Cape Peninsula
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THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY FOR HEALTH SERVICE DELIVERY IN NAMIBIA.

by

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DECLARATION

I, Meke Iyaloo Shivute, declare that the contents of this thesis represent my own work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

26/02/2008

Meke Iyaloo Shivute **Date**

ABSTRACT

Understanding the use of information and communication technology (ICT) in the Namibian's health sector is important in the global information society. It is not clear how ICT is being deployed to support the delivery of health services to the Namibian patients. Health service providers (HSP) in both private and public health sector must be aware of ICT use patterns because this may influence how they deliver services to their patients in the future. This study thus seeks to investigate how ICT have been used in the delivery of health services to patients in the Khomas and Oshana regions of Namibia.

Based on the literature review and data collected from the HSP and patients, a 'generic' health service delivery landscape for Namibia was developed and regional landscapes for the Khomas and Oshana regions were further derived from it. The landscapes depicted health service provision to patients in the different health sectors in Namibia. After mapping the health landscapes primary data was collected from the health service providers (HSP) in private, mission and public health institutions using a questionnaire. A second structured questionnaire was administered on the patients. A total of 21 and 134 HSP patients respectively, responded to the survey questionnaire.

Results from the descriptive analysis indicate a relatively high ICT use by both HSP and patients. A large proportion of patients from both regions use radio as their major source of health information and that they mostly use radio (83%) and television (74%) for health related services. The study also shows a high penetration of mobile phone use among both rural and urban patients.

Factor analysis was used to identify factors that account for the patterns of collinearity among the eight ICT channels or variables. The factor analysis identified three main factor groupings namely, *'high technology'*, *'mobile technology'* and *'traditional technology'*. These factors were then used in subsequent analysis as dependent variable in the multinomial regression model to investigate factors affecting awareness of multiple ICT use by the patients. ICT awareness was based on the number of ICT channels used by the patients.

Multinomial regression results showed that major factors that influenced ICT awareness in the Khomas and Oshana region were namely functional literacy, age, sources of health information services, level of education for patients.

The logistic regression analysis was further conducted to ascertain factors affecting the use of an individual ICT channel. Results from the PC logistic regression show that functional literacy, age, education, perception on importance of personal privacy in health information, perception that ICT improves health services and perception on infrastructure support were statistically significant factors affecting its adoption.
Similarly, the logistic regression results for mobile phone indicate that functional literacy, patient's privacy, positive perception on infrastructure and cost of ICT were statistically significant factors affecting the adoption of mobile phones by both rural and urban patients.

This study made a contribution to the literature by providing some insights into ICT use for health service delivery (HSD) by HSP and by determining the extent of ICT use among patients based in rural and urban setting in Namibia. The study was limited to investigating the use of ICT in the health service delivery in the Khomas and Oshana regions only. The results of this study can be used to guide similar research in other African countries.

Key words: Health Service Delivery, Information and Communication Technology, Logistic regression, Multinomial logistic regression, Namibia

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DEDICATION

"Omwenyo gwandje, hambelela Omuwa! Ino dhimbwa uuwanawa we"
Psalm 103: 2

For my parents:
Vili-Heikki and Salmi Shivute

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Conference paper (accepted)	IST Africa - 2008 conference (to be presented in May 2008).
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GLOSSARY

Acronyms	Definition
AIDS	Acquired Immune Deficiency Syndrome
ARV	Anti Retro-Viral
EQUINET	Equity Network for Southern Africa
EPR	Electronic Patient Record
GDP	Gross Domestic Product
GRN	Government of the Republic of Namibia
HIS	Health Information system
HSD	Health Service Delivery
HIV	Human Immunodeficiency Virus
ICT	Information and Communication Technology
IT	Information Technology
MOHSS	Ministry of Health and Social Services
NGO's	Non-governmental Organizations
N$	Namibian Dollar
PC	Personal Computer
PHC	Primary Health Care
SIDA	Swedish International Development Cooperation Agency
UNAIDS	Joint United Nations Programme on AIDS
WHO	World Health Organization

CHAPTER 1
INTRODUCTION

1.1 Introduction

The extent of Information Communication Technology use in health service delivery (HSD) in Namibia is not fully known. It appears that there is a gap in understanding of Information and Communication Technology (ICT) use for health service provision and demand for ICT based health services by patients. This chapter describes the research problem and presents the background information on Namibia. This background information helps to examine the context in which ICT is being used for health service delivery in the country. The main aim of the thesis is to investigate how ICT is used for health service delivery in the Namibian health sector. This chapter is organized into four sections. First, it introduces the research problem; secondly the background information on the problem is discussed. The background information on Namibia covers the socio-economic context of the country, political situation, geography, demography and lastly the country's ICT infrastructure and health services delivery.

1.2 Statement of the research problem

The degree to which Health Service Provider's (HSP) use ICT for HSD in Namibia is not well known. Similarly, the extent to which patients use available ICT to access health services remains unclear. The above may result in a general lack of ICT awareness or it might affect the effective use of ICT in HSD. The researcher thus, aims to investigate to what extent ICT is used in health service provision to patients.

Namibia is faced with some of the major health problems in Africa, as the country is amongst the worst countries affected by the HIV and AIDS pandemic and the prevalence rate is between 18.9% and 24.7% (UNAIDS, 2006). Other problems include the polio outbreak that was experienced in 2006 and diseases like Tuberculosis that were reported to be on the increase (UNAIDS, 2006).

1.3 The Namibian context

This section is divided into three parts. The first section presents a description of the socio-economic situation of Namibia. The second section discusses Namibia's political situation, geography and demographic conditions. The third section discusses the ICT infrastructure and the delivery of health services in the country.

1.3.1 Socio-economic situation

The country's Gross Domestic Product (GDP) in 2005 was estimated to be US$ 6.1 billion (World Bank, 2006). Poverty is said to have reduced since 1996 as shown in the preliminary results of a recent survey, which indicates that the proportion of Namibian households classified as living in poverty has fallen from 38% to 28% (Levine, 2006). Although there is a reduction in poverty cases, the country's health care system is burdened by the escalating burden of the HIV and AIDS epidemic. The country is amongst the 6 most affected countries in the sub-Saharan with HIV and AIDS (Namibia, 2003:6; UNAIDS, 2006). The prevalence in 2001 was estimated to be about 20 percent (Namibia, 2003:6). This corresponds with the report from UNAIDS that the HIV and AIDS prevalence stood at 19.6% in 2005 (UNAIDS, 2007). Similarly, diseases like Tuberculosis were reported to be on the increase (estimated incidence rate was 680 out of 100,000 population) it is closely associated with HIV and AIDS.

According to the Namibian national health accounts, 2003, malaria is also posing a major problem to the health status in the country, as it affects 22 out of 34 districts. In 2006, an outbreak of Polio (polio virus type 1) was reported in Namibia which has been polio-free for close to a decade (UN, 2006:1). The Namibian national authorities responded to the outbreak by launching national immunization campaigns. According to the WHO epidemiological report, 2006, the immunization response "consisted of 3 national immunization days, using a monovalent oral polio vaccine type 1" (WHO, 2006). The immunization campaign targeted the country's population of 2 million people. The polio campaigns were successfully completed and there has been a decline in the polio cases.

However, the national crisis with (HIV and AIDS) has also received attention from the government of the republic of Namibia (GRN) and there are campaign programmes (provision of Anti Retro-Viral) in place to fight the epidemic.

According to the UNAIDS reports, it is stated that the GRN has taken measures to fight the epidemic and national HIV strategic plan has been in place since 1992. This strategic plan provides a comprehensive framework for the national multicultural and sub-regional response to HIV and AIDS (UNAIDS: 2006).

Non-governmental organizations (NGO's) are also involved in campaigning for the prevention, education and establishments of home-based care for those infected. Although, there are mechanisms in place to fight the HIV and AIDS and raise awareness, ignorance is still abounds in some of the country's regions.

Nevertheless, Namibia's effort to combat the HIV pandemic has gained momentum as there has been a decline in the number of HIV hospitalizations as well as leveling off in AIDS deaths in the period of 2004-2005 (Namibia, 2005:3).

1.3.2 Political situation overview

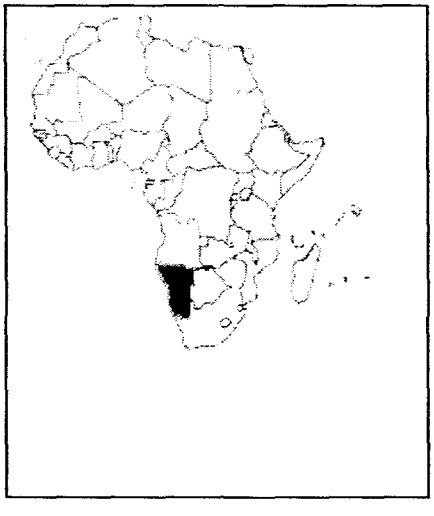
Namibia is a country that was colonized by South Africa. South Africa occupied the German colony of South West Africa from year 1986, where Namibia engaged in an armed struggle and gained its independence in 1990. Since Independence, the country has been undergoing a process of restructuring and re-organizing of its health sector in line with the principles of a new democratic and multiracial dispensation (Delanyo, 2001:1).

After Independence, Namibia "inherited a health system from the colonial era that was fragmented along ethnic lines, inequitable in terms of accessibility, and extremely skewed curative services" (Namibia, 1999:1). However, this health system has undergone major reforms such as the adoption of the primary healthcare policy. To date the health system has been decentralized to enhance efficiency and improve the quality of services offered (Delanyo, 2001:1).

1.3.3 Location and population statistics

Namibia is situated in Southern Africa and is bordered by Botswana on the east, Angola and Zambia in the north, Zimbabwe at the eastern Caprivi Strip and South Africa on the south and Atlantic Ocean on the west (Namibia, 2003:5). Map 1.1 and 1.2 shows the location of Namibia in terms of it neighboring countries.

Map 1-1 : Namibia and its neighboring countries (Source: Delanyo, 2001)



Map 1-2: Namibia's position on the Africa continent

The country is divided into 13 administrative regions. These regions are further divided into health districts. Overall, the country has 34 health districts which are managed by district co-ordinating committees (Delanyo, 2001:3). Regional divisions are shown in Appendix E. Namibia has a population of 1.830,330 with an annual growth of 2.6%, and the individuals live on the surface area of about 824,116km ^{2} (Haoses-Gorases, 2005:4). This makes Namibia one of the sparsely populated countries in the world (Namibia, 2004b:3).

The location of hospitals is affected by the population distribution. The Oshana region is situated in the northern part of the country. It is the smallest region (5,290 km^2) with a population of 167,797, hence one of the most densely populated regions in Namibia (Namibia, MOHSS, 2004a:1). The Khomas region is in the central part of the country and it contains the capital city of Namibia (i.e. Windhoek). This region has a population of 250,305, thus the highest population of any region in Namibia (Anon, 2007a). The level of ICT penetration is likely to differ between the two regions.

1.4 Namibia's ICT infrastructure and health service delivery

The GRN developed an ICT policy which was an outcome of several workshops. This policy was aimed at shaping the use of ICT in the country especially in the education sector. The policy provided the basis for the telecommunications policy and regulatory framework 1999 (Namibia, 2002b:19). In addition, there have been policy reforms in terms of ICT implementation in Namibia (Hesselmark & Miller, 2002:5). According to the Namibian National Information and Communication Infrastructure (2006), the country has been active in ICT policy formulation and in developing the necessary infrastructure for information society. The country's telecommunications and Internet infrastructure is very advanced by African standards, (United Nations Economic Commission for Africa, 2006). It is however to be noted that although a general ICT policy is developed and implemented, there is no official policy specifically for health service delivery, as the policy was still in draft form at the time of this research.

A national development plan titled "Namibia Vision 2030" was established by the GRN to describe the country's long-term goals. The main objective of the vision by the year 2030 is to "improve the quality of life of the people of Namibia to the level of their counterparts in the developed world by 2030" (Namibia, 2004c: 7). The vision pertaining to ICT status in Namibia by the year 2030 is to advance microelectronics-based ICT to achieve social and economic transformations in Namibia.

As the cost of ICT continue to fall while the capabilities increase, ICT are bound to be applied throughout all sectors of the economy and society to serve developments goals (Namibia, 2004c: 79). A brief summary of the Namibian Vision 2030 as it relates to ICT is shown in appendix Q.

The "Namibia vision 2030" however does not state the current state of ICT in Namibia, specifically for health service delivery, but it simply focuses on what is aimed to be achieved by the year 2030. According to Munukka (2005:30) there are developmental needs that need to be achieved before the vision is fully realized. Some of the developmental issues raised were advanced education and training to transform Namibia into a knowledge-based society and the need to address health-related issues such as HIV and AIDS epidemic.

According to Bennet, Russell and Mills (1996:1), health sector reforms in developing countries have "changed, or aimed to change, the role of the state in a number of ways. These include the following: private finance has been introduced to supplement public funding; policies are being introduced to enable greater private sector participation in healthcare provision; governments are using public funds to purchase privately provided services, and there have been measures to restructure (i.e. decentralize) and commercialize the public sector". These reforms are the same for Namibia, since the Ministry of Health and Social Services (MOHSS) has adopted a decentralization policy to improve service provision and management by devolving authority to the thirteen regional directorates of the MOHSS (Namibia, 2003:31). The thirteen regional directorates manage service delivery in all health districts. Organization of health service delivery is depicted in Figure 1.1.

The provision of health services in Namibia is divided between the government that provides (70-80%), missions or church based organisations (15-20%) and the private sector provides (5%) of the health services. Furthermore, the missions (i.e. Lutheran, Anglican, and Roman Catholic) are non-profit providers and they are 100 percent subsidized by the MOHSS (Namibia, MOHSS, 2004b:5). Delanyo (2001:2) explains that the non-governmental service providers in the Namibian health sector are mainly in the form of various religious missions, which are subsidized by the government and include hospitals, health centers and clinics mainly in the rural areas of the northern part of the country.

Given the background on the provision of services, the current state of health services has improved since the introduction of ICT use in the Namibian health sector. ICT is used to support health services delivery to all the thirteen regions and thirty four districts. The main aim of using ICT tools such as personal computers is to analyze, document, and distribute the planning, implementation and evaluation of health information, and also to assist with resource allocation and direct changes in policies and strategies.

Furthermore, the use of ICT aims to improve the delivery of quality health services and improve the effectiveness of strategies, monitor performance over time and identify health facilities that need support and supervision (Haoses-Gorases, 2005).

The country's ICT survey on Namibia was conducted in 2002 by the SIDA (Swedish International Development Cooperation Agency) to assess the current ICT situation in the country. This ICT survey was probably the first to be conducted in Namibia. The results of the study revealed that ICT use in Namibia is widespread and used by many organizations. Hesselmark & Miller (2002:36) describes that there has been massive improvements in Namibia's infrastructure in the past years after Independence.
ICT such as the Internet, faxes and telephones have been used in the health sector to support various health services.

Namibian's telecommunication services are provided in a monopolistic operation through an enterprise called Telecom Namibia. While mobile services are provided by Mobile Telecommunications (MTC) Namibia and Cell One. The table in Appendix I shows Namibia's state of ICT from 2000-2004. From the figures given, it shows that in ICT uptake for mobile subscribers has more than doubled from 43 to 111 per 1000 people between 2000 and 2004. Hesselmark and Miller (2002:36), further state that Namibia's ICT private sector is relatively advanced, giving an example that large companies have invested in SAP installations. Generally, the status of ICT for the country is relatively high compared to other African countries.

According to Baldwin, Clarke, Eldabi and Jones (2002:312), ICT plays an increasingly crucial role in delivering healthcare nowadays. In Namibia, ICT has been used to some extent to support HSD given that the MOHSS has completely decentralized and computerized the health information system (HIS) to the regional and district level (Namibia, 2004a:26). The system is currently being used to gather a host of data each month on services, morbidity and mortality from all government health facilities – 34 district hospitals, 37 health centers, 258 clinics, and their scores of mobile/outreach service points as shown in Figure1.1(Equity Network for Southern Africa, 2005:9). The distribution of health facilities by location across the country is depicted in appendix D.

Internet-based communications are used to communicate data between different levels of management (e.g. from regional to district then to national level).

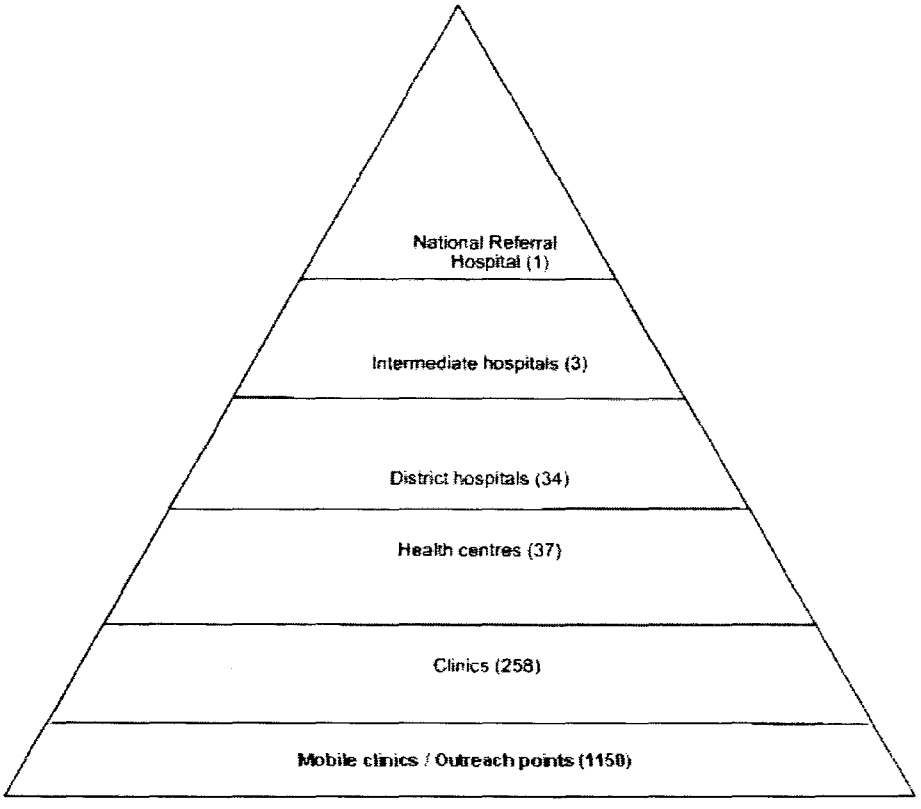


Figure 1.1: Organization of Health Service Delivery in Namibia (Source: Namibia, 2003:7)

Haoses-Garoses (2005:6) observed that health information is passed on to the regional and then to the national level via diskettes and email; the data is then screened and uploaded on computers. The above shows that ICT is indeed used to some extent to support health service delivery, even though there is need for improvement on efficiency and effectiveness of the processes at the operational levels.

1.5 Research significance

Given the growing importance of ICT use for development in Africa, it is crucial to study the use of ICT in improving health service delivery in Namibia. It is important so that health services are diffused to communities in remote locations and those facing health emergencies that require immediate diagnosis and intervention. There are signs of growing ICT related advancements and developments in the area of HSD in Namibia. HSD encompasses the provision of information for health care, prevention and treatment.

By examining the literature and conducting a survey with health service providers (HSP) and patients, recommendations can be made to policy makers on how to deploy ICT in delivering health services in Namibia. The results of this study can be used to promote lessons for other African countries and draw some insights for further research.

1.6 Research objectives

The focal point of this research is to investigate the use of ICT in the delivery of health services in Namibia. The study is guided by the following investigative questions:

i. How do health service providers make use of ICT to deliver health services to their patients?
ii. What are the ICT channels that health service providers use for internal and external communication with other health stakeholders?
iii. What are the key factors affecting the use of ICT for HSD by patients in Namibia?
iv. What are the existing government policies that engender ICT use within health service delivery?

1.7 Research methodology

1.7.1 Limitations

This study was limited to investigating the use of ICT for health service delivery in the Khomas and Oshana regions of Namibia. The study excluded other areas of the health sector (such as, pharmacies and medical aid companies), because the research purpose primarily focused on the use of ICT in the formal health service sector (i.e. mission, public and private hospitals, clinics and health centers) in the Khomas and Oshana region. Traditional health service delivery (e.g. traditional birth attendants) is not part of the study.

HSP were interviewed to investigate how they deliver services to their patients. Patients were surveyed to obtain their views about ICT use for HSD. Furthermore, ICT based interactions between mission, private and public hospitals were explored. This research project covered Oshana and Khomas regions, where a sample of HSP and patients was drawn from each region to investigate their use of ICT for health services.

1.8 Chapter outline of the Thesis

This research study is divided into five chapters. Chapter one introduces the thesis and chapter two reviews the literature by exploring how ICT is being used in developing countries, as well as its potential contributions and challenges in supporting health services. The research methodology is described in chapter three. Chapter four describes the health service delivery landscape, patterns of ICT use in the health service delivery from selected HSP and from the patient survey. Concluding remarks and research recommendations for future research are described in chapter five.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In chapter one the problem of ICT utilization by different health stakeholders in Namibia was stated. The background information on Namibia was presented and this background provides insights into the current status of ICT use in Namibia. This chapter examines the literature on ICT use in developing countries, benefits and challenges in ICT for health services, the applications of ICT in the health sector and related government policies and strategies. The term "information communication technology' dates back to mid 1980's (Dutton, 1996). Rao (2001:261) describes Information Communication Technologies (ICT) as "A set of activities that facilitate the capture, storage, processing, transmission and display of information by electronic means". Dutton (1999: 7) explain that ICT are "all kinds of electronics systems used for broadcasting, telecommunications and computer-mediated communications. However, many authors hold different opinions on what to include and exclude in the definition of ICT since it is an area that keeps advancing.

