, e.g. the rainy season; high poverty levels and dependency on social grants; lack of infrastructure, facilities, medicine, long waiting times; lack of access to health experts; and a sense of lack of privacy and dignity by patients due to sharing of facilities.

Sub-research Question 2.1: How do the stakeholders' of healthcare service provision view the role of telehealth in a rural under-resourced setting based on the needs of such a community?

Stakeholders reckoned that introduction of telehealth in the area may help improve healthcare delivery, provide education for nurses and patients and attract new staff to come and work in the location. The need for utilizing technology is clear and the type of technologies that could be used in these settings for healthcare services is also known. However, technology has not yet been considered for these villages in spite of the availability of technology infrastructure. The indirect benefit of telehealth identified by the nurses is they would feel more appreciated when they are included in healthcare service provision beyond the boundaries of the community of villages.

Live interactions with experts at a remote site, also the connectivity in the area was considered. The technology should be used by both patients and nurses. It was recommended that mms and SMS be available as instances of telehealth. The following

aspects for technology solutions to support better healthcare services to the people in these villages should be considered: environmental and infrastructure factors; the purpose of the service; user (patient and nurses) needs and preferences; the availability of healthcare professionals on the other side of the technology; costs of the service, devices, data, etc.; digital literacy level of the users; etc.

Sub-research Question 2.2: What are the contextual considerations for designing technology solutions to play a role in improving access to healthcare services in rural resource-restricted communities?

The contextual aspects that need to be considered for designing technology solutions are: the environment's effect on services and technology use; the role of the community people who are essential participants for the design of appropriate telehealth solutions for their benefit; the nurses' and patients' local knowledge on their health needs and practices; and suitable technology for the context of use.

Next the second main research question is answered.

Research Question 2: How can telehealth address the limitations of healthcare services of this particular community taking into account the views and technology perceptions of the healthcare service providers and recipients?

Telehealth can address the access problems experienced with going to referral hospitals; it can enhance the current healthcare services with access to health experts; it can improve communication between patients, nurses in the community and healthcare professional outside the community; the waiting times can be reduced; the community may become less reliant on and affected by the current infrastructure and environment; it can extend the reach of current healthcare services available to urban areas to rural communities; and the people from the community can become empowered by having a greater say in the provision of healthcare services to them based on the needs, cultural practices and preferences.

7.4 Reflecting on research

A reflection on the methodology, the value of using co-design as an additional method to collect data and the role of the researcher are discussed.

7.4.1 Reflect on the methodology

The study adopted a qualitative interactive research approach as it seeks to understand the phenomena being studied through participants' experiences. Data was collected using

literature reviews, interviews, observations and co-design sessions. To explain telehealth to patients a co-design method was used, as it allows using visual materials to explain a new concept to people who are not familiar with the concept at hand. Co-design requires that all stakeholders be taken into account when it is implemented. In this study nurses, patients and a telehealth specialist were interviewed.

Through this method 3 new findings were discovered by the research as the participants' voices were heard that would not have been the case if only interviews and observation methods were used. These findings appear in the analysis chapter but are indicated here again to indicate which findings were specifically obtained through the co-design section. The first being that nurses are appreciated by patients and felt welcome in the area they worked and therefore did not relocate and change jobs. This was discovered in the interviews with the nurses where community friendliness was seen as a factor with the nurses who have worked in the village for more than 5 years. The second was that there was a lack of communication between the nurses and patients hence healthcare delivery was not up to the standard. Patients stated that if there was communication some of the challenges would have been addressed and perhaps solved. The last one was that nurses felt that by having telehealth, this would show that they were appreciated by government. This would motivate them to carry out their jobs at the best they could do.

7.4.2 How co-design was applied in data collection

The researcher had to get hold of all the necessary material for this study. This included telehealth videos, stickers, pencils and pictures. After introducing the topic and giving the respondents an outline of the study and explaining the process of co-design. I handed out stickers for respondents to write key notes and told them that I would like us to discuss the subject to get their views instead of expecting an answer for a question. I played the videos of how telehealth works, showed pictures of some of the telehealth machines. When it came to discussions, we took the important part and wrote them on the stickers. Respondents had to place the stickers according to the diagram that was drawn on the wall. The diagram included having cars, hospital, East London hospital, foot images, cell phones, nurses and doctors. The diagram was created for easy use so that the respondents knew where to place a sticker.