2.2 ICT use in developing countries

"The use of ICT is widespread" Schware (2003:3), and developing countries are becoming aware of the significance of using ICT to promote sustainable development as well as the creation of a knowledge society (Crede & Masell, 1998). In today's information society, health professionals need to maximize the potential benefits offered by ICT as a means to improving public access to health care and information (Wallace: 1997:88).

Schware (2003:3) further explains that ICT is an essential tool for the efficient administration of an organization and in the delivery of services and its clients (i.e. patients). Healthcare managers are therefore increasingly seeking opportunities in the field of ICT to help them to operate more effectively and efficiently, to reduce the overall costs of healthcare delivery and improve the quality of services (Greenes & Lorenzi, 1998:296).Throughout the world the convergence of ICT has changed the way in which the health sector and society at large are organized and managed. It is important for every part of the health sector to adapt to these changes as ICT can enhance the delivery of health services in various ways.

Lal (1999:6) observes that ICT can allow access to information sources worldwide and foster empowerment of communities; this applies in healthcare as well, seeing that ICT such as

Internet provide access to health information anywhere in the world and can improve governance in health service provision.

According to Venancio (2005:1), developments in the field of ICT started in Europe and other industrialized countries and were much later followed by African countries. Therefore, ICT is being used mostly in the developed countries and developing countries seems to be lagging behind. Chandrasekhar and Ghosh (2001:853) explain that health status management and most experiments using ICT in health service delivery have taken place in developed countries.

The production of ICT use in Asia is progressing as well as linking up on the Internet (Pedrelli 2001:21). He further states that Latin America has one of the fastest growing rates of acquisition and improvement of ICT. Although there is a growing number of ICT use in developed countries, developing countries are trying to catch up on the developed countries.

In the sub-Saharan countries, the use of ICT has increased in the past years. Uganda was one of the few sub-Saharan countries to obtain full Internet connectivity and it has grown moderately in the past years (Kasusse, 2005:150). In Senegal, emphasis is put on ICT development and implementation, with the objective to promote good governance by improving the quality of public services provided to citizens. This includes the management of personal data files in various sectors and health institutions (Olivier, 2006:1).

Kehbuma (2005:148) argues that if technology is an indicator for economic development, then South Africa (unlike other African countries in the sub-region) has advanced in economic development. Similarly, findings in an article in 2006 show that the greatest number of Internet users in Africa resides in either South Africa or Kenya in the sub-region or in Morocco and Egypt in the northern region.

The use of ICT in developing countries can help in poverty reduction, provision of basic needs by improving the quality of healthcare, public administration improvement, democracy enhancement and citizen empowerment (Lal, Cambridge, Lexington, Hadley &, Bethesda, 1999). The delivery and management of health services to deprived communities and regions in developing countries is a truly complex task (Braa, Sahay & Montero, and 2004: 338). Developing countries face major barriers that need to be dismantled before denoting proper access and effective use of ICT (Warden & Singer, 2004:91). Further, Cullen, (2003.249) states that the four main barriers to ICT use are: physical access, ICT skills, attitudes and content. Fors and Moreno (2002:200), express the same view that it is well known that lack of up to date information in healthcare is a common problem in developing countries, which may be caused by barriers mentioned by Cullen (2003:249).

There is a gap between the access to and the usage of ICT, meaning that the inequalities between the information" haves" and "have-nots" which is generally referred to as the digital divide. Pedrelli, (2001:6) describes the 'digital divide' as the "unequal provision of opportunities to access, and contribute to information, knowledge and networks; and to benefit from the development-enhancing capabilities of ICT". Fors and Moreno (2002:203) further observes that ICT inequalities in developing countries are one of the major obstacles in promoting sustainable development.

In his study, Pigato (2001:1), indicates that the gap in access to and use of ICTs ('digital divide) often follows and reinforces existing inequality and poverty patterns and the divide is within countries and also between developed and developing countries. Furthermore, Pigato says, "the gap is between those who have access to new technologies and those who do not is widening" (Pigato, 2001:1).

However, Fink and Kenny (2003:17) argue that a widening gap in per-capita to ICT access does not necessarily imply that poor or developing countries are lagging behind, but the key point is to look at relative rates of growth. Furthermore, Fink and Kenny explain that developing countries are not falling behind as such because if developing countries experience faster growth in the usage and access levels of ICT, then it is mathematically predictable that at some point, they could surpass the rich world and notwithstanding the fact that the absolute gap may continue to widen. Fink and Kenny (2003:17) point out that the digital divide or ICT gap is not widening as many argue but it is closing instead. Their argument was based on the 2002 World Bank report statistics, that there is a growth of Internet and telephone lines per capita and also that the statistics provides evidence that the ICT gap is closing.

2.3 The digital divide and ICT use for health service delivery

Digital divide is a gap between people who have the access to information through ICT, and those who do not have it (Munukka, 2005:7). On the other hand, Chen and Wellman (2003:2), describes the digital divide "as the multi-dimensional inequalities in Internet access and use, ranging from the global level, to nation states, to communities, and to individuals".

A number of African countries are struggling with the problem of inequality. For instance South Africa is experiencing two divides with regards to ICT, that between itself and the developed world, and that between the rich and the poor (Warden & Singer 2004:90). Meanwhile in Asia, countries such as India are unable to provide even total primary medical care in all rural areas (Rao, 2001:226).

Namibia is experiencing the same inequalities as its economy is unevenly distributed which may affect the uptake of ICT in some areas of the country. According to Munukka (2005:8), reasons why some areas of the country are left aside from the information society, are lack of basic infrastructures (e.g. electricity, telephone lines) lack of computers and professionals with computer skills. This is also applicable to the rural communities of Namibia, as these are the areas where mostly disadvantaged people reside. The rural areas are typically not developed, and they lag behind with the latest developments in the ICT fields especially the health sector.

While there is still discrepancy as to whether the gap (i.e. digital divide) between developed and developing countries is closing or widening, arguments still remain on how such gaps can be closed and how ICT can strengthen existing social and economic inequalities within developing countries.

According to Munukka (2005:1), the divide between developing countries (specifically referring to Africa) and developed countries is in terms of infrastructure and skilled users. This is also true in terms of ICT infrastructure, that developed countries have more advanced and greater access to ICT infrastructure than then developing countries. The same divide exists in the health sector that health services in the developed countries are more advanced and more developed in terms of the ICT related tools used in enhancing health services in the health institutions. The potential benefits of using ICT for health services are discussed in the next section.

2.4 Potential contribution and benefits of ICT to health services

ICT has the potential to radically change the way health services are delivered to patients and improve the quality of health services by providing easy access to health information. The potential use of ICT as a technique to improve the quality of health services is widely acknowledged worldwide and health institutions are striving to get easy ways to deliver their services efficiently and effectively.

ICT can be utilized to overcome geographic isolation for the population in rural areas, and it can facilitate access, dissemination, utilization and exchange of information on combating debilitating diseases such as malaria, tuberculosis and HIV and AIDS (Yamuah, 2005:1).

Chandrasekhar (2001:851) explains that ICT has the potential to be used as a mechanism to increase the transparency and efficiency of governance, which in turn would improve the availability and delivery of health services. He further explains that the potential of ICT in the health sector can be that of acting as mediatory role between the HSP and beneficiary (i.e. patients).

In the mediatory role, ICT is used as a medium to deliver health services to patients or can be used as tool to organize information more efficiently and effectively. This also applies to the referral systems as ICT can facilitate the flow of information from one level to the next.

Yamuah (2001:2) supports the benefits mentioned by Chandrasekhar (2001:851), and he adds that indeed ICT can improve communication between different levels of delivery units (e.g. district hospitals, health centers, clinics and referral hospitals).

ICT, at the referral level can enable more effective resource management and planning, efficiency in processing transactions and access to more reliable information. Health professionals would have the advantage of effectively and efficiently sharing the information with other health professionals (Yamuah, 2001:2). This would be helpful especially in developing countries as sometimes health professionals (e.g. specialist) may be a great distance from where they are needed and one may urgently need information for example symptoms on a certain disease in order to give a prescription to the patient (i.e. e-prescription). ICT such as email, telephone or mobile technology can facilitate communication between two health professionals in sharing information on various diseases affecting the patients.

The second benefit is that ICT encourages easy dissemination of disease treatment and disease control. Thirdly, ICT help reduce costs on patient transfers (Yamuah, 2001:2). Telemedicine is a good example of this, as it simply allows exchange of health information and delivery of health care across distances by using telecommunications (Rao, 2001:223). Furthermore, patients can have their consultations with medical specialists across a distance and they do not have to travel long distances for health services. Systems such as the Advanced Informatics Distributed Medical Access Network (AIDMAN) have been used in UK for virtual consultations between patients and specialist when they find themselves in different locations (Baldwin, Clarke, Eldabi & Jones, 2002: 313). All of the above has helped patients to save on travel expenses (i.e. time and money) to other places for health consultations.

Fourthly, Yamuah (2001:2) describes that ICT helps on reporting on disease surveillance information and interventions accessibility, it also includes databases of health management information system (HMIS) for efficient planning and policy formulation. Overall ICT facilitate access to health meaning helping improve health services provided to patients.

Before ICT can achieve its potential there are challenges that need to be resolved (Anderson, Vimarlund & Timpka, 2002:159). These challenges or barriers will be discussed in the next section.

2.5 Barriers and constraints to ICT use in developing countries

While there are many benefits offered by using ICT in the health sector, there are a number of challenges which need to be tackled before the benefits are realized. Barriers are obstacles that hamper ICT use by different users. These barriers hinder ICT access extrinsically, meaning obstacles that the user does not have control of, or intrinsically meaning those obstacles that are based on personal preference.

Lim and Khine's (2006:100) study explains the barriers to ICT integration in schools. Ertmer, Addison, Molly and Woods (1999:54) study groups these barriers into *'internal'* (first order) and *'external'* (second order) barriers. A study by Ertmer.*et al.* (1999:54) and Lim & Khine (2006:99), describes *internal barriers'* as the type of barriers that are extrinsic to the ICT user and this includes lack of access ICT, insufficient time to plan instruction, and inadequate technical and administrative support. This can be similarly explained in the health context, as inadequate technical and administrative support in the health institutions is also one of the external barriers. In addition, these barriers also comprise lack of infrastructure (e.g. electricity) and insufficient costs. All of the above can inhibit ICT access in health institutions.

On the other hand, *'external barriers'* are more concerned with the unwillingness to change from the user's side and attitudes about ICT use, these barriers are referred as' fear factors' (Yamuah, 2005:2; Ertmer *et al.*1999: 54).

Health stakeholders can be unwilling to use certain ICT due to certain beliefs or they can be resistant to change due to unfamiliar ICT (e.g. telephones, computers). A good example was given in the study done by Wallace (1997:88) when telephones were invented in London; some people were resistant to change as they thought telephones would not be useful because they had many messenger boys. Resistance to change can therefore hinder ICT use in health institutions for example if a health provider is used to record patient data in manual files, they might be resistant to using a computer for the first time if they have not been given proper training or administration support.

Yamuah (2005:2) is of the opinion that developing countries are facing a lot of challenges that hinder ICT use. The challenges in the health sector are summarised as follows:

- Modes of data collection are still manual and not yet standardised.
- Lack of electronic means to capture data, dependence on manual processes is still common in hospitals for administrative, diagnosis and referral services in Africa and other developing countries.

- Low literacy rates among health providers affect ICT utilization as literacy I key for ICT use. The literacy problem is actually spreading from computers to new ICT such as PDA, 3G mobile phones etc.
- Infrastructure constraints such as low distribution of reliable telecommunications and grid power in community health units.
- Lack of technical support has been identified as a hindrance in ICT use.
- High establishment costs for ICT projects give limited budget for health services.

A similar study by (Sargeant , 2005:304), identified challenges for ICT use in health services as technological, educational, and social environment. He further states that technological challenges relate to using the appropriate ICT and having proper support for its use. The challenges entail limited access to communication capability such as Internet, cellular phone networks etc. Other constraints that hinder the use of ICT by the poor may also include lack of skills, financial resources, gender, and existence of urban/rural and other inequalities (Pigato, 2001:2). This also applies to the health sector because if the staff in health institutions lacks skills in using certain ICT it can affect the way they deliver services to patients. Sargeant (2005:305) is of the same opinion that incorporating ICT into medical educational interventions is a challenge. It is therefore vital that staff is trained on ICT use to ensure maximum effectiveness and efficiency for support in the process of rendering health services to patients.

Even though there are barriers and low awareness to ICT use especially in the rural communities, Huggins and Izushi (2002:114) point out that some of the challenges can be overcome by having programmes facilitated to learn ICT among those with little awareness and knowledge. Furthermore, in their study Huggins and Izushi (2002:114) added that the delivery of ICT learning in rural communities often has to start with quite a low level of ICT awareness and knowledge among target groups, the target groups being different stakeholders in the health sector.

Huggins and Izushi (2002:115) identified good practices for future programmes designed to combat the digital exclusion or barriers to ICT use in the rural areas.
Some of the practices that also apply to health service delivery are:

- Community resource centres providing opportunities for 'tasting' ICT.
- Emphasis on 'user management' as a means of creating ownership e.g. If HSP are supplied with ICT e.g. mobile phones, it will promote self-help and personal responsibility in the learning processes.

- Service delivery beyond fixed locations e.g. having outreach points in the community were HSP use mobile communication with health institutions or with other health facilities.
- Use of ICT capabilities in the delivery of general services.
- Selected use of financial support.

The barriers in using ICT to enhance health services relate both to the specific use and access to certain ICT. Hence, solutions to overcome ICT challenges in order to gain effective access to ICT and use are required.

2.6 ICT use and applications for HSD in developing countries

The continuous advancement in ICT development has serious consequences for the health sector. There are fundamental changes taking place in health institutions as they reorganise their processes for effective delivery of health services in order to meet the needs of the patients. Implementation of new technologies needs to consider improvement with a view, to reduce service costs, health services, in terms of offering new opportunities for health services provision to patients.

Also, ICT use can facilitate the delivery of information in a reliable manner and enhance communication in the health sector. Technologies like the Internet and e-mail have the ability to send information in a fast, efficient and cheap fashion, which can provide remarkable improvements in access to information and care in the health sector (Pradhan, 2003:157).

Quibria, Tschang and Reyes-Macasaquit (2002:287), classifies ICT in three categories namely, computing, communications and Internet-enabled communications and computing. These categories can also be used in the context of health as various ICT that can be used for different purposes exits. The categories can be used as a guide to categorise different ICT applications in health and specifically for HSD.

2.6.1 Traditional technology use for HSD in developing countries.

In the past, information in the health sector has been processed and stored manually; this however still exists in the health sector. Computers were not widely used in healthcare in the past but have been used more in other sectors. Quibria.*et al.*, (2002:287), describes communication to take two forms, one-way and two-way communications. One-way communication includes broadcasting media such as radio and television. These communication media has been used in the health sector and they are known as traditional ICT.

In the past telephones were a popular way of communicating and they are still being used nowadays. Quibria.*et al.*, (2002:287) further explains that two-way communication includes devices such, mobile telephony, telephone (land lines), fax, pagers and more others. This section will discuss how these devices and communication processes are used in delivering health services in the health sector.

Traditional technologies have improved delivery of health services to patients especially those in remote areas and they continue to play a major role in this process. Telephones for example have been around and they are still being used for health services purposes. Mcwhirter (2003:341) study describes how televisions as one-way communication devices can be used in hospitals to provide health information to patients. He suggested a wide range of options and amongst them he mentioned a bedside television infrastructure that has been used as a source of health information for patients in Europe (e.g. England hospitals) and other civilized countries.

Traditional technologies such as radio have been widely used as a means of communication especially in rural areas to better communicate health information to the communities in remote areas. Kenny (2002: 141) reviewed the potential efficacy of radio and telephones as tools to alleviate poverty in developing countries. His study concluded that traditional ICT such radio are a powerful and sustainable technology that meets many of information needs of the poor and that traditional technologies are less expensive than high technology such as Internet. In countries like Uganda people perceive the development of information technology in the forms of FM radio transmission and modern graphics transmitted via the TV stations (Kasusse, 2005:148). This has improved in the over the years as organizations in Uganda have access to Internet connectivity. This is a good example of a one-way communication device that can be utilized to deliver health services information to patients.

2.6.2 Mobile technology use for health service delivery

Mobile computing or technology is a form of technology that is not fixed and is capable of being portable (Hameed 2003:100). Examples given include laptops, palmtop computers, personal digital assistants (PDAs) etc. Mobile computing can also be broadly described as computing technology, comprising software, hardware and communications specifically associated with mobility (Zaslavsky & Tari, 1988) in Hameed (2003:100). Mobile computing devices such as, mobile phones, and PDAs can greatly enhance the delivery of health services in the health sector due to their portable nature.

Mobile technology has been used in the health sector to make health procedures more accurate and efficient; and to reduce the risk of human error (Chao, Jen, Hung, Li & Chi, and 2006:1).

There has been a rapid growth in mobile telephony in the 21st century (Chao *et.al.*, 2006:2). The use of mobile telephony as an example of a two-way communication is evident and increasing and it is being used widely for personal and business purposes. In some countries mobile phones are even used to that extent of reminding patients about their appointment with HSP.

The HSP acquires contact details of their patients including their mobile numbers. They are then able to send SMS to them as appointment reminders. This allows better communication between different stakeholders in healthcare. Mobile technology also plays a vital role in developing countries, especially with health institutions in the remote areas. Given that most villages lack basic infrastructure such as electricity and telephone lines, it is inconceivable to imagine the use of a computer in rural based health institutions. Mobile ICT can play a major role in information management and mostly communication purposes in rural health institutions. According to Chau and Turner (2006: 307), devices such as PDAs offer an ideal solution to managing and accessing health information efficiently. This can be very helpful for health facilities in the rural areas, because using PDAs will enable them to share vital health information with bigger institutions in towns and this will reduce the manual processes.

Personal digital assistant's have proven useful in African countries such Uganda (Satellife Inc, Uganda Chartered Healthnet and Makerere University in 2003). The project which aimed to address challenges associated with the flow of health information in the Ugandan health sector uses PDA's to support data collection, data analysis and to provide access to health and medical information for health workers in the remote areas of Uganda (Kintu, 2007: 2). The project demonstrated that improved health information management through the use of ICT such PDAs, has direct impact on efficient health service delivery (Kintu, 2007:6).

2.6.3 High technology application for health service delivery

High technology or 'high tech' is defined as the "technology that is at the cutting edge or the most advanced technology that is currently available" (Wikipedia, 2007). There is no distinction of which technologies are in the high-tech category as new technologies are being developed every now and then. In this study 'high-tech' will refer to new and advanced technologies that are currently being used in health sector for health services provision.

Over the past decades the use of computers in the health sector has greatly improved and ICT applications have been used extensively in the developed countries in providing healthcare services. They are being used particularly in large public hospitals and also in different applications such as Health Information Systems (HIS), computer-based psychological testing applications and individual patient monitoring in the intensive care unit (Egan & Liu, 1995:357).

Nowadays, ICT is widely used in providing health services in health institutions. Computers are being used to record, process and store patient information in the health sector and also to enhance health services in these institutions. Rao (2001:222) states that computers have become indispensable to most businesses and this includes the healthcare industry. Furthermore, personal computers has changed from being a device that is primarily used for personal computing and authoring documents to a device that provides access to information to numerous computers on the Internet (Rao, 2001:222).
Wallace (1997:90) describes the Internet as the largest computer network linking millions of computers; furthermore the concept of the Internet was originally conceived in 1957 and has been evolving since then. Increased networking between healthcare service providers and various workforce developments have created a greater need for coordination and integration across organizational units in order to improve health care and the efficient delivery of services Kouri, Karjalainen-Jurvelinb and Kinnunen (2005, 1001).

The Internet has been widely used in health care industry and it has brought remarkable changes in the way services are delivered. It has been used especially in developed countries to supply health related information such as diseases symptoms, research in the medical fields etc. The Internet plays a vital role in the health sector and it has improved the process of delivering services to patients. According to Seror (2001:2), the Internet provides rapid access to medical information and expert consultation; and this will especially help in the process of delivering services easier in developing countries. It is crucial for health institutions to acquire new health information as the healthcare industry is advancing and changing by day. Tele-health is one of the ICT which includes health services, education, research supported by the Internet and it affects the way health services are provided (Seror, 2001:2).

Applications on the Internet such as emails can be used to share and send information e.g. in the health sector. They also offer various advantages such as, cost effectiveness, and efficiency (Wallace, 1997). Communication between different stakeholders in healthcare is crucial and important because enhanced communication can help better services offered to patients.

HSP need to have access to new health information to advance their knowledge in these areas. There are other high technologies that are used for health service nowadays. This entails, e-health, e-medicine, tele-health and these technologies have been used interchangeably and the difference is here that E-health entails everything that has to do with medicine online. The definition given in Wikipedia 2007 is that e-health is "healthcare practice which is supported by electronic processes and communication". However Eysenbach (2001:1), states that e-health should not only be used to "characterize "Internet medicine", but also virtually everything related to computers and medicine".

Tele-health on the other hand is the "delivery of health related services and information via telecommunications technologies" (Wikipedia, 2007).

This traditionally would refer to the telephone, where health service providers would discuss health information with other HSP over the telephone. Nowadays this has been advanced to using technologies such video-conferencing and Telemedicine. Telemedicine would be categorized into modern technologies and this is further discussed in the next section.