This helped the respondents to get an idea of what the study comprised, they also had questions for me. The aim of using co-design was to introduce the topic to them and help respondents to understand what telehealth is. It was also to gather their views on what they thought would work for them and for them to get a sense of ownership of a potential solution. The respondents enjoyed their participation in the session and felt valued because their

views were considered. They were encouraged to think of ways that the healthcare service could be improved.

7.4.3 Reflect on the role of the researcher

The researcher is from the community that was used as the case for this study. The reason for me doing this research is to “give back” to the community what I have gained from having the privilege to study further. I knew about the challenges specifically around the general health of the people in the community and the inadequate healthcare service to the community. This was my starting point but I relied on the literature to guide me towards the published challenges and issues of telehealth and the context of this study. I had the advantage of speaking the same language as the research participant but more importantly is familiar with the cultural practices, community structures and hierarchies. The people from the different communities know me and I had their trust. They were therefore willing to share their views openly. I could also relate to their situation having experienced it first-hand. Although I may have been biased in terms of the objective of this study I did not manipulate the data but at all times tried to listen with an open mind and to not ask leading questions but to stick to the interview questions based on the research questions derived from the literature.

7.5 Contribution of the research

The research intends to contribute by adding value to the existing body of knowledge in the field of Information Technology and Health Informatics.

In addition in the current literature, there is limited information available on telehealth for clinics providing healthcare services in rural resourced-restricted settings. The output of this study can be used as guidelines by the Eastern Cape Department of Health.

7.6 Recommendations

This study recommends that before the government implements telehealth in the location, attention should be given to the infrastructural, capacity and environmental needs. They can start by extending the clinic’s consulting rooms and also in conjunction with the department of roads improve the location’s roads which lead to town. Dedicated transport can be arranged where two ambulances can be placed at the clinic for emergencies. A general doctor can take turns to visit the clinic at least three times a week. For remote villages, the study proposes that the clinic must have midwives who can be transported to the remote villages’ chiefs, where patients in those areas can obtain help. This can be done during the

rainy season. This would require that the midwives go via Butterworth to get to these villages if the river is full, hence a dedicated transport is needed at the clinic. During weekends it is recommended that the clinic opens but can close early. This can be communicated to patients that the clinic will close early on weekends but will have nursing staff available for standby should anything happen at night. This would require that the ECDOH hire more staff who would take turns to work as standbys.

For telehealth to work effectively patients would need to have smart phones which in this case they do not have but there are possible solutions for feature phones as well. When it comes to the implementation, the ECDoH must come down to the people to get the assurance that they will use the technology and would have the right mobile phones for possible technology solutions. More importantly, that their input be obtained during the design and development of a telehealth solution. During the research process, participants were willing to upgrade their phones if this technology was to be implemented. In the meantime while the technology is not available the above-mentioned recommendations can be put into action until telehealth is implemented. Accessibility to healthcare would improve a lot in the location. When there is loss of power or load shedding, the study recommends that the clinic have a backup generator that will provide power to the clinic. With regards to the clinic running out of water, the village has a stream not far from the clinic where the villagers get water, the department of water and sanitation can be approached to have water supply from the stream that will fill the clinic's tanks when they run dry.

An important recommendation is that a platform needs to be created where community representatives and local nurses can engage with the healthcare service providers and government to communicate their needs, preferences and views.

7.7 Future research

The study is carried out in one location and is not seeking to generalize its findings. Future research could look at other settings to obtain insights in the general challenges of such settings. Those results could then be used to work hand in hand with the ECDoH to intervene with appropriate technology solutions to facilitate better healthcare services. A framework to deploy telehealth in rural remote areas can be developed to assist governments when they need to deploy these services to rural remote areas.

7.8 Limitations

The researcher did not study the whole of the Eastern Cape as this would have incurred large amounts of traveling and only one clinic and the nine villages served by it was considered. Also technological equipment and software used to provide telehealth were not included in this study.

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Appendences

Appendence A: plan for data collection and patients' interview questions

Plan for Data collection on 11 July 2015

Researchers: **Odwa Gazana**

Supervisor: **Prof Retha de la harpe**

Researcher will explain the objective of the workshop to participants.

The number of participants attending is estimated at about < 5 but >10 people. The process of data collection will be divided into 2 phases.

Phase 1 consists of men and women. Each participant will be given stickers and other materials needed to answer questions. Allocated time for data collection planned to be between 45 minutes – 1 hour. Also videos of what telehealth is and how it works will be shown to participants

Phase 2, the researcher will visit Walter Sisulu University (WSU) in Mthatha. The aim of the visit is to find which aspect of telehealth can best suite Mantunzeleni locations. WSU provides telehealth services to certain part of the Eastern Cape, hence talking to them will provide a greater insight on how the technology can be implemented and so forth.

Data Collection Method: **Co-design session, unstructured interviews.**

Prepared questions for data collection

Interview Questions (Patients)

HEALTH INFORMATION

- How do you currently obtain healthcare?
- Are you happy with the healthcare services you get form the clinic?
- If the clinic is closed or does not have medicine, what do you do?
- How long does it take you to get to the clinic?
- If the clinic referred you to hospital, how do you get there?
- Do you get the help you need from the hospital you are referred to?
- What challenges do you face when you visiting the clinic?
- How often do you receive information that is relevant to your health?
- How do you usually get to the hospital/clinic (own car, hired car, public transport, other)?
- How much do you spend getting to the clinic?
- Is access to public transport to the healthcare centres (hard to find, average, always available)?
- Have you ever been transferred to another hospital/clinic? If yes, how many times?
- How did you get to the place?
- How would you rate the cost (very expensive, expensive, average, reasonable)

- How many times do you come to the clinic in a year?
- Is there anything else you would like to add?
- What are the needs of your clinic/ and of the community?

Technology QUESTIONS

- How much do you know of ICT technologies (very good, good, average, poor)?
- Do you own a computer? If yes,
- Rate your computer literacy (very good, good, average, poor)?
- What do you usually do with the computer?
- Is your computer connected to Internet?
- Do you know what telehealth is? Or ever heard of it? If yes.
- What is telehealth to you?
- Do you have access to internet or use a telephone?
- If yes, what type of phone do you use, e.g. smartphone?
- If technology could be implemented to help you access healthcare on line, would you use it?
- How will this improve healthcare delivery?
- How do you think the community could benefit from telehealth?
-

WSU (interview questions)

- What technologies could be used in a rural clinic to implement telehealth?
- How has telehealth changed lives of the people where you have assisted in its implementation?
- How can telehealth be implemented in rural clinic to promote access to quality healthcare?
- Is there anything else you would like to add?

Appendence B: nurses' interview questions

- What challenges do you face when providing healthcare?
- When there are not enough medicines to hand to patients, what do you do or say to them?
- Does the regional/provincial department of health know of the situations and challenges you are facing at this clinic?
- How often do you transfer your patients to other hospitals/clinics and for what reasons?
- What media is currently used to notify patients of their scheduled health appointments? (radio, TV, video, cell phone, internet, other (specify))
- What challenges is your clinic facing now, or has had in the past?

- How do you think the community could benefit from telehealth?

- If technology could be implemented to help you, would you use it?
- How will this improve healthcare delivery?
- Do you have access to a telephone or cell phone?
- If yes, what type of phone do you use, e.g. smartphone?
- What kind of infrastructure is currently available to the clinic?(bedding, computers, x-rays mechanics, etc)
- Is there anything else you would like to add?

Appendence C: letter for authorisation to conduct study from the chief

HEADMAN: M.F. TSHAKA
TYEKANA A/A
NQAMAKWE
DATE: _____
SIGN: _____

Isitampu phezu kwalomgca ungenlta.

Mna ndingu (Bhala igamalakho) MZANKE TSHAKA ngokwemvume yam yobukhosi bamaNtunzela ndiyavuma ukuba uOdwa Gazana wakwi Dyunivesiti yase Cape Peninsula University of Technology, athathe incukaca ezawuthi zinikezelwe sisiNtunzela kuphando lwake. Lilungelo lwam njengeNkosi yamaNtunzela ubandingavumi ngoluphando kwixa elizayo. Ikwailungelo lam njengeNkosi uba oluphando ndiliqawule phakati nanini nditanda.

Okulandelayo igama lwamaNtunzela ndiyavuma lwisetyenziswe koluphando. (Bhalango X apho uvumakhona), ungabhala kuzozonke.