2.7 Emerging trends in ICT for health service delivery: Telemedicine

Emerging trends in ICT for health have changed the way health services are delivered to patients. This is more common in developed countries as new ICT are being developed each year to improve the delivery of health services. Telemedicine is one of the emerging areas of ICT applications that are used in the health sector for services enhancement.

Telemedicine refers to the use of ICT in helping to provide medical information and services in healthcare (Baldwin *et al.*, 2002:309). Rao (2001:223) further explains that telemedicine is the process of delivering health care and the exchange of health care information across distances by using ICT. Conversely, there is no fixed definition for this term as Linkous (2001:1) states that the definition of telemedicine continues to evolve because of technological advances. Telemedicine includes computer-based systems transfer of image such as radiographs, and the transfer of basic patient information over computer networks (Baldwin *et al.*, 2002:313) and (Rao 2001:223). Since it involves the transfer of objects over networks, it requires appropriate equipment and some type of telecommunication medium to be successful. There are other components other than technology that contribute to the success of telemedicine. The components are "personnel" and "a liberal measure of perseverance" (Harnett, 2006:4-5).

Telemedicine started way back in the 1920s and has been evolving ever since and it has been widely adopted in the western world (Rao, 2001:224).

The most operational telemedicine services are found in industrialized countries such as, Canada, Australia, United States of America and the United Kingdom (Graig & Patterson 2005:7). Moreover, other countries like Norway, Finland, Russia and Hong Kong have telemedicine programmes in operation (Graig & Patterson 2005:7). On the other hand, telemedicine has been operational in the industrialized countries but has also been adopted in some of the developing countries in Africa.

According to (Geissbuhler, Ly, Lovis & L'Haire : 2003), there are functioning networks of telemedicine in Mali. However, Namibia is not yet exposed to the use of telemedicine but will be connected through the Tygerberg hospital (International Atomic Energy Agency, 2006).

Telemedicine can be considered a health intervention designed to improve the care delivered to patients (Coiera, 2003:262). Therefore, ICT use in telemedicine offers remarkable opportunities to developing countries for alleviating poverty and health improvement. Telemedicine offers a wide range of benefits, be it to rural or urban areas. Benefits vary from accessibility to health services, efficiency, improved professional education, quality control of screening programmes and reduced health-care costs (Hjelm, 2005:60). Bynum, Cranford, Irwin and Banken (2006:39) further add that telemedicine can improve the quality of the diagnosis and management of patients in remote areas. Richards, King, Reid, Selvaraj, McNicol, Brebner and Godden (2005:2) are of the same view that indeed the use of ICT in health has the potential to improve access to educational opportunities for professionals and access to care in remote areas.

Despite the benefits presented, before telemedicine is adopted in developing countries certain factors must be of concern, Graig and Patterson (2005:6) support this view that due to lack of resources, African countries cannot utilize telemedicine, therefore cannot reap its benefits. However, Hjelm (2005: 61) argues that telemedicine offers improved access to services and increasing care delivery. For that reason it also plays a role in health service delivery.

2.8 Institutional support in ICT for health service delivery

Policies play a vital role in the intervention of ICT use in any sector. According to Galloway and Mochrie (2005:41) policies are have been developed for a number of ICT related issues. In his study Galloway and Mochrie (2005:41), stated that indeed policies may best intervene to support rural ICT development for economic sustainability or advantage.

Policies should be developed with clear objectives and specific goals in mind, regarding expected achievements of the health institutions.

In the Eastern Africa sub-region, there is ICT policy coordination at the regional level. The aim here is to increase levels of development. The ICT policy framework is Eastern Africa is designed to foster sustainable development in various areas and this includes the health sector (UN, 2003:2).

McFarlane, Murphy and Clerkin (2006:245) study, discusses a number of health information policies specifically for Ireland as they relate to telemedicine services. He concluded that using ICT including telemedicine is a challenge, and this challenge can be overcome by going forward to taking cognizance of the complexities involved and to actively foster levers for implementation and sustainability through policy , practice and research initiatives.

With reference to Asia, Quibria, Ahmed,Tschang and Reyes-Macasaquit (2003:819) mentions that policies to promote ICT, involves, investment in education, infrastructure, creation of favorable institutions, fostering new institutional innovations and international cooperation.

Governments and health institutions should have policies and strategies on how certain ICT should be implemented. Schware (2003:3) supports this view by stating that governments or any other organizations should have a policy in place and specify key strategies on implementing ICT projects in their institutes. Maumbe and Owei (2007:1) are of the same opinion that in order to achieve long term success in e-government policy development and implementation, institutions should examine the socio-economic context, key constraints and formulate appropriate policies that address those challenges. However, governments cannot merely set up their own policies but they must adhere to the international standards. Namibia (2002:33) has adopted the same position that government policies standards, and related processes should be internationally benchmarked. Furthermore, policies and standards should also facilitate interoperability within an international, voluntary and consensus-based environment for standards setting. The international standards bodies such as International Telecommunication Union guide Namibian policies and standard formulations. According to (Maumbe and Owei, 2007:1) the area of e-government policy development has received less attention in Africa, and South Africa is not an exception despite making great strides in e-government development.

At the time of the study, the Namibian ministry of health and social services did not have an ICT policy developed specifically for the delivery of health services to patients as it was still in development stage at time of study.

But there is a national ICT policy that the MOHSS adheres to. According to the interview with the directorate of policy and planning in the MOHSS the ministry adheres to policies set up by the management or the public service committees.

However, it is established that the policy for health service delivery was in draft form at the time of the study and was still to be implemented. Even though there is no ICT policy specifically for HSD in Namibia, there have been initiatives in other sectors such education. The ICT policy for education has been implemented with the aim of articulating the relevance, responsibility, and effectiveness of integrating ICT in education with a view to meeting the challenges of the 21st century (Tech/na, 2007:1).

2.9 Conclusion

This chapter has discussed the background information on Namibia and reviewed literature on ICT use in developing countries, applications of ICT in health and finally the ICT policies and strategies in health. The background information on Namibia shows that the country's ICT status is relatively advanced by African standards although there are still some barriers that hamper ICT in different sectors including health (Hesselmark & Miller 2002:5). ICT has been used to support health service delivery to some extent, but there is still a need for improvement on efficiency and effectiveness of processes especially on the operational level.

Literature was reviewed on ICT use in developing countries, applications of ICT for HSD, benefits and challenges of ICT use and finally ICT policies and strategies in health were discussed. ICT use in the health sector in developing countries can facilitate provision of basic needs by improving the quality of healthcare and generally it can also help in poverty reduction. In general developing countries are lagging behind with ICT use and developed countries are way ahead in their ICT use especially in the health sector.

ICT offers new opportunities to advance provision of health services to patients. Applications of ICT in health vary in different ways and it can be categorised in computing, communications and Internet-based communications. Overall, they all help in computation of health information, enhancement of communication that can be a traditional way or Internet-based. Finally, ICT policies and strategies help in the governance of ICT use in any sector including the health sector.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This study explored ICT use in the health service delivery in Namibia. The study investigates how HSP make use of ICT to deliver health services to patients, patient views and characteristics that affect ICT use for health service delivery (HSD) and government policies on ICT implementation as they relate to HSD.

Questionnaires were used to obtain primary data from health service providers (HSP) and patients in the private and public health sector. The questionnaires aimed to investigate 1) existing ICT and how it is used to deliver health services to patients 2) the constraints in delivering health services, and 3) factors that influence patient's use of ICT for health service delivery in Namibia, particularly Khomas and Oshana region. One hundred and thirty four patients were surveyed and twenty-one health service providers participated in the survey. The survey was a cross-sectional study where data was collected during the period from July 2006 to August 2006. The researcher aspired towards a result which would prove that the respondents selected in one region matches the sample selected in the other region for comparative purposes.

Permission to conduct the research study was obtained from the permanent secretary of the Ministry of Health and Social Services (MOHSS) before data could be collected. The researcher filled in an application form with the MOHSS for the registration of the research proposal. This process was undertaken to gain approval to conduct research in public health institutions. Approval was granted to conduct research in the health facilities of Oshana and Khomas regions (See letters of approval in appendix A, B and C). Even though, approval was granted to carry out the study, further permission from the hospital management was sought to pilot questionnaires in Onandjokwe hospital. However, the pilot study was successful and amendments were made to the final questionnaire.

3.2 Location of the study

The study was conducted in the Khomas and Oshana region (see Appendix E for the location of regions). The rationale for choosing these regions is that Khomas is representative of a typical urban area while Oshana region is situated in the northern part of the country which is primarily a rural setting. By conducting the survey in two different geographical areas, the researcher aimed to capture any locational differences and similarities in ICT use for HSD.

3.2.1 Khomas region

Khomas region is located in the central part of Namibia and it is 37,007 square km², and this is where the capital city Windhoek, is situated. The head office of the MOHSS is situated in this region as well as the directorate that consists of various health facilities of which, one is a national referral hospital, one intermediate hospital, two health centers, seven clinics, three private hospitals, private clinics and thirty-three outreach points. The region has the highest population which stands at 264,616 compared to other regions in the country, and the population per hospital is 121,278 (Namibia, 2006). Most health facilities in the Khomas region are situated in urban areas, while those in the Oshana are in semi-urban and rural areas.

Access to ICT in the Khomas region might be higher than Oshana, as the community tends to have better access to resources especially infrastructure endowment. However, access to infrastructure cannot be assumed as use, because it is possible that the community can have access to ICT but do not necessarily utilize it. Also, the region tends to have access to more health facilities as it is more developed than the Oshana region.

3.2.2 Oshana region

Oshana region is the smallest region (5,290 km²) with a population of 167,797, hence it is densely populated (Namibia, 2004a:1). The Oshana region forms the second largest population concentration in Namibia after Windhoek, but it lacks basic infrastructure and most of the services and facilities normally found in urban areas of this size (Anon, 2007a).

The Oshana health directorate is divided into fifteen health facilities, one Intermediate Hospital (regional), four health centers and twelve clinics. The district also has twenty-eight outreach points. The intermediate hospital is the ultimate referral point in the Oshana region and it is responsible for providing essential back up services and support for clinics and health centers in the region. Health centers are smaller than intermediate hospitals and they are found in two types, namely, day care health centers and rural health centers (Namibia, 1998:16), the latter is common to Oshana region. Health centers are bigger than clinics, offer more services and they normally have more equipments. Health centers have more regular visits by medical practitioners than clinics. Clinics are smaller than health centers and they are an entry point in the health system. The outreach points are also called mobile clinics whereby services are rendered by nursing teams to communities where health facilities cannot be put up.The population per hospital in the Khomas region is 169,147 (Namibia, 2006).

3.3 Type of study and research method

Health service providers and patients in the private and public health sector were interviewed to explore their use of existing ICT. Semi-structured interviews were conducted with Health Service Providers in the private and public health sectors. A HSP's questionnaire (see Appendix F) was prepared before the interview and was thus used to explore how ICT is being used to deliver health services to patients, the extent of ICT deployment and constraints in the delivery of health services to patients.

A second questionnaire for patients (see appendix G) was developed and it was used to obtain views from a purposive sample of patients in various health facilities in the two regions. Purposeful sampling is concerned with choosing participants that manifest certain characteristics that the researcher is interested in (Struwig & Stead, 2001:122). The patient's questionnaire was administered in different departments of health institutions and this included, waiting areas, wards, and out patient departments. The patient's questionnaire covered factors that influenced the use of ICT in delivering health services, perceptions of ICT use for HSD and it also investigated patient's access to and use of ICT. A high response rate was reached in this study due to self-administration procedure of questionnaires. This increased the response rate unlike online surveys. By conducting face to face interviews with health institutions management (institutions supervisors), effective communication was ensured.

3.4 Research design

This research was aimed to investigate how HSP makes use of ICT to deliver health services to patients and whether ICT is being used to ultimately benefit patients to whom the services are provided. Brink (1996:100), explains that the research design is the set of logical steps taken by the researcher to answer the research question. It forms the blueprint, pattern or recipe for the study and determines the methods used by the researcher to obtain subjects, collect data, analyze the data and interpret the results.

3.4.1 Questionnaire design

Two questionnaires were prepared for HSPs and patients before commencing with the field study. The first questionnaire was developed for HSPs to explore current ICT use in health institutions and their constraints in delivering health services to patients the Khomas and Oshana regions.

The first step to designing questionnaires was to develop specific questionnaire items for the concepts employed in the research question (Greenfield, 2002:174). The HSPs questionnaire consisted of five sections. The first section captured personal particulars of health institutions. The second section, explored the current ICT use in health institutions, the third section questioned the role of ICT in collaborations with other institutions. The fourth examined factors that influenced the use of ICT for HSD and the fifth section explored health institution's future investments in ICT. The HSPs questionnaire was designed to be only used as a guideline in semi-standardized interviews. Details of HSPs interviewed are shown in Appendix M.

The second questionnaire was developed for patients to help determine the factors that influence the use of ICT in the health service delivery in the Khomas and Oshana regions. The questionnaire for patients initially comprised of four sections. The first section of the questionnaire identified patients targeted for this study. Screening of patients was done and patients were included in the study if they have visited a health facility in the past three months only and if they had at least 15 years of age. The second section focused on respondent's views about the use of ICT and how they perceived ideal health services offered to them.Third section explored factors that influence the use of ICT in HSD and the fourth section obtained patients demographic information.

Both questionnaires consisted of open-ended and closed-ended questions. The advantage of open-ended questions is that they give respondents the freedom to freely answer the questions and allows them to formulate an answer in their own words (Groves, Fowler, Couper, Lepkowski, Singer, & Tourangeau 2004:156). Closed-ended questions were used to limit lengthy answers where unnecessary. Closed-ended questions in both questionnaires were pre-coded for analysis. All questionnaires were assigned a serial number on each page to identify the questionnaires and to avoid mix up should pages of the questionnaire go missing.

3.4.2 Questionnaire translation

In this study, the researcher translated patient's questionnaire (see Appendix H) in Oshiwambo (one of the languages in Namibia), as Oshana region is typical of a rural area and translating the questionnaire was helpful in getting patients views who could not communicate in English. The questionnaire in Oshiwambo was also used in the Khomas, as the researcher came across patients that preferred to be surveyed in their mother tongue even though they could speak English. The questionnaire (appendix H) was thus used the Khomas and Oshana regions.

According to Geldenhuys, Herbst, Dixon and Stoker (1989:142), it is essential that researchers conducting field work in Africa have some knowledge of local African languages for conducting interviews. Pre-testing of the questionnaires was carried out prior to the field research, and this is discussed in the next section.

3.4.3 Questionnaire pre-testing

Questionnaires (Appendix G and H) were pre-tested in Onandjokwe hospital in Oshikoto region, the same community as the research study area Questionnaires were piloted in the outpatients department of the Onandjokwe hospital. Before the pilot study was conducted, the researcher sought permission from the hospital management and permission was granted to pilot the questionnaires. The questionnaire was piloted on 17 patients, 7 questionnaires in English and 10 in the vernacular language. The pre- testing of instruments was done to determine if questions were well understood by the patients in both English and *"Oshiwambo"*.

Creswell (2003:158), points out the importance of pre-testing a research instrument lies in the need to understand the content, as well as to improve the questions, format and scales of the instrument. In addition, pre-testing the questionnaires helped to evaluate clarity of questions, effectiveness of the instructions in the questionnaires, determine the suitability of the questionnaire's format, to detect unforeseen problems and weed out sensitive questions. One of the benefits of pre-testing the questionnaire was having an error free questionnaire that was better understood by patients. The other main benefit was to detect errors at an early stage and correcting them early in the study has produced an effective instrument. In this study, pre-testing was conducted in Oshiwambo and English questionnaire versions.

Some of the problems encountered during the pre-testing phase were the time- consuming process of seeking permission from hospital management. The researcher was required to write an application letter to the hospital management to ask for permission to pilot the questionnaires in that particular hospital. This process took almost a week as the researcher had to wait for the application letter to be discussed in the hospital committee meeting. Eventually permission was granted to pilot the questionnaire in Onandjokwe hospital. Other problems encountered were lack of clarity in some of the questions (e.g. question 13 in Appendix G), the researcher had to change words in the questionnaire and substitute it with words that gave the question a better meaning in a local language.

After the questionnaires were pre-tested, modifications, rephrasing and revisions were made. This was mostly common in the Oshiwambo questionnaire, as some questions (e.g. question 13) needed to be rephrased to enable better understanding of the questions by patients.

The final questionnaire both in Oshiwambo and English versions were then compiled and the researcher was ready to collect data.

3.4.4 Questionnaire administration

The questionnaire on ICT use by health service providers (Appendix F) was aimed at investigating current ICT used in health institutions and their constraints in delivering health services to patients. A description of ICT use for HSD in Namibia was done, in relation to locality (Urban/rural), the type of the health facility and the number of years in operation. Existing ICT were explored and their use in the health facilities was investigated. Twenty-two (22) health service providers were interviewed, and this included, policy directorates, health information systems officer, nurses and supervisors in charge of various health facilities.

Patient's questionnaire (Appendix G) was designed to obtain their views on ICT related services provided by health service providers and also to establish patient's use of ICT as it relates to HSD in different health facilities. Greenfield (2002:178) mentions of different modes of questionnaire administration. A face to face mode of questionnaire administration was used for this study and in cases where the researcher could not administer the questionnaire, patients completed it by themselves. A total of 134 questionnaires were obtained from Khomas and Oshana region. Out of the total number of questionnaires, 124 were self-administered by the researcher. The purpose of the questionnaire was explained and greatest care was taken in briefing the patients on the questions. Furthermore, clarifications were given to patients where they did not understand the purposes explained or questions asked. The remaining 10 questionnaires were personally filled in by the patients in the Roman Catholic private hospital. Permission was not granted to the researcher to administer the questionnaire in this private hospital, due to privacy reasons. Instead, the questionnaire was interpreted to the nurse in charge and eventually given to patients to fill it in. List of health facilities covered in this study, are shown in Appendix M.

3.5 Sampling procedures

The sampling procedure was initiated by identifying the target population to be studied. The target population in terms of a geographical area studied was the HSPs and patients in health institutions in the Khomas and Oshana regions.

The sampling procedure was therefore designed to produce a representative sample of patients from various health facilities in the two regions. The selection procedure of the population sample was based on two sampling methods, namely multistage stratified sampling and purposive sampling.

The target population consisted HSP (health institution supervisors or staff in charge) and patients from health facilities the Khomas and Oshana regions. The two geographical regions were selected for this study, as it was deemed likely that Khomas and Oshana conceivably have unique experiences as Khomas is indicative of an urban and the latter a rural area.

3.6 Multistage sampling

Multistage sampling was used as a method to select a sample of respondents from Khomas and Oshana regions. Multistage sampling is a process that includes collecting data from a sample using a previously defined technique and based on the information found, a sub sample is selected for further study (Cooper & Schindler, 2003:199).

The first stage involved identifying regions for the research study, which were the Khomas and Oshana regions. The second stage was used to select a sample of health facilities located in the respective regions. The health facilities were purposively selected based on the researcher's accessibility, distance of traveling and resources such as cost etc. Health facilities targeted in the two regions were clinics, health centers, private and public hospitals. An attempt was made to identify the same health facilities in both the Khomas and Oshana regions.

The sampling process for health facilities was thus initiated by first determining the sampling frame. The sampling frame is a list of all the sampling units in the population (Struwig & Stead, 2001:109). Groves *et al.*, (2004:45), is of the same opinion that the "sampling frame" is a listing of all units in the target population. A list of all the health facilities the Khomas and Oshana regions was thus obtained from the MOHSS website. Health facilities were divided into subgroups, e.g. clinics, health centers, hospitals and also according to their owners (whether it belonged to the mission, public or private section). A sample of 10 and 11 health facilities (e.g. clinics, health centers and hospitals) was purposively selected in the Khomas and Oshana regions respectively. The sample of health institutions selected for this study is shown in Appendix M.

HSP and patients served as sample units to be investigated in this study. Alreck and Settle (2004:56), describe a sample unit as the smallest entity that provides one response and that sample units may consist of individual units.

Firstly, HSP (institution's supervisors or staff in charge) within sampled health institutions were interviewed to explore how they deliver health services to their patients and to establish their perceptions on ICT use for HSD. The above mentioned officers were chosen for their knowledge of ICT related operations in the health institution, the maintenance and ICT use for health services in that particular facility.

Secondly, the selection of patients was random and purposive, based on the screening procedure used in the questionnaires. Patients were selected if they had been to a health facility in the past three months and those were fifteen years and older. Therefore, patients were eligible if they met each of the following criteria: i) Not less than 15 years of age, and ii) If they have visited the health facility for the past three months.

The sample size of 134 patients was carefully surveyed in the health institutions of the two regions. Patients from different health facilities were questioned on their use of ICT as it relates to HSD. To obtain a representative sample, the researcher sought to obtain an equal number of respondents from each region. Patients were randomly drawn from the private and public health facilities (inclusive of mission facilities) Purposive random sampling was thus used to select respondents to be surveyed. Purposive random sampling involves a selection of small sample and its emphasis is on information-rich samples (Struwig & Stead, 2001).

A total of 134 questionnaires were administered with patients and a total of 21 HSP were interviewed from Khomas and Oshana region. There were 72 questionnaires administered in the Khomas region and 10 interviews conducted with HSP, while in the Oshana region, 11 HSP were interviewed and 62 questionnaires were administered with patients. However, not all the health facilities in the two regions were covered for this study due to time and budgetary constraints. The researcher aspired that the stakeholders selected in one region matched the sample selected in the other region for comparative purposes.

3.7 Data collection

3.7.1 Secondary data

Secondary data was acquired from different publications such as journals, white papers and health policies. Policies as they relate to HSD were examined to determine Namibia's policy in terms of ICT use in the different sectors and specifically for the health sector.

In cases where the documentations were not easily accessible, it was deemed necessary to interview GRN officials from the policy and planning directorate to further investigate policies that engender ICT use within the health service delivery. Semi-structured interviews were conducted with the policy directorate in the MOHSS, to enquire about the policy documents on ICT and to also find out if there are existing government policies, particularly for HSD. Secondary data sources from literature review, policy documents and interviews provided an essential preparation for collecting primary data.

3.7.2 Primary data

An exploratory survey was carried out in various health facilities the Khomas and Oshana regions to explore ICT use by different stakeholders. A sample of HSP from various health facilities was selected from the two regions and HSP selected in one region matched the sample selected in the other region for comparative purposes. Primary data was collected from interviews with HSP and questionnaires administered with patients. Questionnaires for patients, aimed to obtain their views on ICT related services rendered by HSP and also to establish their use of ICT as it relates to HSD. Data was collected from a total of 134 patients and 21 HSP in both the Khomas and Oshana regions. Table 3.1 below shows a summary of the study's key variables.

Table 3. 1: Description of variables

Variable	*Variable Description*	*Measurement/Scale*
Dependent variable		
ICTAWARE	ICT awareness	[1] = Traditional technology, [2]= Mobile technology, [3]= High technology
Patient Characteristics		
AGE	Age	Years
GENDER	Gender	[1]=Female, [0]=Male
EDUCATION	Level of education	Count/scale 1= Primary 2= Secondary 3=College 4 =University
RACE	Race	[1]=Black, [2[=Colored [3]=White
INCOME	Household income range	N$
LOCATION	Region	[1]=Khomas,[0]= Oshana
Operational/Management Variables		
INFOSCOUNT	Number of health information sources	Count variable
LITCOUNT	Number of ICT a patient can operate	Count variable
PRIVACY	Number of ICT contacts one is willing to share	Count variable
Perception variables		
STC	Skills and training capability	[1]= yes , [0] = no
STPERCEPT	Service convenience	[1]= yes , [0] = no
AFFORDP	Perception on affordability	[1]= yes , [0] = no
PEPINFRA	Perception on infrastructure	[1]= positive perception on infrastructure [0]= otherwise
PEPTRNW	Perception on training	[1]= positive perception on training [0]= otherwise

Source: Survey data, 2006

HSP were interviewed to determine factors that influence the use of ICT in delivering health services and specifically how ICT is being used to serve patients. A description of ICT use for HSD in Namibia was done, in relation to locality (i.e. urban/rural), the type of the health facility and the number of years in operation. Primary data was collected through structured questionnaires with different HSP and patients. Table 3.2 shows the number of responses from questionnaires in different health facilities.

Table 3. 2: Number of questionnaires administered in the Khomas and Oshana health facilities

Type of health facility	Number of questionnaires administered with patients	Number of Health service providers interviewed
Khomas region	72	10
Oshana region	62	11
Total	**134**	**21**

Source: Survey data, 2006

3.8 Ethical considerations

In this study, patients were briefed on the purpose of the study and they were allowed to ask questions where they did not understand. A letter of consent (Appendix F) was pre-drafted and signed by the researcher to give assurance that the information given by respondents remains anonymous and confidential. The purpose of the letter in this study was to introduce respondents to the study objectives and also brief them on the content of the questionnaire. The letter was read to patients and they were given a choice of participating or not participating in the study.

Henning, Van Rensburg and Smit (2004:73), state that respondents need to give informed consent to participate in the study, meaning they must be fully informed about the research objectives, their roles and any consequences. It is of paramount importance to seek consent from participants (patients), especially for a health study, as patients should agree to take part voluntarily. In addition, health studies normally deal with confidential health information and they must be only used for the research study it was intended for, and not for other purposes such revealing confidential information for non-research purposes.

3.9 Techniques of data analysis

3.9.1 Descriptive analysis

Data collected from patients and HSP analyzed using SPSS version 14.0. Descriptive analysis was conducted on data obtained from HSP and patient's survey. The analysis was conducted on variables such as gender, age distribution, education, income, race and the type of ICT in use. Frequency analysis was used to determine patterns of ICT use. The aim of the descriptive analysis was to identify patterns of ICT use in the Khomas and Oshana region. Comparisons were made between two regions to study their differences and similarities in ICT use. Interviews were transcribed and analyzed qualitatively.

3.9.2 Factor analysis

Factor analysis was conducted to identify factors that account for the patterns of collinearity among ICT variables. The analysis was conducted on eight ICT based health service delivery channels used are namely, PC, email, Internet, fax, mobile, radio, telephone and television (see table 3.3). The aim was to find out if they could load on a common component in the component matrix. Kaiser- Meyer-Olkin and Bartlett's test was conducted to test if variables were suitable for factor analysis. Bartlett's test was found to be statistically significant for combined data set.

Table 3. 3: The eight Information and Communication Technology based delivery channels

Technology	Variable Name
Personal computer	**PC**
Internet	**INTERNET**
Email	**EMAIL**
Mobile/Cell phone	**MOBILE**
Radio	**RADIO**
Television	**TV**
Telephone	**TEL**
Fax machine	**FAX**

Source: Survey data, 2006

3.9.3 Multinomial logistic regression model

Multinomial regression was used to identify factors affecting the use of multiple ICT for health service delivery channels. The ICT awareness variable was developed using results obtained from the factor analysis which generated three categories namely, 'high technology', 'mobile technology' and 'traditional technology'. A chi-square test was conducted to identify important variables affecting ICT awareness.

Results from the chi-square test were then used to develop variables to be used in the multinomial model. Since there were multiple responses for ICT use, multinomial regression analysis was carried out to determine factors influencing use of multiple ICT in the HSD in Khomas and Oshana region. Table 3.4 summarizes the variables used to estimate the multinomial model with ICT awareness as the endogenous variable.

The dependent variable (ICTAWARE) was determined based on the patient's usage and ownership of ICT. The results per region are shown in Appendix N and O.

The variable was created based on the three components that emerged from the factor analysis conducted on the ICT variables. The three components were labeled as, "high technology," "mobile technology" and "traditional technology." The variable therefore takes a value of 3 for those patients that have used ICT in the "high technology" group, 2 for "mobile technology" and 1 for those that used ICT in the "traditional technology" category. Zero would have represented those that had never used any ICT, but there were no patients who reported non-use. The category zero was therefore dropped as no patients reported having no experience with any of the identified ICT.

Table 3. 4: Multinomial logistic model variable description and assumptions

Variable name	*Variables Description*	*Predicted effect on dependent variable*
Dependent variable		
ICTAWARE	ICT awareness: [1] = traditional technology, [2]= Mobile technology, [3]= High technology	
Independent Variables		
AGE	Age [years]	_
GENDER	Gender: [1]=Female, [0]=Male	-/+
EDUC	Level of education [years]	+
RACE	Race [1]=Black, [2]=Colored [3]=White	_
INCOME	House hold Income range [N$]	_
LOCATION	Region :[1]=Khomas,[0]= Oshana	+
Operational/Management Variables		
INFOSCOUNT	Number of health information sources	+
LITCOUNT	Number of ICT a patient can operate	_
PRIVACY	Number of ICT related contact details one is willing to share	_
Perception variables		
STC	Skills and training capability: [1]=yes, [0]=no	_
STPERCEPT	Service convenience : [1]=yes, [0]=no	_
AFFORDP	Affordability : [1]=yes, [0]=no	+
PEPINFRA	Perception infrastructure : [1]=positive perception on ICT infrastructure, [0]= otherwise	+
PEPTRNW	Perception on training : [1]=positive perception on training, [0]= otherwise	+
ICTHEALT	Number of ICT used for health services:[1]=yes, [0]=no	+
ICTIMPRN	ICT provide ways to improve health services:[1]=yes, [0]=no	_
ICTHLPNW	ICT help to access new health information:[1]=yes, [0]=no	_
ICTINTEN	ICT aids interaction with HSP:[1]=yes, [0]=no	+
SHARECN	Willing to ICT related contact details:[1]=yes, [0]=no	_
IMPORTP	Privacy is of importance:[1]=yes, [0]=no	+

Table 3.4: Multinomial model assumptions continued

Variable name	*Variables Description*	*Predicted effect on dependent variable*
DEVICTSN	Wish to develop ICT skills:[1]=yes, [0]=no	+
GRNICTN	Government should provide more IC for health:[1]=yes, [0]=no	+
ICTTRAN	More training on ICT:[1]=yes, [0]=no	–
ICTCOSTN	Cost major hindrance to ICT use in health:[1]=yes, [0]=no	+
PEPSERV	Perception on services: [1]=positive perception on ICT services, [0]= otherwise	–
PEPCOMM	Perception on communication : [1]=positive perception on ICT communication, [0]= otherwise	–

Source: Survey, 2006

(+) Positive association with ICT awareness

(-) Negative association with ICT awareness

- **Mathematical representation of the Multinomial model.**

The multinomial model is represented mathematically as shown in equation 3.1.The probability of an event occurring forms the basis of the prediction formula. There are multiple outcomes for the dependent variable and the model is estimated in table 3.4.The mathematical equation of the multinomial model is shown below:

$$\Pr(Event) = \frac{1}{1+e^{-Z}}$$

Where e = is the base of the natural logarithm

Event = 1, 2, 3 . . . J -1

Z = is the linear combination and $Z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_p x_p + \mu$

$Xi...Xp$ = independent right hand variable

β_0 = constant

μ = error term

Equation 3-1: Multinomial logistic regression model (Stevens, 2002: 147)

The data was analyzed further using a logistic regression model to investigate factors affecting the use of individual ICT channels. The Logistic model regression is described next.

3.9.4 Logistic regression model

Logistic regression analysis was conducted on selected "high technology" and "mobile technology" channels to determine the specific factors driving individual ICT use. Booysen (2006: 46) explains that logistic regression analyses the relationship between one dependent variable and a number of independent variables. The selected ICT based channels were used as dependent variables and the significant variables affecting their use were explored in the multinomial model and were tested for their relationship and the dependent variables.

- **Mathematical representation of Logistic model.**

The logistic model is estimated in table 3.5 is represented mathematically as shown below:

$$\Pr(Event)=\frac{1}{1+e^{-(\beta_0+\beta_{1x})}}$$

Where Pr (event) = probability of given event occurring (e.g. ICT use).

β_0 and β_1 = set of parameters to be estimated and e is the base of the natural logarithm

Equation 3- 2 : Logistic regression model (Stevens, 2002: 147)

3.9.5 Logistic model assumptions

Table 3.5 gives a brief description of variables used in this study. The first group of variables describes demographic characteristics of patients; the second group represents management and operational variables; and the third describes perception variables.

The dependent variables, PC and mobile phone use, take on values of one for use of ICT and zero for non-use. The independent variables comprise of demographic characteristics, management variables and perception variables.
The results are further discussed in chapter 4.

Table 3. 5: Description of variables used in Logistic Regression Model

Variable	*Variables Description*	*Predicted effect PC*	*Predicted effect on mobile phone*
Dependent variable (s)			
PC USE	[1]= use,[0]= nonuse		
MOBILE PHONE USE	[1]= use,[0]= nonuse		
Independent Variables			
AGE	Age [years]	+	+
GENDER	Gender: [1=Female, 0=Male]	_	+
EDUC	Level of education [count]	+	-
RACE	Race [1]=Black, [2]=Colored [3]=White	_	-
INCOME	House hold Income range [N$]]	+	+
LOCATION	Region; [1]=Khomas,[0]= Oshana]	+	+
Operational/Management Variables			
INFOSCOUNT	Number of health information sources	+	+
LITCOUNT	Number of ICT a patient can operate	+	+
PRIVACY	Number of ICT contacts one is willing to share	_	+
Perception variables			
STC	Skills and training capability: [1]=yes, [0]=no	_	-
STPERCEPT	Service convenience : [1]=yes, [0]=no	_	+
AFFORDP	Affordability : [1]=yes, [0]=no	+	+
PEPINFRA	Perception infrastructure : [1]=positive perception on ICT infrastructure, [0]= otherwise	_	+
PEPTRNW	Perception on importance of training : [1]=positive perception on training importance, [0]= otherwise	_	-
ICTHEALT	Number of ICT used for health services: [1]=yes, [0]=no	+	+
ICTIMPRN	ICT provide ways to improve health services:[1]=yes, [0]=no	+	+
ICTHLPNW	ICT help to access new health information:[1]=yes, [0]=no	_	-
ICTINTEN	ICT aids interaction with HSP:[1]=yes, [0]=no	_	+
SHARECN	Willing to ICT related contact details:[1]=yes, [0]=no	+	+
IMPORTPN	Privacy is of importance:[1]=yes, [0]=no	+	-
DEVICTSN	Wish to develop ICT skills:[1]=yes, [0]=no	+	+
GRNICTN	Government should provide more IC for health:[1]=yes, [0]=no	_	-

Table 3.5 Description of variables used in Logistic Regression Model continued

Variable	***Variables Description***		***Predicted effect on dependent variable***
ICTTRAN	More training improves ICT use :[1]=yes, [0]=no	+	-
ICTCOST	Cost major hindrance to ICT use in health:[1]=yes, [0]=no	+	+
PEPSERV	Perception on services: [1]=positive perception on ICT services, [0]= otherwise	+	+
PEPCOMM	Perception on communication : [1]=positive perception on ICT communication, [0]= otherwise	_	+

Source: Survey data, 2006

There seems to be a high ICT awareness in both regions. Khomas region is assumed to have a higher ICT awareness than Oshana region because it is far developed than Oshana region. Gender might also affect PC awareness, as females are expected to be more aware of PC than men, however being aware does not necessarily mean that they are using the ICT.

Education does play a role in end-users' awareness. It is assumed that educated respondents would have high awareness in ICT especially modern ICT such as PC. Respondents who had tertiary qualifications are expected to have more ICT awareness. However, it is predicted that education does not have an effect on mobile phone use.
Income appeared to not be closely related to PC and mobile phone usage, because even if some respondents could not have access to some ICT they were still aware of some ICT that have either been used in the public places e.g. TV in clinics, or maybe mobile phones. It is assumed that Khomas will have a high awareness of both PC and mobile phone use than Oshana region because Khomas is more developed than Oshana region and with most health facilities situated in the urban area might be a reason of more ICT awareness in the Khomas region. It was also further predicted that sources of information for health services and functional literacy would have a positive effect on PC and mobile phone use.

3.10 Conclusion

Research methodology has been described in this chapter. Firstly, the location of the study was described and the status of ICT the Khomas and Oshana regions. The research method survey was used to collect data from patients in different health facilities. Semi-structured interviews were conducted with HSPs in the private and public health sectors.

The interviews sought to investigate how ICT is being used by health service providers to deliver health services to patients, the extent of ICT deployment and further to explore constraints in delivering health services to patients.

A second survey was conducted with patients to identify ICT use patterns. There were different techniques of data analysis used in this study. Descriptive analysis was conducted on the health service provider's data and further on patient's demographics to get major opinions on ICT use. Factor analysis was conducted to obtain factors that explain the patterns of co-linearity among the eight ICT communication variables. Multiple use of ICT was analyzed by using multinomial regression analysis and individual use of ICT communication-based channels was investigated through the use of logistic regression analysis. The research findings are reported in Chapter 4.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Introduction

The aim of this chapter is to present the main findings from the analysis of data. Firstly, the Namibian health service delivery landscape is described to get a better understanding of the organization of health service delivery and ICT-based health service provision in the country. Secondly, results of data collected from the survey of health service providers and patients are analyzed.

The analysis was conducted using Statistical Package for the Social Sciences (SPSS) 14.0 version. The analysis of results from the Khomas and Oshana regions was carried out to identify patterns of ICT use for health services in the two regions. Comparisons were made between the two regions to study their differences and similarities. The Namibian government (GRN) policies on ICT use were also examined to determine the status of ICT development in the country. By comparing the results from the two regions and combining them with evidence drawn from the literature, some insights for further research are provided.

4.2 The Namibian health service delivery landscape

Based on the survey of GRN documents, interviews with health service providers (HSP) in both Khomas and Oshana regions, and the literature reviewed, a health landscape model for Namibia was developed and is illustrated in Figure 4.1. The health landscape depicts health service provision to patients in different health sectors within Namibia.

According to Korpela, Hanmer, De la Harpe, Macome, Mursu, and Soryiyan (2004:2), the "landscape" of healthcare delivery, management and funding as well as the wider societal and political history differs from one country to the next. In this study a generic "landscape model" was proposed that can be used for comparative purposes (Korpela, Soryiyan, Olufokunbi, & Mursu, 2000).

Firstly, a 'generic' health service delivery landscape for the Namibia is developed whereby the regional landscapes for Khomas and Oshana regions are further derived from it. The 'generic' health service delivery landscape for the Namibia was the first step taken in developing a health landscape model for other regions and a 'generic' model for the whole country. The GRN documents that were specifically reviewed for landscape development includes, national health accounts 2004, Namibia country (UNGASS) report 2005, annual

reports for Khomas and Oshana regions from the MOHSS etc Results from HSP survey was also used to verify information in the GRN documents.

Figure 4.1 contains a generic health service delivery landscape model for Namibia and it shows different health stakeholders and how ICT related services are provided to patients, it also shows inter-relations between these stakeholders.

The Ministry of Health and Social Services (MOHSS) is responsible for providing health and social services to the citizens of the country. There are 13 regional directorates, namely; Caprivi, Erongo, Hardap, Karas, Kavango, Khomas, Kunene, Ohangwena, Omaheke, Omusati, Oshikoto, and Otjozondjupa. These directorates are under the management of the MOHSS and within these directorates are 34 districts. The field research was conducted in the Khomas and Oshana regional directorates and both regions have one district Windhoek and Oshakati respectively. There is one national referral hospital country wide and it is located in the Windhoek district. The national referral hospital is under the management of the MOHSS which is at the national level.

The second landscape developed was for Khomas region. Khomas region is under the management of the regional Health and Social Welfare services management. This region consists of one district namely, Windhoek. There are three healthcare divisions, namely the public health sector, missions and private health sector.

Service providers in the public sector comprise mission health services and the government (Ministry Of Health and Social Services). There are 3 different types of health facilities that operate at different levels. See Appendix L, for the classification of health facilities in Namibia. The national referral hospital is situated in the Khomas regional directorate in the Windhoek district and the national referral hospital is responsible for the overall national referral cases.