	Kuphando oluphangaleleyo	kwinkomfa	kwiJenali	Poster yophando
EWE				
HAYI				

MZANKE TSHAKA

Igama lweNkosi

09/09/2014

Umhla

Appendence D: letter to ask for authorisation to conduct study from the ECDOH



Room 432 • 4th Floor • Dukumbana Building • Independence Avenue • Bhisho • Eastern Cape
Private Bag X0038 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel.: +27 (0)40 608 1095• Fax: +27 (0)40 608 1066• Website: www.ecdoh.gov.za

I **Sizwe Kupelo**, in my capacity as a **Media Liaison Officer at Eastern Cape Department of Health** give consent in principle to allow **Odwa Gazana** a student at the Cape Peninsula University of Technology, to collect data in this company as part of his/her M Tech (IT) research. The student has explained to me the nature of his/her research and the nature of the data to be collected.

This consent in no way commits any individual staff member to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the company's name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference paper	Journal article	Research poster
Yes	X			
No		X	X	X

[Handwritten signature]
Sizwe Kupelo

Media Liaison Officer

Eastern Cape Department of Health

083 3780 196

This consent is granted on the basis that this material will only be used for research purposes not for publication or broadcast
16 February 2015

Appendence E: consent letter for participants



61 St George's Mall

Cape Town CBD

8000

Introductory letter for the collection of research data

TO WHOM IT MAY CONCERN

Odwa Gazana is registered for the M Tech (IT) degree at CPUT (214259684). His thesis is titled **Role of telehealth for a clinic providing healthcare services in an under-resourced setting: case of Mantunzeleni, Eastern Cape, South Africa**. The study aims to understand the role telehealth could play to provide access to quality healthcare for people living in the rural villages of Mantunzeleni. Having experienced the difficulties of accessing healthcare in rural areas, I took a decision to seek for intervention from various stakeholders. The findings of the research can help Grain Valley clinic in Mantunzeleni to have the latest technology used to provide telehealth. *Telehealth is a process of making use of technology to deliver healthcare services and education by allowing two or more users in different locations to connect.*

The supervisor(s) for this research is/are: Prof Retha de la Harpe (082 887 7369), email @ DeLaHarpeR@cput.ac.za. In order to meet the requirements of the university's Higher Degrees Committee (HDC) the student must get consent to collect data from organisations which they have identified as potential sources of data which in this case Grain Valley clinic in Mantunzeleni location will be used. As the researcher, I wish to state that patients'/ respondent's private information and details will not be required for the study.

If you agree to this, you are requested to complete the attached form (an electronic version will be made available to you if you so desire) and print it on your organisation's letterhead.

For further clarification on this matter please contact either the supervisor(s) identified above, or the Faculty Research Ethics Committee secretary (Ms V Naidoo) at 021 469 1012 or naidoove@cput.ac.za.

Yours sincerely

O. Gazana

29/01/2015

<<On company letterhead>>

I <<insert name>>, in my capacity as <<insert position in company>> at <<insert company name>> give consent in principle to allow <<insert student name>>, a student at the Cape Peninsula University of Technology, to collect data in this company as part of his/her M Tech (IT) research. The student has explained to me the nature of his/her research and the nature of the data to be collected.

This consent in no way commits any individual staff member to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the company's name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference paper	Journal article	Research poster
Yes				
No				

<<Insert name>>

<<insert date>>

Appendence F: consent letter from Deputy Vice-Chancellor



P O Box 652

Cape Town

8000

Tel: 021-4603356

Fax: 021-4603983

Email: staaka@cput.ac.za

26 August 2015

To whom it may concern

I, Prof Anthony Peter Staak, in my capacity as Deputy Vice Chancellor Teaching and Learning at **Cape Peninsula University of Technology**, give consent in principle to allow **Odwa Gazana**, a student at the Cape Peninsula University of Technology, to collect data at the Walter Sisulu University of Technology as part of his MTech (IT) research. The student has explained to me the nature of his research and the nature of the data to be collected.

This consent in no way commits any individual staff member to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

Whether the company's name may or may not be used in theses, conference papers, journal articles or research posters will be dependent on a decision of the Higher Degrees Committee.

Yours sincerely

A handwritten signature in black ink that reads "A.P. Staak".

(Prof) A.P.Staak Deputy Vice-Chancellor: Teaching and Learning Cape Peninsula University of Technology

Appendence G: Map of Mantunzeleni Location and 3 of the surrounding villages