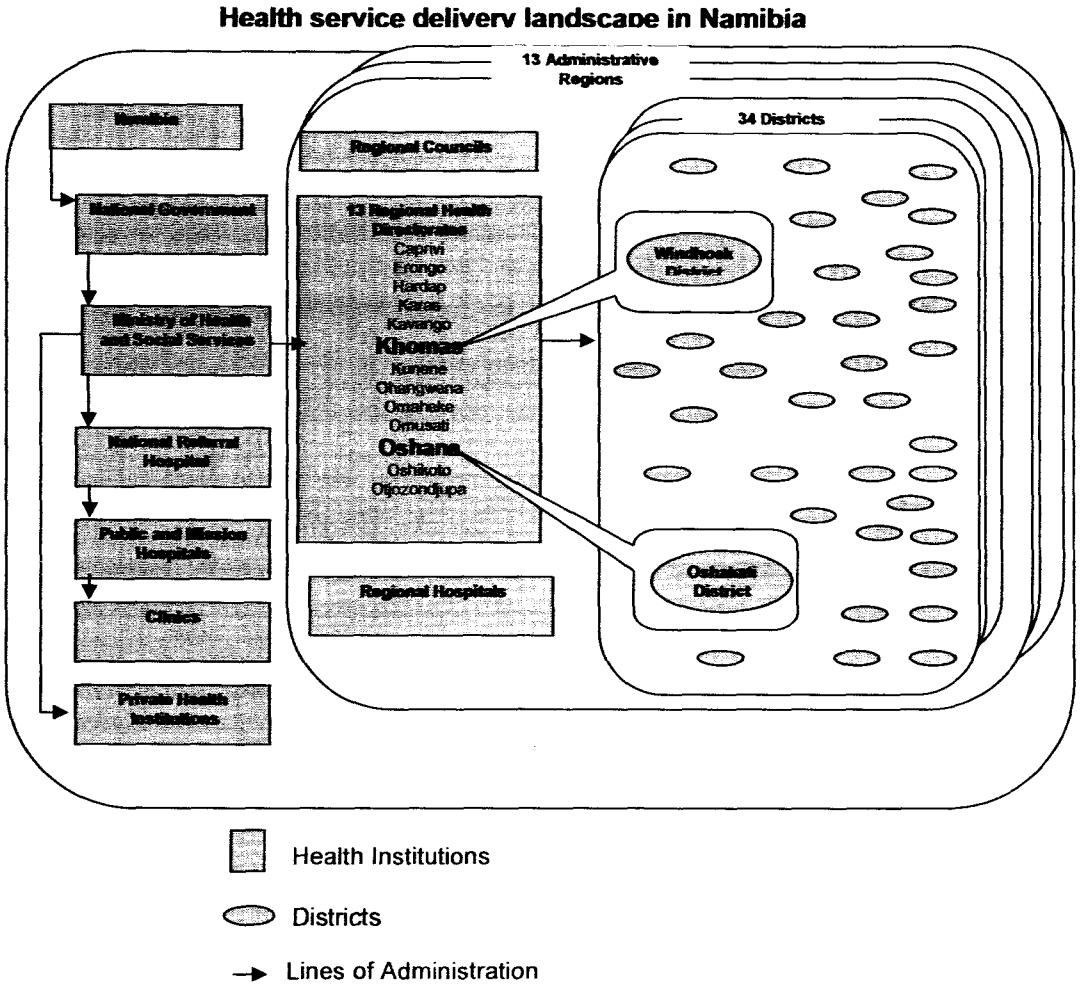


Figure 4.1: The Namibian health service delivery generic landscape, 2007

Source: Survey data, 2006

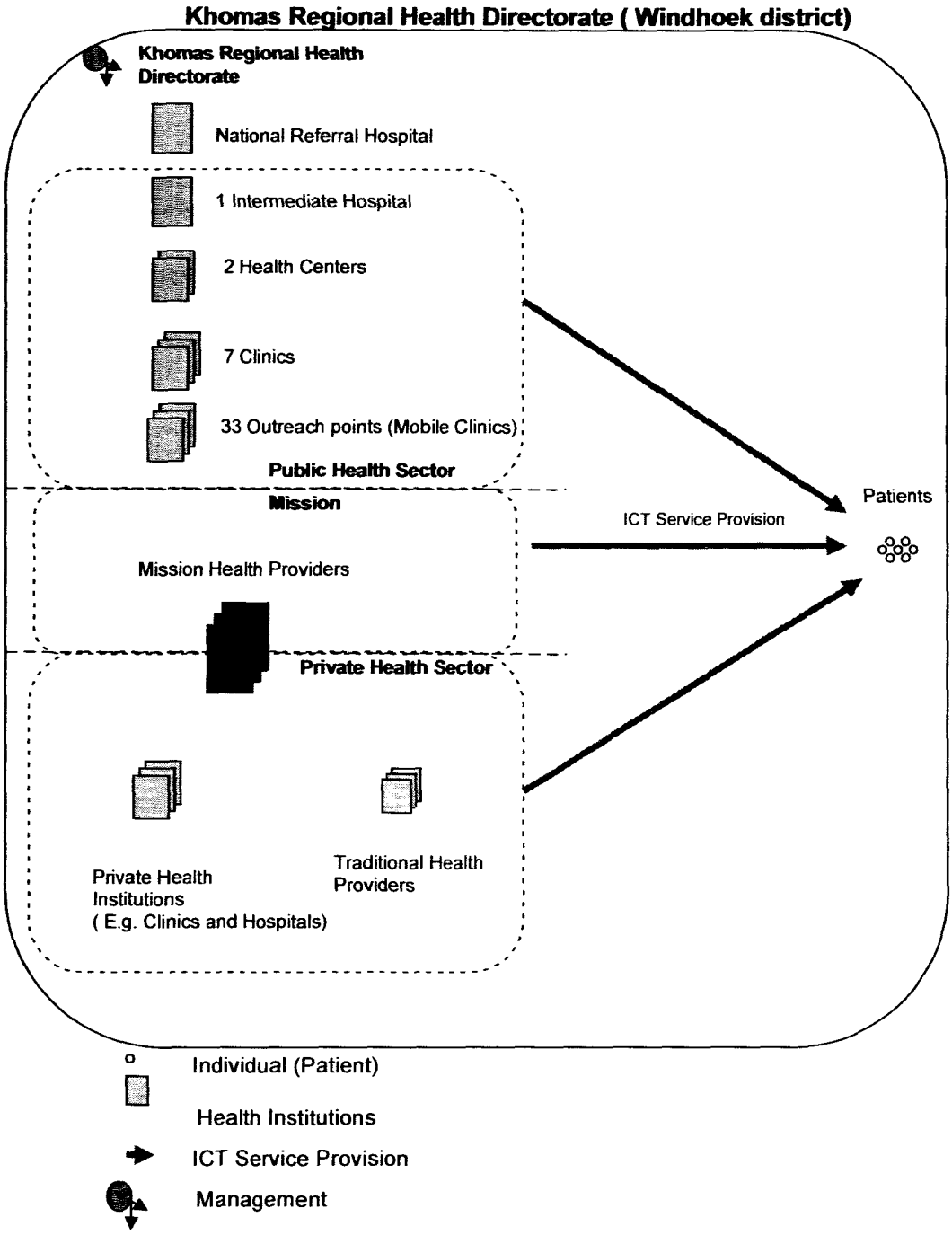


Figure 4.2: A health service delivery landscape for Khomas region, 2007

Source: Survey data, 2006

There is one intermediate health institution, namely Katutura hospital and its main function is to offer services and support to the health facilities at a lower level e.g. health centres and clinics. This intermediate hospital also acts as a referral point in the Windhoek district. The GRN owns most of the health facilities and there are seven clinics and two health centres in the public healthcare sector of Khomas region. Mission health services are subsidised by the GRN, thus considered as part of the public health sector (Namibia, 2005:9). It is however difficult to distinguish whether some health facilities belong to private or mission health providers, as some mission hospitals are operating as private providers. An example of this is the Roman Catholic private hospital, which is managed by the Roman Catholic Church and named as a private hospital.

A clinic is an entry point in the delivery of health services in the public sector. However, patients can choose to go straight to the district hospital because hospitals also provide primary healthcare services. Health centres are larger than clinics in terms of service provision thus clinics can refer patients to the health centres in cases where advanced services are required. Health centres and clinics can refer patients to the regional and district hospital. The private health sector consists of private medical practitioners and traditional healers (El Obeid, 2001:2). There are a number of private clinics and hospitals in the Khomas region.

Figure 4.3 depicts a health service delivery landscape for the Oshana region. Just like in the Khomas region, the Oshana region is also under the management of the regional health and social welfare services and this region has three healthcare divisions, namely the public health sector, missions and private health sector. There are minor differences in the Khomas and Oshana health service delivery landscapes. They have the same management levels, but the differences are that some hospitals would be located in one region and not the other (e.g. Referral hospital); and where there would be more private health institutions located in one region and not the other region.

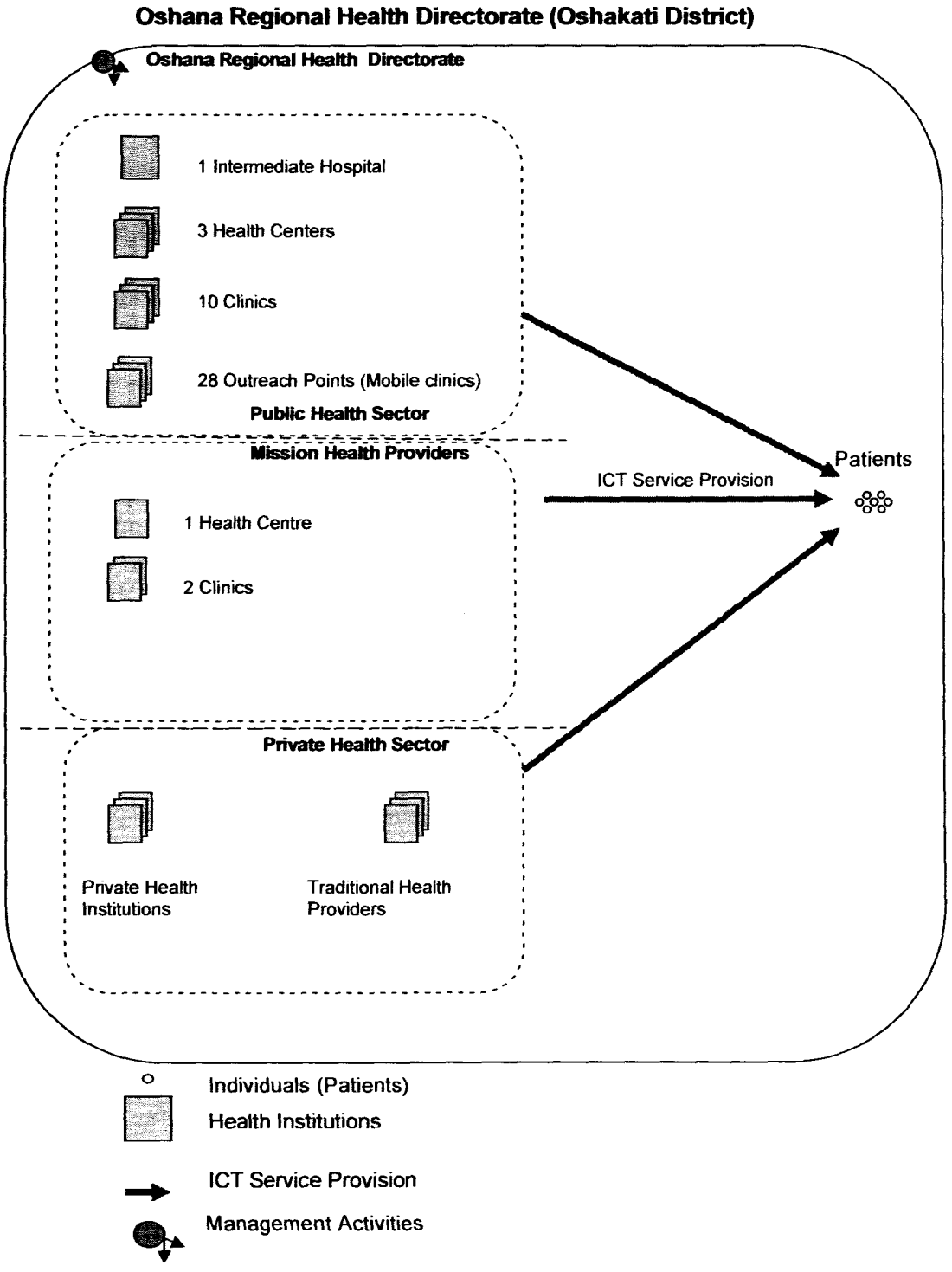


Figure 4.3: A health service delivery landscape for Oshana region, 2007

Source: Survey data, 2006

The Oshana public health sector is comprised of mission health services and the GRN (MOHSS). The GRN owns most of the health facilities and there are ten clinics and four health centres in the public healthcare sector of Oshana (Namibia, 2004a:5). Oshakati hospital is a regional referral hospital and it is acting at the same time as a district/intermediate hospital which makes its classification difficult (Namibia, 2004a:8). The hospital provides regional specialised healthcare services and district support for other health institutions such as clinics and health centres. Its main function at a district level is to provide essential back-up services and support to the health centres and clinics. Oshakati hospital is the highest referral point at district level. In this region, there is one health centre (Okatana) and two clinics that are owned by mission service providers. Mission health services are subsidised by the GRN thus considered as part of the public health sector.

However, just as explained with the Khomas regional landscape, in the Oshana region, a clinic is also an entry point in the delivery of health services in the public sector. Patients can also go straight to the district hospital or health centres as they also provide primary healthcare services. Health centres and clinics refer patients to the regional and district hospital. Finally, there are outreach points in the community whereby the mobile district primary health care team visits to render services to the community. The summary of functions for the health institutions in Namibia are shown in Appendix P.

4.3 Descriptive statistics for patients

Descriptive statistics were conducted on data obtained from patients. Initially, the data sets from urban and rural health institutions were analyzed separately to describe the distribution on ICT use by region. Data sets from both regions were then combined and analyzed to show overall results on ICT use patterns in the two regions. The combined data had a sample size of 134 patients from Khomas and Oshana regions who participated in the survey.

4.3.1 Patient characteristics by region

Table 4.1 shows patients demographic characteristics by region. Out of a total of 134 respondents from both Khomas and Oshana regions most of the respondents were female (73%).The largest group of patients (47%) was in the 21 to 30 years age group from both regions. The majority of patients (90%) were black and (61%) have at least completed secondary education and 15% had finished college (Appendix K). The majority (61%) of patient's income household is less than N$ 5000 (Appendix J).

Table 4-1: Namibian patient demographics by region, 2007

	Khomas region		Oshana region		*Both regions*	
Demographics	**Total N=72**	**%**	**Total N=62**	**%**	***Total N=134***	%
Gender						
Female	54	71	44	69	98	73
Male	18	24	18	28	36	27
Age Distribution						
Under 21	11	15	8	13	19	14
21-30	30	40	33	52	63	47
31-40	16	21	11	17	27	20
41-50	9	12	6	9	15	11
51-60	5	7	2	3	7	5
61 and older	0	0	2	3	2	1
Education						
Primary [grade 1- 7]	4	5	7	14	11	8
Secondary [grade 8- 12]	46	61	34	65	80	60
Tertiary College	10	13	10	19	20	15
University	9	12	1	2	10	7
Other	n/a	n/a	n/a	n/a	13	10
Race						
Black	59	82	61	98	120	90
White	3	4	0	0	3	2
Colored	10	14	1	2	11	8
Household Income						
Less than N$ 5,000	43	57	38	59	82	61
N$5001-10000	24	32	14	22	37	27
N$11000-15000	3	4	5	8	5	4
N$16000 and more	none	none	2	3	5	4
Not disclosed	n/a	n/a	n/a	n/a	5	4

Source: Survey Data, 2006

4.3.2 ICT use by patients in the Khomas and Oshana regions

Access to health services plays an important role in health service delivery. The use of ICT depends entirely on whether HSP or patients have access to ICT. The data on patients' ICT use patterns and perceptions is shown in table 4.2 and 4.3 for the Khomas and the Oshana regions respectively.

ICT awareness in the Khomas region is relatively high as patients indicated they have access to most of the technologies. Most (99%) patients showed that they have used a radio and television before, even though for some patients they do not own these ICT at home. In case of television, some patients who did not own a television at home indicated that they had access either in their neighborhood, or when they visit health facilities, and then they watch video cassettes on health education. Awareness of ICT also proves to be strong in mobile phone use, as 92 percent of patients that took part in the survey indicated that they own mobile phones. Those that did not own them explained that they had at least one person in their household who owned a mobile phone.

There were various perceptions displayed by patients on ICT use. Some patients expressed the view that they cannot use some of the ICT (e.g. computer, Internet). Most of the patients that did not use a computer or Internet either felt that the technology was advanced (i.e. did not know how to use it) or either they had no access at all. ICT literacy implies the ability for users to operate a number of ICT tools. The surveyed patients indicated a high capability to operate the radio (100%), mobile phone and telephone (99%). The ability to use different ICT was also high for PC (74%) and average for Internet (50%).

Large proportions of patients indicated that they use mostly radio (83%) and television (74%) for health related services e.g. listening to health programs or watching health education programs on TV. Telephone (56%) and mobile phone (44%) followed as being used for health related purposes. Surprisingly, radio (76%) and TV (69%) are also mainly used for educational purposes. Radio ranked high with 100 percent as the ICT that all the patients in this region could operate, and which could be adapted for health education purposes. This is consistent with the results of Kenny's study where he reported that radio was highly used (71%) by rural people in Nepal as their source of information (Kenny, 2002:150). The Internet is slowly being used for health related services as only (21%) of patients use it for this purpose. For responses with N/A, patients were not specifically questioned on email.

Table 4-2: Summary of ICT use patterns and user perceptions in the Khomas region, 2007

	Personal computer	Email	Internet	Mobile phone	Radio	Television	Telephone	Fax machine
	%	%	%	%	%	%	%	%
ICT Access								
Current use	44	36	32	94	97	85	90	43
Previous use	72	47	47	97	99	99	97	67
Ownership	24	11	10	92	96	83	64	6
ICT Perceptions								
Expensive	6	n/a	7	0	0	0	0	4
Advanced/do not know how to use ICT.	18	n/a	32	1	0	0	0	14
Time consuming	4	n/a	3	0	0	0	0	0
Not user friendly	0	n/a	0	1	0	0	0	0
Unnecessary	4	n/a	4	0	0	0	0	8
Other	17	n/a	15	2	10	0	0	0
ICT Literacy								
YES	74	n/a	50	99	100	97	99	64
NO	25	n/a	49	1	0	1	1	32
ICT Importance								
Work	40	n/a	21	38	28	13	39	36
Leisure	43	n/a	33	93	94	92	83	38
Health	8	n/a	21	44	83	74	56	17
Education	47	n/a	32	53	76	69	51	19
Other	32	n/a	6	26	0	0	4	0

Source: Survey Data, 2006

On the other hand in the Oshana region (see Table 4.3), a lot of patients indicated relatively low access to ICT such as computers (31%) and the Internet (19%). Reasons provided for not having access to these ICT were due to lack of knowledge or they either had no access at all to that specific ICT. Despite the low access to ICT, all the patients surveyed stated that they could use radio (100%) general purposes and listening to health services and that (98%) owned radios in their household. Mobile phones (95%) are also highly used in the Oshana region. Patients in the Oshana region demonstrated high functional literacy, as most of them could operate radio (100%), telephone (99%) and mobile phone (97%).

A summary of ICT use patterns and perceptions in Oshana are shown in table 4.3. In the Oshana region, radio (92%) and television (79%), came out as the two ICT that are mostly being used for health related purposes, telephone (45%) and mobile phone (39%) came second as being used for health related services.

ICT such as mobile phone (55%), radio (95%), television (63%), are being used for educational purposes. In the case television, HSP mentioned that they provide health education to patients by playing videos with films that inform patients about diseases such as HIV and AIDS etc.

Table 4-3: Summary of ICT use patterns and perceptions in the Oshana region, 2007

	Personal computer	**Email**	**Internet**	**Mobile/Cell phone**	**Radio**	**Television**	**Telephone**	**Fax machine**
	%	**%**	**%**	**%**	**%**	**%**	**%**	
ICT access								
Current use	31	13	19	95	100	84	77	31
Previous use	40	15	21	98	100	100	97	63
Ownership	7	0	2	94	98	61	47	3
ICT perception								
Expensive	18	n/a	18	0	0	0	0	5
Advanced/do not know how to use	27	n/a	36	3	0	0	0	7
Time consuming	7	n/a	7	0	0	0	0	5
Not user friendly	2	n/a	2	0	0	0	0	0
Unnecessary	2	n/a	3	0	0	0	0	15
Other	32	n/a	44	3	0	0	0	32
ICT Literacy								
YES	39	n/a	21	97	100	97	36	22
NO	61	n/a	77	3	0	3	63	39
ICT Importance								
Work	23	n/a	10	39	24	18	42	31
Leisure	18	n/a	18	98	100	86	81	44
Health	7	n/a	13	39	92	79	45	7
Education	29	n/a	16	55	95	63	37	13
Other	11	n/a	2	12	0	0	0	3

Source: Survey Data, 2006

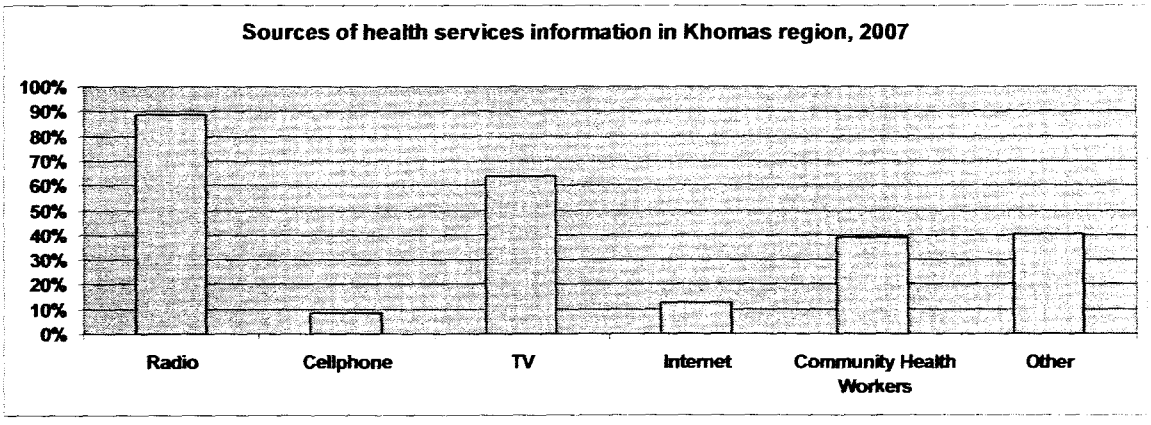
During the survey, patients were questioned on their willingness to improve their ICT skills. Patients displayed a strong interest in learning or improving their ICT skills which shows a positive perception towards ICT.

4.3.3 Comparison of the Khomas and Oshana regions

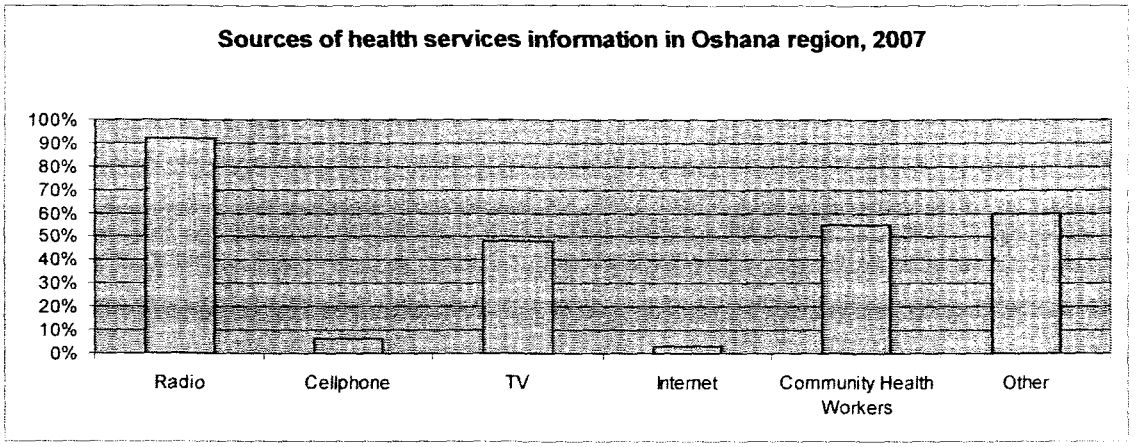
In this section, comparisons are made between the two regions regarding the use of ICT. This covers ICT health information sources, ICT-based communication channels, and their applications in HSD. Graph.4.3 shows the distribution of sources of information used by patients in the two regions. The two main ICT that have been used by patients as their sources of health information are radio and television.

The study reveals that most patients in both regions use radio and television as their major sources of health information. Patients in the Khomas region tend to have more access to TV which was expected due to the fact that Khomas is in an urban area. Similarly, Internet use as a source of health information is higher in the Khomas (13%) than in the Oshana region (8.2%). However, community health services rendered by health workers are more in the Oshana (55%) than Khomas region (39%).

The majority of patients indicated that they depend on multiple sources of health information. In addition, patients from both regions indicated that they also obtain their health information from other sources such as, newspaper, pamphlets from health facilities, health education offered by nurses at health facilities, campaigns and also through telephone enquiries to a health facility.



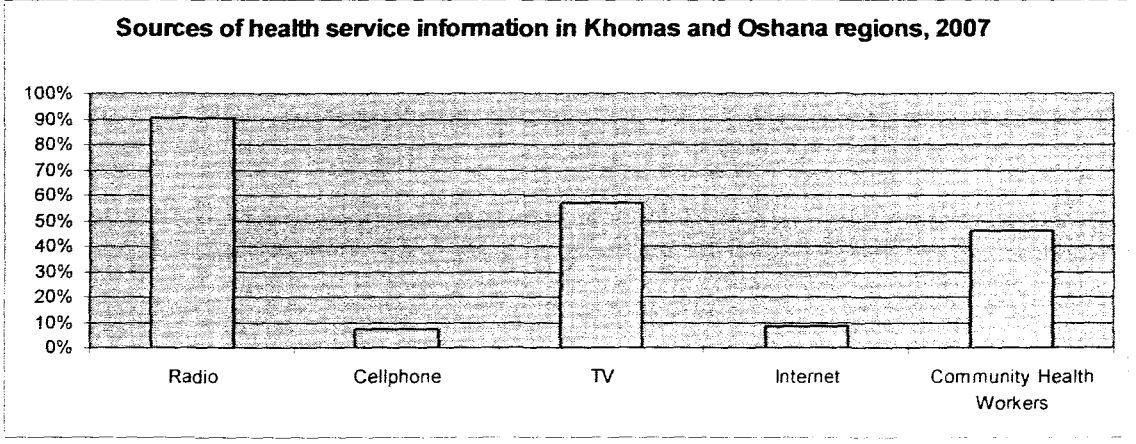
Graph 4-1: Distribution of information sources used by patients in the Khomas region
Source: Survey Data, 2006



Graph 4-2: Distribution of information sources used by patients in the Oshana region
Source: Survey Data, 2006

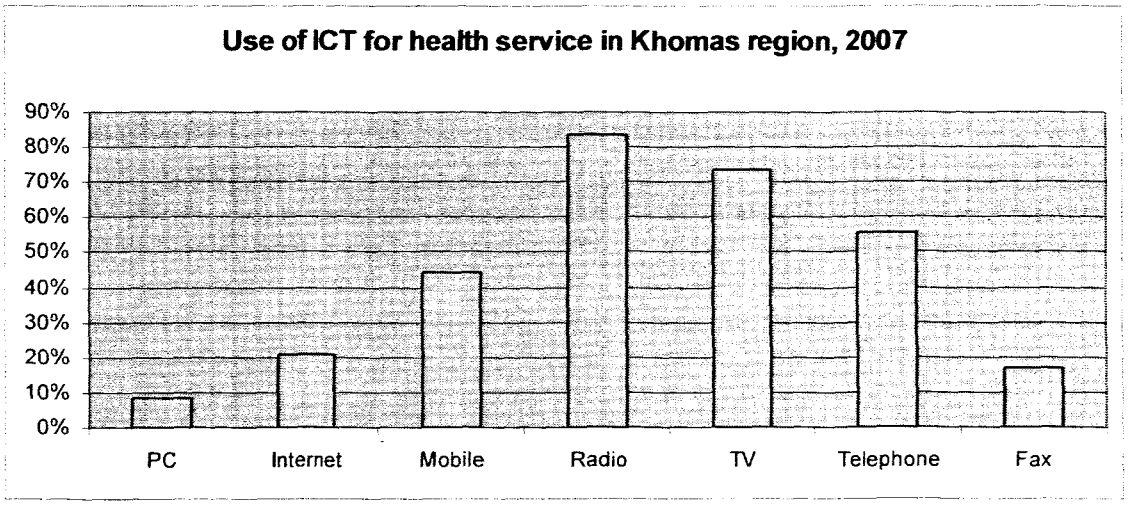
From the foregoing results, it is evident that ICT use is much higher in the Khomas than in the Oshana region. Khomas being a region where most people live in urban areas might be one of the reasons why access to, and use of ICT is higher in the Oshana region. On the contrary, there are slight differences in the combined results from the both regions. In graph 4.3, radio (90%) still came out as the highly used ICT for sources of health services. TV (58%) ranked second, followed by community health workers (48%), Internet (13%) and cell phone (12%).

It is interesting to note that mobile phone usage for health service delivery is still evolving despite more than 90 percent penetration rate recorded during the survey. Patients were also questioned on what purposes they used ICT for health services.



Graph 4-3: Distribution of information sources used by patients in the Khomas and Oshana regions.
Source: Survey Data, 2006

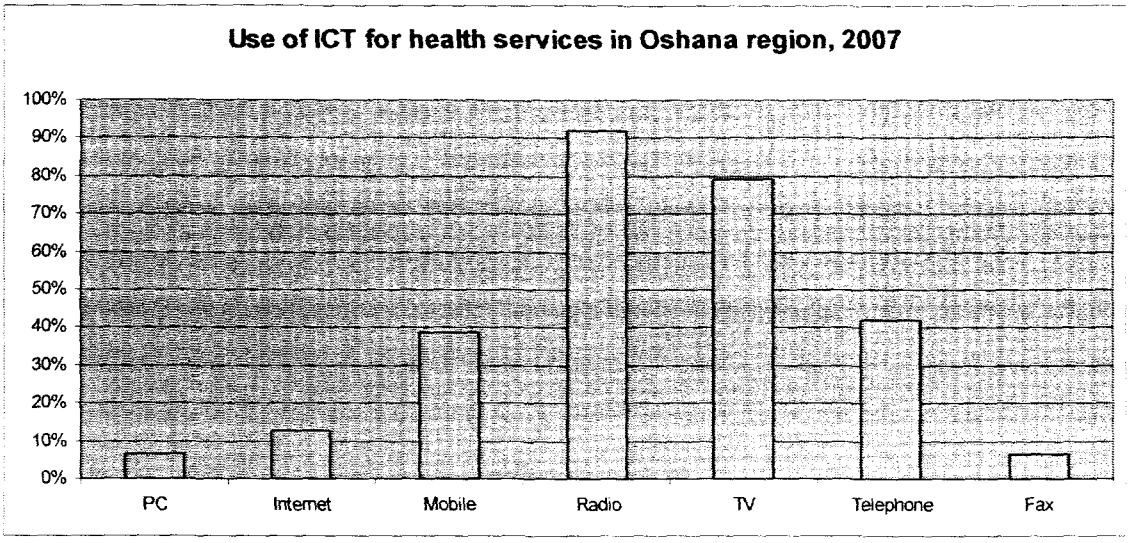
Graph 4.4 and graph 4.5 shows the distribution of the ICT-based communication channels that have been used strictly for health services in the Khomas and Oshana region, respectively. The most highly used communication-based channel in both the Khomas and Oshana regions, was the radio. Ninety-two percent of the patients in the Oshana region mentioned that they use radio for purposes of health services. These services included listening to health programmes and key announcements from HSP. In contrast, 83 percent of patients in the Khomas region indicated that they use radio for health services. This confirms that radio is still highly used in health service delivery despite the fact that it is considered a traditional communication technology.



Graph 4-4: Distribution of ICT-based communication channels used for health services in the Khomas region

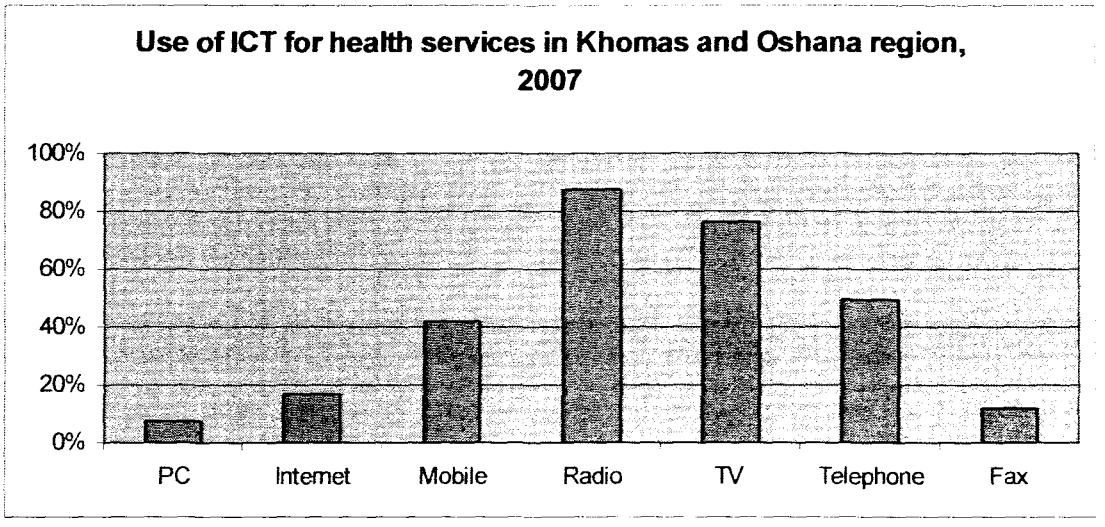
Source: Survey Data, 2006

The proportion of ICT use for health service delivery such as PC, Internet, TV, telephone and fax were used relatively higher in the Khomas region than in the Oshana regions. This was anticipated as many facilities in the Khomas are urban and the region has more of a developed infrastructure compared to the Oshana region. An important observation is that patients in the Oshana are also using mobile phones (39%) for health services, as those in the Khomas region (44%), which shows that there is awareness of modern technologies, despite the fact that the Oshana region is in rural setting. Patients mentioned that they use their mobile phones to communicate with HSP and this included calling the nurse at the hospital to inquire about health information and also to make appointments with the HSP.



Graph 4-5: Distribution of the ICT based communication channels used for health services in the Oshana region
Source: Survey Data, 2006

Overall, in the combined results of the Khomas and Oshana regions as shown in graph 4.6, it is indicated that radio (87%) was the highly used technology for health services followed by TV (76%) (I.e. screening of health related videos at the health institutions). The videos are distributed by the MOHSS to almost all the health institutions in different regions of the country with the aim to educate and provide health information (e.g. diseases, HIV AND AIDS, etc) to patients.



Graph 4-6: Distribution of the ICT based communication channels used for health services in the Khomas and Oshana region
Source: Survey Data, 2006

Patients in both regions confirmed that they use the Internet for health services e.g. checking health information on the Internet (disease symptoms). Even though the Internet is not highly used in the Khomas and the Oshana regions, its use indicates some growing awareness of the modern technologies for HSD. Generally, the use of the above mentioned technologies for health service demonstrates that ICT is being used to some extent in health service delivery in the Khomas and Oshana region. Similarly, these results suggest that ICT is likely used to:

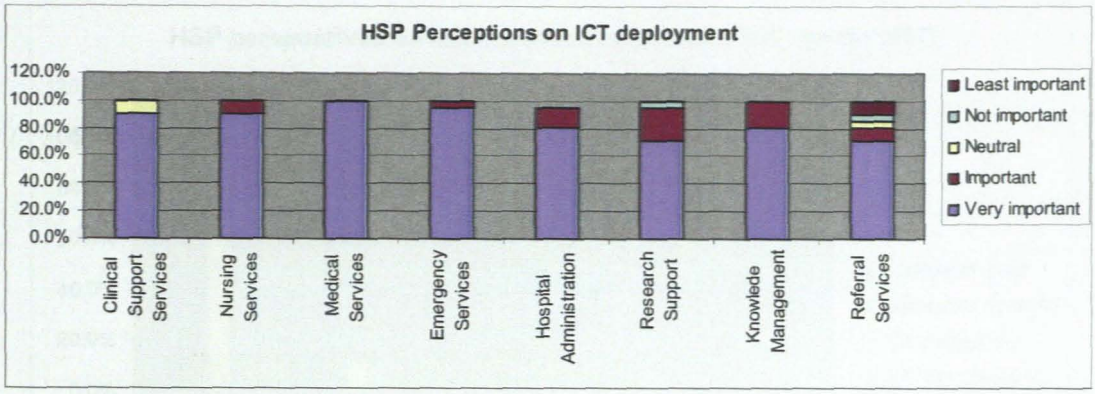
i. Enhance the two-way communication between patients and HSP
ii. Support the delivery of health services to the patients, especially those in remote areas.

4.4 Descriptive statistics for health service providers

This section describes the use of ICT for HSD as perceived by HSP. It covers areas such as ICT applications, perceptions about the importance of ICT in HSD and how ICT is aiding the internal and external communication process of HSP.

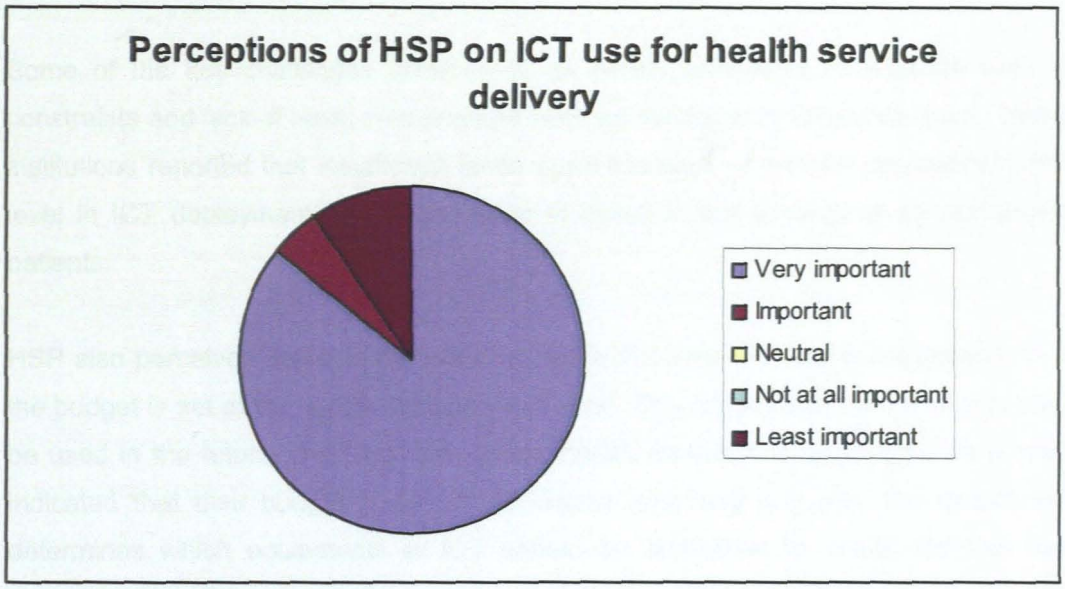
4.4.1 ICT use for health service delivery: HSP perspective

A number of health facilities that were visited during this study are presented in Appendix M. Names of health facilities, type of institution and target respondents are revealed. Health service providers have different perceptions on ICT use as shown in Graph 4.8. HSP perceives ICT being very important to use especially for medical services (100%). Examples of medical services range from use of Internet to research new health information in the medical field, use of ICT tools in the theater and basic use of ICT-based communication devices to communicate with other HSP (e.g. Doctors on call perceived the use of a pager device very crucial for communication). Clinical support (91%); and nursing services (91%) ranked second as the services that HSP perceived very important for ICT to be applied. However, in general most (86%) HSP viewed that it is very important to use ICT for health service delivery (See graph 4.7).



Graph 4-7: HSP perceptions on ICT deployment

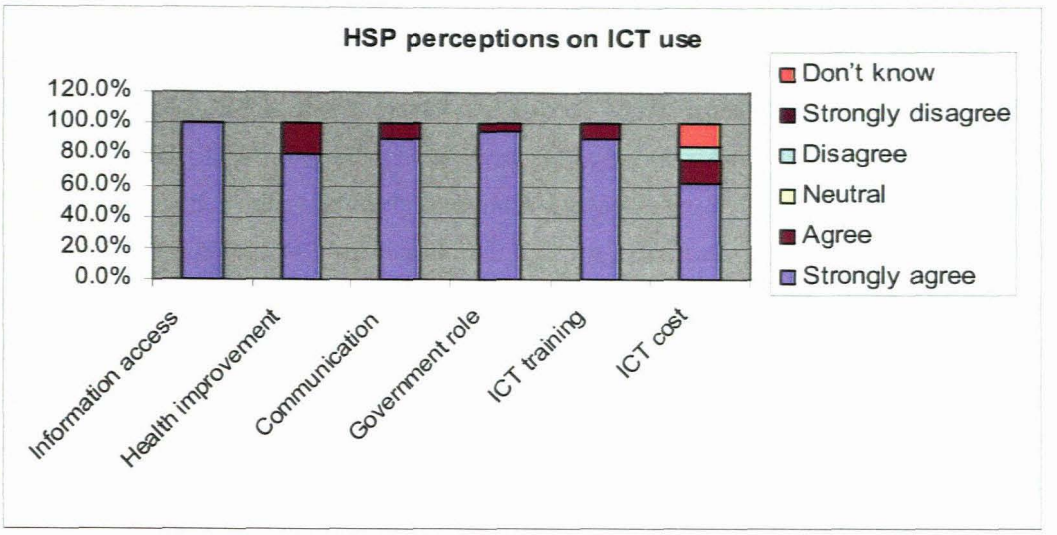
Source: Survey Data, 2006



Graph 4-8: HSP perceptions on ICT for health service delivery

Source: Survey Data, 2006

HSP had different views on how they think ICT can intervene to make the delivery of services effective and efficient. Most HSP perceived that staff members in the health institutions need to be educated on how to use computers and other ICT to enable effective use of ICT tools and to render better services to patients. Graph 4.9 shows that most (100%) HSP perceived that free computer lessons would enhance ICT use in HSD, as they can be trained in using ICT tools more effectively and efficiently.



Graph 4-10: HSP perceptions on ICT use for health service delivery
Source: Survey data, 2006

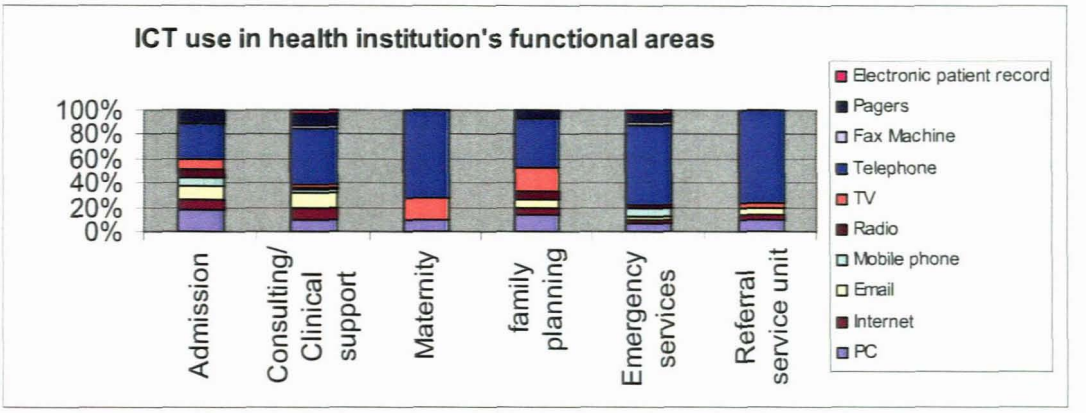
HSP had different opinions on how existing ICT in their institutions has helped them to enhance the services provided to patients. As shown in graph 4.10, it is remarkable to see that there was complete consensus among HSP on the view that ICT helps them to access new health information. It was observed that use of computers helps to improve efficiency and effectiveness of health management information. This mostly applied to departments such as admissions, where patient data needed to be captured and stored accurately.

Ninety-one percent of HSP viewed ICT as helping them to interact with other HSP and other health institutions and higher levels. Eighty-one percent of HSP strongly agreed that ICT does provide ways to improve health services even though there are costs involved in the introduction, maintenance and utilization of ICT. More training of staff on ICT use is required to achieve more effectiveness. Ninety-five percent of HSP strongly agreed that the GRN needs to play a more prominent role in the provision of ICT for health service delivery, as they felt that the public sector is lagging behind in ICT use as compared to the private sector. HSP felt that the public sector should learn from the private sector how ICT is used in the process of service provision to the patients. Specific use of different ICT applications is discussed in the next section.

4.4.1.1 Main functions of ICT use for health service delivery

This section identifies specific use of ICT in different departments of health institutions in Namibia. ICT use in functional areas of health institutions has different functions. The majority of ICT tools used varies across different functional areas.

Graph 4.11 shows departments in which different ICT is used for health services. The commonly used ICT for health services across all the functional areas was telephone. The commonly used ICT in the admission areas of health institutions came out as, telephone (36%) and PC (23%). For clinical support services, telephone (86%), email (23%) and are the key ICT used. In the Maternity department telephone (36%) and TV (9%) were the mostly used ICT. HSP providers also mentioned that they use telephone (27%) and TV (9%) in the family planning departments. Telephone (91%) was still topping for emergency services and referral services (73%). It is interesting to see that telephone was the most commonly used ICT across all functional areas of health institutions followed by TV. Purposes of ICT use in functional areas are further explained in table.4.4.



Graph 4-11: HSP perceptions on ICT use for health service delivery
Source: Survey data, 2006

Table 4-4: Main purposes of ICT use in health institutions functional areas, 2007.

	Admission	Consulting/ Clinical Support	Maternity	Family planning	Emergency services	Purpose of use
ICT						
PC	√					-Patient record's keeping Administrative duties
Internet		√				-Search new health information Office duties
Email		√				-Communication with higher levels (e.g. District)
Mobile phone	√					-Used in cases where landline is not functional.
					√	-Contact emergency vehicles (ambulance) -Communication with other HSP (e.g. Polio campaigns)
Radio	√					-Used for personal reasons
TV		√	√			-Display videos on health education on diseases such HIV and AIDS , TB etc.
Telephone	√		√			-Making appointments
		√				-Consultations -Ordering medication for pharmacies -Commutation with district office
				√		-To call ambulance -To call doctors in emergency cases -Communication with district office, in cases of urgent documents
					√	-For referral cases to big hospitals
Fax Machine		√				-For administrative duties e.g. sending fax to higher levels such as district
					√	For referral cases
Pagers		√				To page doctors on call
					√	To page doctors on call
Electronic patient record		√				Used to keep track of medication (ARVs) intake for HIV and AIDS patients.

Source: Survey data, 2006

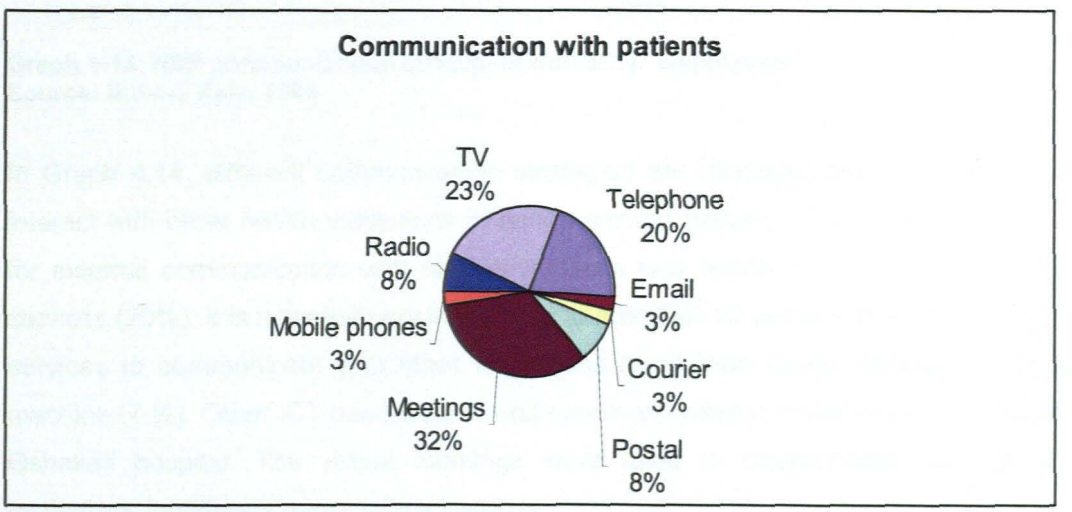
√ = Use of ICT in the health institution's functional area

Table 4.4 discusses main purposes of ICT use in specific functional areas of health institutions. Overall, telephone was the mostly use ICT across all the functional areas. The interesting finding is that HSPs mentioned that TV was as a communication channel for health education, and this corresponds with the patient's responses that they use TV as their main source of health information.

4.4.2 Communication strategies: internal *vs.* external

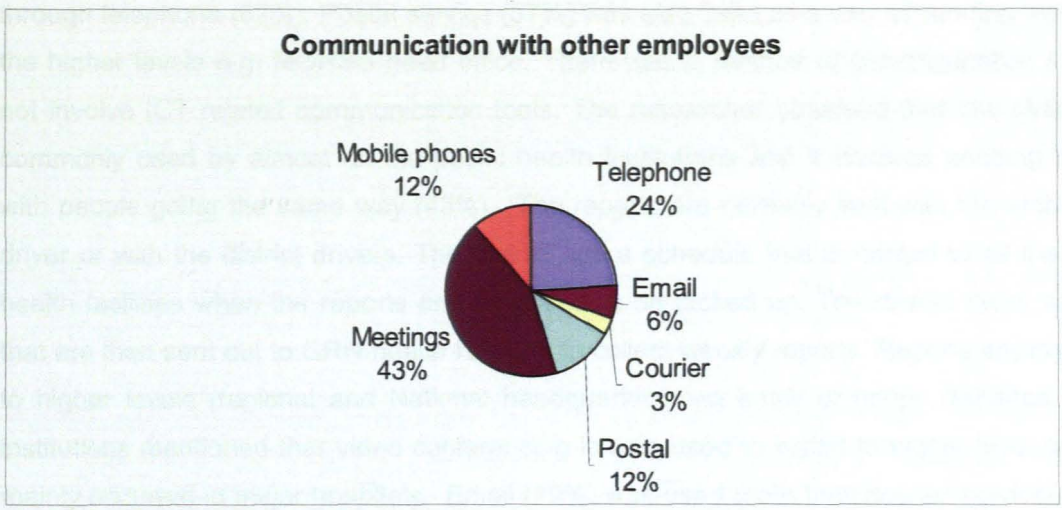
HSP use different communication strategies to interact with patients, other employees, institutions and the higher level of management. In this section, communication strategies with the above mentioned groups are going to be discussed.

Graph 4.12 shows different ICT channels used for communication between HSP and patients. Meetings (32%) were the commonly used communication channel to between HSP and patients. This specifically ranged from health education meetings held with patients in various health facilities. Health education in this context refers to HSP one on one session with patient's, holding meetings for patients as a group to present health related information. The second communication strategy used with patients was TV (23%), whereby patients were shown videos of health related information on diseases such HIV and AIDS, TB etc Telephone (20%) was also used for communication with patients and this ranged from consultations, making appointments and follow up by HSP. It is surprising to see that the results demonstrated that HSP were not really using radio (8%) as the main communication channel for health information provision, as stated by patients. This could be that the most health programmes and health information services broadcasted on the radio are not initiatives of the MOHSS but it maybe it's from other organizations.



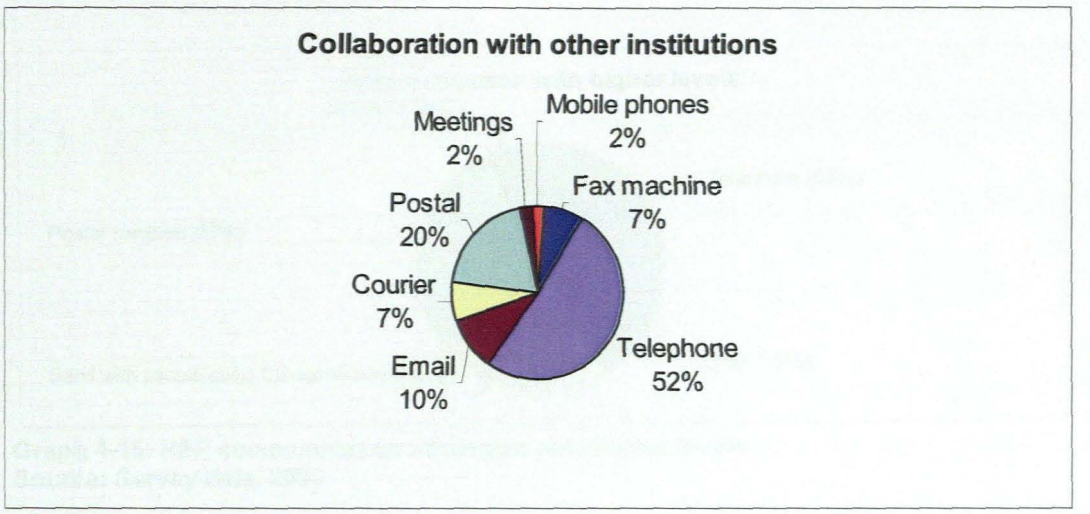
Graph 4-12: HSP communication channels with patients, 2007
Source: Survey data, 2006

In terms of ICT use for internal communication the HSP graph 4.13 shows how HSP communicate with other employees in the same health institution. Meetings (43%) are widely used as a communication strategy in big institutions (e.g. reporting of information from low levels to the health institution management). Most institutions mentioned that they hold daily, weekly and monthly meetings and this is where issues concerning their health institutions are addressed. Telephone (24%) was used for internal communication with other medical personnel, and it was used more in bigger health institutions. HSP from some health institutions particularly small ones (clinics and health centers) in both the Khomas and Oshana regions, viewed that it was not necessary to use ICT such as telephone constantly for internal communication in their health institution. The argument was that some of these institutions were small and would rather use verbal communication in by way of holding meetings for employees working in the same health facility.



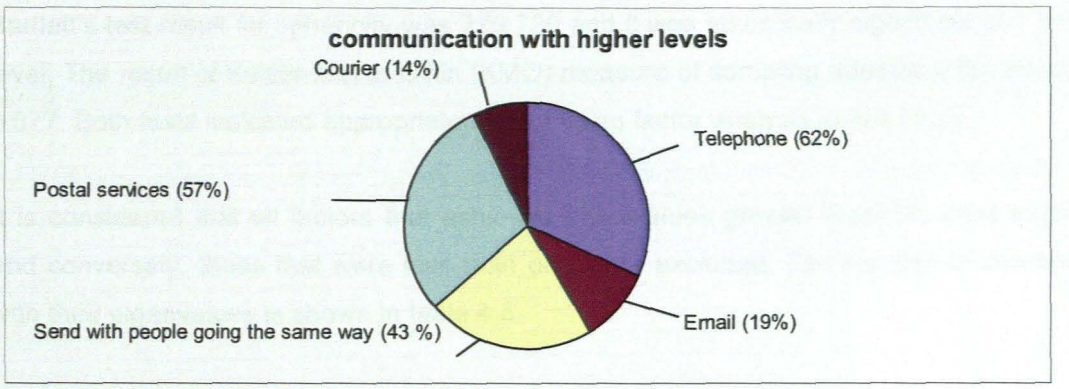
Graph 4-13: HSP communication strategies with other employees.
Source: Survey data, 2006

In Graph 4.14, different communication strategies are displayed that are used by HSP to interact with other health institutions in health service delivery. The most used ICT by HSP for external communication with other institutions is a telephone (52%) followed by postal services (20%). It is however very interesting to note that 10 percent of HSP are using emails services to communicate with other institutions more than courier services (7%) and fax machine (7 %). Other ICT used were virtual meetings (video conferencing) specifically for the Oshakati hospital. The virtual meetings were used to communicate with other health institutions in different geographical regions.



Graph 4-14: HSP communication strategies with other institutions
Source: Survey data, 2006

Communication between institutions and higher levels such as district level were mostly through telephone (62%). Postal service (57%) was also used as a way of sending reports to the higher levels e.g. MOHSS head office. There was a method of communication that did not involve ICT related communication tools. The researcher observed that this strategy is commonly used by almost all the public health institutions and it involved sending reports with people going the same way (43%). The reports are normally sent with the ambulance driver or with the district drivers. The district has a schedule that is rotated to all the public health facilities when the reports are supposed to be picked up. The district owns vehicles that are then sent out to GRN health facilities to collect weekly reports. Reports are then sent to higher levels (regional and National headquarters) via email or floppy diskettes. Some institutions mentioned that video conferencing is also used to report to higher level and this mainly occurred in major hospitals. Email (19%) was used more than courier services (14%) as a communication strategy between HSP and higher levels in health service delivery. Graph 4.14 shows communication between HSP and higher levels in the health service delivery.



Graph 4-15: HSP communication strategies with higher levels
Source: Survey data, 2006

4.4.3 ICT awareness among HSP

The HSP survey revealed the need to be aware of ICT before users start using it. High awareness of ICT was observed in both regions despite the slight differences between Khomas and Oshana region. Most respondents in both regions are aware of ICT even though not all have access to them. This was more common in the Oshana region, that HSP or medical personnel's were aware that computers and Internet exist, but some have never used them and they have limited access to these ICT. The subsequent analysis discusses factors affecting ICT awareness.

4.5 Factor analysis results on ICT use for health service delivery

Exploratory factor analysis was conducted to identify factors that explain patterns of collinearity among the eight ICT-based communication channels. According to Laurence and Paul (2000), factor analysis is a technique that relates measured variables to unmeasured variables or factors. The goal of using factor analysis was to obtain factors that explain the collinearity among eight ICT variables and these variables must relate to each other for the model to be appropriate. The eight variables that represent different technologies or communication channels for the delivery of health services are: personal computer, email, Internet, mobile phone, television, telephone, fax and radio. In this section, factor analysis is conducted to determine the dependent variable to be used in the adoption of the eight ICT variables. Factor analysis aims to group the variables into smaller manageable data sets for subsequent analysis.

The analysis was conducted using SPSS 14.0 version. A correlation matrix was computed to test variables and confirm whether factor analysis is appropriate for the data. Bartlett's and

Kaiser-Meyer-Olkin (KMO) tests were conducted to test for factorability of the data. The Bartlett's test result for sphericity was 276.720 and it was statistically significant at 1 percent level. The result of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for this data is 0.677. Both tests indicated appropriateness of using factor analysis in this study.

It is considered that all factors that achieved eigenvalues greater than 0.5 were significant and conversely, those that were less than one were excluded. The number of components with their eigenvalues is shown in table 4.5.

Table 4-5: Principal component analysis showing eigenvalues for components and percent of variation explained by each component, 2007.

Component/ Variable	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.602	32.524	32.524	2.602	32.524	32.524
2	1.737	21.713	54.236	1.737	21.713	54.236
3	1.012	12.649	66.886	1.012	12.649	66.886
4	.949	11.867	78.753			
5	.623	7.793	86.546			
6	.439	5.485	92.031			
7	.366	4.577	96.608			
8	.271	3.392	100.000			

Extraction Method: Principal Component Analysis.
Source: Survey data, 2006

Principal component analysis (PCA) was the method used for factor analysis. This method aims to minimize the large number of variables to a small set of uncorrelated variables (Hair, Anderson, Tatham & Black: 1995). The PCA produced 8 components of which three were returned and they had eigenvalues greater than or equal to one. The factor loading cut of point was 0.5. Table 4.6 shows the structure matrix and the loadings of the specific technologies on different components. The technologies that were grouped under component one are; personal computer, email, Internet and fax. This group comprised of relatively modern technologies and was labeled *'high technology'*.

Table 4-6: Factor loadings on the component matrix for ICT use in the health service delivery system in Namibia, 2007

	Component		
	1	2	3
USEPC	**.789**	.098	.005
USEEMAIL	**.839**	.009	.021
USEINT	**.797**	-.186	.023
USEMOB	.133	**.908**	-.002
USERADI	.051	**.922**	-.005
USETV	.163	-.040	**.821**
USETEL	.287	-.072	**-.580**
USEFAX	**.716**	-.106	-.009

Source: Survey data, 2006

The technologies that loaded on component 2 were; mobile phone and radio (see table 4.6). One of the major characteristics for these technologies is the mobility aspect as a result this group was labeled *'mobile technology'*. Telephone and television loaded on component 3, and these technologies comprise of the traditional media channels and were therefore labeled *'traditional technology'*. According to Hopkinson and Pujari (1999: 282), factor loadings indicate the correlation between the variables and the factors such that variables with large loadings on the factors are grouped together. In this study, a factor loading of the value 0.50 and above is considered good and significant.

One of the objectives of the study was to investigate ICT related constraints in delivering health services to patients. To uncover the constraints, an investigation on factors that influence ICT use was conducted. However, since the study examined multiple ICT use in the health service delivery sector, understanding factors affecting such use required a determination of awareness levels of the different technologies.

The ICT awareness variable was determined using the factor analysis results. The awareness variable was based on the use of the three technology groups identified above. For instance, level one referred to use of 'traditional technology', level two 'mobile technology' and level three 'high technology' in that particular order. Therefore, the index for ICT awareness comprised four different levels namely; high technology, mobile technology, traditional technology, and no awareness. However, the results show that respondents fell into the first two categories. No respondent showed complete lack of ICT awareness on traditional technologies above.

All the variables except one have communality values above the cut off value of 0.5. This suggests that all the variables were adequately represented by the 3 components identified. A multinomial model was further conducted to investigate factors affecting awareness of multiple ICT use for health service delivery. The stage of analysis uses three components returned from the factor analysis and the highest significant variables were used as dependent variables to investigate ICT awareness factors.

4.6 Multinomial logistic regression results

The multinomial regression is used to identify the key factors specific to the Namibian context that influences the use of multiple ICT in health service delivery. Independent variables that were included in the model are, demographics (e.g. age, gender, education etc), sources of health service information, functional literacy, attitude towards privacy and confidentiality, ICT use in health service delivery, and perception variables on ICT training appreciation and ICT infrastructure. Multinomial logistic regression predicts categorical outcomes with more than two categories (Statistical Package for the Social Sciences, 2007).

Table 4.7 shows results of the fit of the multinomial regression model. The model was found to be statistically significant at 1 percent level of significance. Salkind (2004:144) defines statistical significance as the degree of risk one is willing to take that one will reject a null hypothesis when it is actually true. He further explains that significance level is the "risk associated with not being 100percent confident that what one has observed in an experiment is due to the treatment or what was being tested" (Salkind, 2004:144).

Table 4-7: Model fitting information for multinomial regression, 2007

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	122.750			
Final	12.857	109.892	26	.000

Source: Survey data, 2006

The results of chi-squared goodness of fit are reported in table 4.8. The Pearson chi-square and a deviance (likelihood ratio) chi-square indicated a 1.000 significance level and this shows a good prediction of the ICT awareness (ICTAWARE) variable.

The result (1.000) is not significant; therefore the model fits the data adequately. Lee, Kwon and Schumann (2005:429) explain that values that are greater than 0.05 in deviance

statistics indicate a good fit with the data, and this makes the model acceptable. Garson (1998: 1) is of the same opinion that the chi-square statistic test is desired to have an outcome of non-significance, as this indicates that the model has adequate fit for the data.

The chi-square goodness of fit intends to find out how well a set of data "fits" an existing set (the observed data set), (Salkind, 2004: 266). Discrepancies between the model and data are also measured in the goodness of fit test. Li, Tan and Xie (2003:299) refers to the goodness of fit as the degree to which the structural equation model fits the sample data. The results of the Cox and Snell and McFadden R-square were 0.603 and 0.880 respectively, and this indicates that the model is highly robust.

Table 4-8: Chi-squared goodness-of-fit

	Chi-Square	df	Sig.
Pearson	10.691	81	1.000
Deviance	11.235	81	1.000

Source: Survey data, 2006

Table 4.9 present the multinomial regression results. Three important variables that were statistically significant at 1percent level are functional literacy (LITCOUNT), age, and sources of health information services (INFOSCOUNT). These variables were statistically significant as predicted in table 3.5 in chapter 3. This implies that functional literacy, access to diverse information sources for health services and age particularly influence multiple uses of ICT channels. Education (EDUC) and a positive perception on health services (PEPSERV) were statistically significant at 5 percent level. Perceptions on health services entail views from patients on whether or not they perceived private and or public ICT services positively or negatively (Graph 4.8). Variables such as positive perception on use of ICT for health services (PEPSERV), and race were predicted to have a negative effect on the dependent variable, but instead they came out significant.

Table 4-9: Multinomial logistic regression results for the Khomas and Oshana regions, 2007

Effect	**Model Fitting Criteria**	**Likelihood Ratio Tests**		
Variables	**-2 Log Likelihood of Reduced Model**	**Chi-Square**	**df**	**Sig.**
Intercept	12.857	.000	0	.
Age	34.162	21.305	5	**.001 *** **
Race	17.503	4.646	2	**.098 ***
Education [EDUC]	21.513	8.656	3	**.034 ** **
Functional Literacy [LITCOUNT]	77.352	64.495	5	**.000 *** **
Sources of health information (INFSCOUN]	31.473	18.615	5	**.002 *** **
Privacy [INFCOUNT]	19.141	6.284	3	**.099 ***
Use of ICT for health services [ICTHEALT]	13.733	.876	1	.349 ns
Willingness to develop ICT skills [DEVICTSK]	15.876	3.019	1	**.082 ***
Perceptions on health services [PEPSERV]	19.273	6.415	1	**.011 ** **

Source: Survey data, 2006

Notes:

***Significance at 1 percent level

** Significance at 5 percent level,

* Significance at 10 percent level

Ns = Not significant

The results lead to a conclusion that functional literacy, sources of health services information, level of education and age are the key factors that influenced multiple ICT use in health service delivery of Namibia, particularly that of the Khomas and Oshana regions. Logistic regression was conducted to further confirm key factors that affect the adoption of individual ICT channels. The results are presented in the next section.

4.7 Binary logistic regression results for ICT use

According to Agresti (2002: 175), the logistic regression model compares the observed counts and fitted values by using either likelihood ratio (G^2) or Pearson X^2 statistic. The logistic regression analysis was conducted to ascertain factors that influence individual ICT use for health services. In order to identify key factors affecting individual ICT adoption, a likelihood ratio chi-square X^2 test of independence was initially conducted to establish associations between the eight ICT based communication channels and the independent variables.

A backward-wald selection method was used to identify the most significant variables influencing ICT adoption leading to the selection of a final model.

In this method, variables specified for the model are entered into the model together and they are removed from the model based on their significance of Wald statistic. The selected ICT were personal computer and mobile phone. The aim was to select at least one ICT from the "high technology" and "mobile technology" groups and identify major factors affecting its use.

Table 4.10 presents the logistic regression results for PC which represents the "high technology" ICT-group. Results reported for PC, show seven significant variables namely, functional literacy, age, education, perception on importance of personal privacy in health information, perception that ICT improves health services and perception on infrastructure support. Functional literacy was highly statistically significant at 1 percent level and has a positive effect on the likelihood of PC use. Functional literacy represents the ability for one to operate various ICT communication channels in table 3.3.

Results showed that unitary increase in functional literacy (LITCOUNT) increases the odds of using PC by 26 times. This variable had the greatest effect on PC adoption in Oshana and Khomas regions of Namibia. Perception on the importance of privacy of health information for patients (IMPORTP) was statistically significant at 5 percent level and it had a positive (19.386) effect on the likelihood of PC use. This implies that an increase in positive perception on the importance of privacy of health information increases the likelihood of PC use by 19 times. This means that patients that had a positive perception on the importance of privacy of their health information were more likely to adopt PC as they are confident that it secures their private health information. Age was also statistically significant at 5 percent level, but had a marginal positive effect on PC adoption. Education (EDUC), perception on ICT infrastructure and perception that ICT improves health services (ICTIMPR) had a positive effect on the likelihood of PC use at 10 percent level of statistical significance.

Table 4-10: Binary logistic regression results for personal computer use in the Khomas and Oshana regions, 2007.

	PC			
Variable	**B**	**S.E**	**Sig.**	**Exp (B)**
Age	-.815	.368	.027**	.443
Education [EDUC]	.467	.241	.052*	1.595
Functional Literacy [LITCOUNT]	3.258	.753	.000***	26.004
Privacy for health information [IMPORTP]	2.965	1.291	.022**	19.386
ICT Improves health services [ICTIMPR]	-3.230	1.898	.089*	.040
Perception on infrastructure [PEPINFRA]	1.773	.945	.061*	5.887

Source: Survey data, 2006

Notes:

***Significance at 1 percent level

** Significance at 5 percent level,

* Significance at 10 percent level

Ns = Not significant

Logistic regression results on mobile phone are shown in table 4.11. Functional literacy (LITCOUNT) and privacy (INFCOUNT), meaning the number of ICT channels with personal contact details that the patient is willing to share were statistically significant at the 1 percent level of significance. It is of interest to note that the functional literacy variable was highly significant in both the high technology and mobile technology logistic regression results. This implies that functional literacy in terms of ability to operate the modern technologies is critical for ICT adoption. Furthermore, a unit change in functional literacy increases the odds of using mobile phone by 15 times. The result of privacy (INFCOUNT) indicate that a unit increase in the number of ICT related contact details that a patient is willing to share increases the likelihood of mobile phone use by up to 13 times.

A positive perception on infrastructure and the cost of ICT were statistically significant at 5 percent level. A unit increase on the perceptions on infrastructure increases the likelihood of mobile phone usage by approximately 25 times. In addition, a positive perception on the cost of purchasing a mobile phone had a positive effect on the likelihood of mobile phone usage although the magnitude was marginal. Meanwhile, the willingness to share personal contact details specifically with HSP was statistically significant at 10 percent level. This means that individuals who are predisposed to sharing their ICT contact details with HSP are more likely to use mobile phone although the effect is marginal in this case as well.

Table 4-11: Binary logistic regression results for mobile phone

	Mobile phone			
Variable	**B**	**S.E**	**Sig.**	**Exp (B)**
Functional Literacy [LITCOUNT]	2.747	.699	**.000*** **	**15.592**
Privacy [INFCOUNT]	2.569	.899	**.004*** **	**13.048**
Contact details willing to share [SHAREC]	-6.620	3.589	.058*	**.001**
Willingness to develop ICT skills [DEVICTSK]	21.125	11209.486	.998	**1E+009**
Perception on infrastructure [PEPINFRA]	3.212	1.595	**.044** **	**24.835**
Perception on ICT cost [ICTCOST]	-2.246	1.091	**.040** **	**.106**

Source: Survey data, 2006

Notes:

***Significance at 1 percent level

** Significance at 5 percent level,

* Significance at 10 percent level

Ns = Not significant

4.8 Results interpretation and discussion

In this section, overall findings are presented, as they provide insight on views held by health stakeholders' on ICT deployment in the service arena. The results also provide an understanding of the main factors driving ICT adoption by patients in Namibia.

Development of the 'generic' health landscape model for Namibia was carried out to obtain a better understanding of the organization of health services and ICT-based health service provision. The landscape was developed based on the literature review and a survey of GRN policy documents. Information collected from GRN policy documents and literature also helped in interpreting the results from survey data.

Descriptive results from the HSP reveal that ICT is being used to support the delivery of health services to patients in Namibia. ICT such as TV, telephones, radio and mobile phones are being used to assist HSP to deliver health services to patients. Meetings, followed by TV were the commonly used medium of communication between HSP and patients. It is important to note that the results demonstrated that HSP were not really using radio as the main communication channel for health information provision, as stated by patients.

This could imply that most health programmes and health services broadcasted on the radio might not be the initiatives of the MOHSS. Even though radio was not commonly used for health services by HSP, they did mention that they use the radio occasionally to broadcast their messages on programmes such as 'Eyakulo lyoshigwana' to inform the community on health-related messages. The radio programmes were widely used during the polio campaigns in 2006. Magazine programmes such as, Namibian Mirror also keeps the nation informed about health and community-related issues also.

During the survey period, the national radio stations were running polio campaigns and infant vaccinations against measles and other diseases. HSP also mentioned that during the polio outbreak in Namibia 2006, mobile phones also played a major role in the process of delivering health services patients. In the rural areas in particular, one would find that the vaccines would run out at a certain vaccination point, and then HSP would need to contact other HSP at the health institutions to deliver more medication in order to better serve the patients. In this regard, TV was also used as main communication channel for polio campaigns. This involved broadcasting programmes that would educate the nation on the causes of polio and how to prevent it.

Despite the fact that telephone is perceived as traditional technology, it is still widely used as a communication tool between HSP and patients. This was more common for malaria patients, as HSP would need to monitor their medication intake and they had to either telephonically follow-up on the patients.

Based on the discussions with HSP it was observed that one of the major ICT that is being used to render health services to patients is the electronic patient records (EPR). EPR was only common in major hospitals (Windhoek central hospital, Oshakati and Katutura hospital) and was specifically used in some departments' such HIV and AIDS to keep track of ARV intake of HIV and AIDS patients. This has enhanced the services offered to HIV and AIDS patients because it effectively captures the data regarding a certain patient.

Personal computers also served a major role in the providing health services, as these aided in administrative duties of capturing health related information and particularly that of patients. According to the HSP results, ICT that were used for health service delivery to patients, were, email, fax machines, EPR and other medical related equipments. Almost all HSP perceived that it is very important to use ICT in the health service delivery and most specifically for medical services.

Even though, ICT has been used for health service delivery, there were constraints involved in this process. In some health institutions in the Oshana region, HSP mentioned that they only had solar (energy) for electricity provision and they could not use electronic ICT for health services. The use of solar energy for electricity was reported at the time of this study. Most HSP felt that lack of fully integrated ICT in their institutions was due to budgetary constraints. This means that some ICT were expensive and that the MOHSS could not provide computers to all health institutions (e.g. clinics) but only to major hospitals. Although ICT were widely used for health service delivery, at the time of this research, there was no ICT policy in place as it was still in formulation process (Munjuu, 2006).

Descriptive results from patients indicate that ICT is a powerful instrument in bringing about efficient and effective changes to the quality of health services. It is evident from the survey results that ICT use was higher in the Khomas than in the Oshana region. Awareness of ICT came out strong in mobile phone use both for Khomas and Oshana region. This implies that there is a high penetration of mobile use both in rural and urban patients. Radio was the commonly used ICT for health services followed by TV. A study by (Kenny, 2002:153) reported similar results that radio was a major source of health information and that it was found to be a powerful tool for development.

Results from the factor analysis demonstrated that the eight ICT communication channels were grouped under 3 components namely, 'high technology', 'mobile technology' and 'traditional technology'. Technologies that loaded on the 'high technology' represent modern technologies used in health service delivery. Fax loaded on this category as it is still commonly used nowadays and it has not phased out to be labeled as a traditional technology. Mobile phone and radio has a mobility aspect in common and they loaded on the 'Mobile technology' component. The technologies that comprised of traditional media channels (i.e. TV and telephone) loaded on the "traditional technology" component. The factor analysis results were used to determine the ICT awareness variable. The ICT awareness variable was thus based on the three above mentioned components. The results showed that respondents fell into the 'high technology' and 'mobile technology' categories, since no respondent showed complete lack of ICT awareness on traditional technologies above.

A multinomial model was further conducted to investigate factors affecting awareness of multiple ICT use in the health service delivery. Functional literacy, multiple sources of health services information and patient's age were identified as the key factors affecting the use of multiple and individual ICT channels. For instance, this means that the functional literacy (i.e. ability of one to operate various ICT) is critical for ICT adoption. Functional literacy plays a major role in the use of these technologies and those people who are highly literate were more likely to use high technology or mobile technology. Similarly, as the patient's become older and as access to multiple sources of health services information improves a significant and positive effect is observed on multiple ICT use. Education was also statistically significant implying that patients that are more educated were more likely to use a personal computer. Therefore patients that were more literate were more aware of ICT and were using ICT than the illiterate patients.

The number of ICT related personal contact details (e.g. their mobile number, email address), patients were willing to share was also a significant factor. This means that patients with a pre-disposition to share their personal contact details with health service providers were more likely to be aware of multiple ICT-based technologies. Key findings from the multinomial model, indicates that functional literacy, sources of health services information, level of education and age are the major factors influencing ICT awareness for health service delivery in the Khomas and Oshana regions.

Logistic regression results on the use of PC for health services show that functional literacy is the main factor driving PC use and it was statistically significant at 1 percent level. Results also show that age and privacy (i.e. perception on the importance of privacy of health

information for patients) had a positive effect on PC use and were statistically significant at 5 percent level.

Logistic regression results on the use of mobile phone for health services in Khomas and Oshana regions show that functional literacy and privacy (i.e. the number of ICT channels with personal contact details that the patient is willing to share with HSP) were statistically significant at 1 percent level. In addition, a positive perception on both infrastructure and cost of purchasing mobile phone had a positive effect on mobile phone use and were statistically significant at 5 percent level. Therefore, a positive perception on infrastructure support increases the likelihood of using PC and mobile phone. Similarly, the results show that those patients who perceived the cost of purchasing a mobile phone as affordable were more likely to use mobile phone in the study areas.

The key findings from the logistic regression models clearly indicate that functional literacy, privacy, age, positive perception on infrastructure support and cost are the important factors influencing the use of PC and mobile phone in the Khomas and Oshana regions.

There is no doubt that ICT seems to be a powerful instrument for improving the delivery of health services specifically in Khomas and Oshana region. During this study it was discovered that the Namibian ICT policy document for health service delivery was still in draft form, and that the researcher was denied access as it was not yet completed. There is however, a general ICT policy document for the Republic of Namibia. This policy document highlights the current status of ICT in Namibia and it is used to guide the formulation of future strategies for ICT deployment.

4.9 Conclusion

In this chapter, the Namibian health delivery landscape was described to get a better understanding of the delivery of health services. Distribution of ICT use by patients and HSP from both the Khomas and Oshana regions was analyzed.

Firstly, patient demographic characteristics were described and their use of ICT was explained. Results of ICT use by patients in the Khomas and Oshana regions were further compared to capture differences and similarities in ICT use for the two regions. There was high use of ICT in the Khomas than Oshana region. Results from HSP reported that the commonly used channels for communication were meetings followed by TV. HSP reported that they were not really using radio as the main communication channel for health information provision, as stated by patients and this could imply that most health

programmes and health services broadcasted on the radio might not be the initiatives of the MOHSS. Data was analyzed using the factor analysis, multinomial logistic regression model and logistic regression models.

Factor analysis was conducted to obtain factors that would explain the patterns of collinearity among the eight ICT communication variables. The components identified were 'High technology', 'Mobile technology' and 'Traditional Technology'. Multinomial regression analysis was conducted to determine factors affecting awareness of multiple ICT. Key factors affecting awareness of multiple ICT were identified as; sources of health services information, functional literacy among patients, age, level of education, positive perception on health services rendered by through ICT. Finally, the logistic regression results on PC and mobile phone were conducted to further identify factors affecting ICT use for health service delivery in Namibia. An overall summary of the research findings is reported in chapter 5 and recommendations to improve use of ICT in Namibia are suggested.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the research findings and conclusions drawn from the study. The study focused on the use of information and communication technology for health service delivery (HSD) in Namibia. The study also involved mapping the health landscape of Namibia initially. After that, face to face interviews were conducted with Health Service Providers and patients in the Khomas and Oshana regions.
In phase one, a survey of health service providers in the Khomas and Oshana region was conducted. This first survey aimed to investigate ICT use patterns from HSP perceptive and constraints for health service delivery. Furthermore, HSP from various health facilities were interviewed to investigate the available ICT and how they have been used to deliver health services to patients in the two regions.

The second phase involved a survey of patients in the two regions. The second survey was conducted to determine patient's access to and use of ICT for health services. Factors that influence the use ICT for health service delivery were also investigated.

This chapter concludes the research study by discussing an overview of the research, the contributions and research implications. Recommendations are provided on, how to improve the delivery of health services in Namibia and how to conduct further research on ICT for HSD in Namibia.

5.2 Summary of research findings

This study sought to investigate factors affecting the use of ICT in health service delivery and how health service providers deliver services to their patients. In chapter 1, the background information on Namibia was presented to help in establishing the current status of ICT use for health service delivery in the Khomas and Oshana regions. The Khomas region is more developed in terms of its ICT infrastructure than the Oshana region as Khomas region is an urban-based region. All the regions almost had the same health service providers, namely the government (70-80%), missions (15%-20%) and private sector (5%). Mission health providers are subsidized by the GRN and these include hospitals, health centers and clinics mainly in the rural areas of the northern part of the country. The use of ICT has enhanced communication between lower and higher levels of health providers. The use of ICT in Namibia is prevalent and it is used in many organizations including the health service sector. ICT is used in the health sector to support provision of various health services.

In chapter 2, the literature review examined ICT use in developing countries; its applications in health service provision and GRN policies and strategies as they relate to ICT use. Chapter three outlined the research methodology used in this study. A survey method was used to identify how ICT is used for health service delivery in the context of Namibia. Two questionnaires were constructed and were administered to HSP and patients. The first questionnaire sought to obtain HSP perceptions on ICT deployment and constraints in delivering health services. The second questionnaire aimed to obtain patient's opinions on ICT use and what they perceived important in improving health services provided to them. The questionnaire also helped to determine the factors that influence the use of ICT in the health service delivery in the Khomas and Oshana regions.

Based on the literature reviewed and data collected from the survey, a health landscape model was developed to depict health service provision from HSP to patients in different health sectors of Namibia and particularly the Khomas and Oshana regions. The health landscapes for the Khomas and Oshana regions were developed to obtain a better understanding of the organization of health service sector and ICT health service provision in the country. The landscapes comprise key stakeholders in health services delivery, their linkages and administrative information flows.

Chapter 4 presented results of the main findings from the analysis of the data. Descriptive statistics was conducted on primary data collected from 134 patients and 21 HSP. The study demonstrated that radio, TV and mobile phone use are the major ICT used in both the Khomas and Oshana regions. The study reveals that 92 percent of patients that took part in the survey indicated that they own mobile phones. Results also indicated that patients in the Oshana (39%) were using mobile phones for health services at similar rate with Khomas (44%). The study provides evidence that mobile phones were highly used in the study areas. A large number of patients indicated that they mostly use radio and TV for health related information. TV was used as a health education tool whereby videos on health information on diseases such HIV and AIDS and TB are shown to patients in health facilities. Radio was also commonly used as a source of health information. However, only a few HSP did mention that they use radio as a way of communicating with patients. This might imply that a large number of health programmes on radio do not originate from the MOHSS but maybe broadcasted by other organizations.

Factor analysis has enabled ICT channels to be uniquely categorized as 'High Technology', 'Mobile technology' and 'Traditional technology'. The 'high technology' category indicated use of PC, email and fax. 'Mobile technology' grouped mobile phone and radio together.

By the same token, the category of 'traditional technology' indicated use of ICT such as TV, radio and telephone in the health sector. It was interesting to find that most respondents fell into the mobile and high technology groups. The results obtained from the factor analysis were used in subsequent analysis to derive the ICT awareness variable.

Multinomial logistic regression analysis (i.e. based on ICT awareness as dependent variable) was used to identify factors affecting multiple use of ICT in HSD to patients. It was established that factors that influences ICT awareness for health service delivery to patients in the Khomas and Oshana regions were, functional literacy, access to diverse information sources for health services, age, and level of education, race, and willingness to develop and improve ICT skills. Patient's perceptions relating to communication with HSP, training and infrastructure, were also some of the important factors that influenced the use of ICT amongst patients.

Logistic regression analysis was conducted to further identify specific factors affecting the use of individual ICT channels. The logistic regression models were based on the use of PC and mobile phone in HSD. The results from the model concluded that the three significant factors affecting individual use of PC and mobile phone were functional literacy, perception on the importance of infrastructure support and privacy. This means that patients were more likely to use PC or mobile phone if they had the ability to operate these ICT (functional literacy), if they had a positive perception on infrastructure. Patients were also more likely to use Pc if they had positive perception privacy (i.e. their willingness to share ICT related contact details). The result of privacy also indicated that a unit increase in the number of ICT related contact details that a patient is willing to share increases the likelihood of mobile phone use by up to 13 times.

It was thus concluded from the research results that significant factors that influenced ICT awareness in the Khomas and Oshana regions were namely; functional literacy, diverse sources of health information services, level of education, infrastructure support, privacy and age.

5.3 Research objectives

The focal point of this study, as indicated in chapter one, was to investigate how ICT have been used in the delivery of health services in Namibia, and to determine possible factors that influence the use of ICT use for health service delivery. It was mentioned in the problem statement in chapter one, that it is not clear to what extent ICT has been used in the health delivery and that whether available ICT effectively support the delivery of health service to the patients.

The following research questions were posed from the problem statement.

- How do health service providers make use of ICT to deliver health services to their patients?
- What are the ICT channels that health service providers use for internal and external communication with other health stakeholders?
- What are the key factors affecting the use of ICT for HSD in Namibia?
- What are the existing government policies that engender ICT use within health service delivery?

In finding answers to the research questions posed, literature was reviewed to get a better understanding of the status of ICT in Namibia and other developing countries.
From the literature it has been established that:

- There was no ICT policy specifically for health service delivery in Namibia at the time of study, but it was only in draft form. However, a general national ICT policy for the Republic of Namibia and a general Information Technology for the public service are in existence and these were further used to comprehend current ICT policies.
- The Vision 2030 was established and it outlines goals the country wishes to achieve and these include health related goals. See appendix Q for an overview of the Vision 2030 as it was summarized in Vision 2030 document.

From the study results it was discovered that there were constraints in delivering health services and they were namely:

- Budgetary constraints: whereby finances are not enough to buy all the necessary ICT to assist in the process of service provision to patients.
- Lack of basic infrastructure to support health service delivery: some health facilities especially those in the rural areas lacked basic infrastructure such as electricity and this was a constraint in using ICT such as personal computers.

Even though there were constraints in delivering health services to patients, results show a relatively high levels of ICT use in both Khomas and Oshana region. This re-affirms that ICT use in Namibia is widespread (Schware, 2003:3).

The GRN has developed a plan named "Vision 2030" and this also entails health goals that the country aims to achieve in the year 2030.
One of the main goals is "to ensure that the people of Namibia have access to quality

education, health and other vital services, in an atmosphere of sustainable population growth and development" see Appendix Q for a summary of goals related to ICT in Namibia. The "Vision 2030" document aims to tackle challenges the country faces and amongst them are health- related issues. There is still a need to improve the services delivered by HSP to patients. Recommendations on how to enhance health services delivered by HSP are outlined in the next section.

5.4 Recommendations

Key considerations that should be given to enhance the use of ICT in the health service delivery in Namibia include the following:

- Draft a comprehensive ICT-based health service delivery policy.
- Develop health services functions (e.g. emergency services) that can be supported through mobile technologies given the high penetration rate of more than 80 percent in both Khomas and Oshana regions.
- Enhance the use of ICT in the health service delivery through the provision of personal computers especially at operational level, as capturing and processing of the data at district level is prone to errors.
- Establish training sessions for health service providers on ICT-related tools to facilitate use of these tools in the various health institutions in Namibia.
- Continue using the radio and TV as a communication channels, because most patients especially those in rural areas are rely heavily on radio for health information. At the same time the GRN should also promote the use of modern technologies such as PC, email and mobile phones and provide assistance with literacy programmes to further stimulate their uptake.

5.5 Research significance

This study has made a contribution to the literature determining the extent of ICT use for HSD and factors associated with its use in rural and urban setting in Namibia. ICT use patterns and key factors affecting this use were studied in the Khomas and Oshana region. Constraints in delivering health services were also investigated. The study demonstrates the importance and need to integrate ICT (especially high technology such as email, PC) for health service delivery in Namibia. By examining the literature, and research results, recommendations were made for policy makers to promote the use of ICT in delivering health services to patients in Namibia. The results of this study can be used to provide insights into ICT use in health service delivery in other African countries.

5.6 Limitations and suggestions for further research

This study was limited to investigating the use of ICT in health service delivery in Khomas and Oshana region only. The study excluded other stakeholders in healthcare such as pharmacies and medical aid companies etc., because the research purpose was primarily to focus on use of ICT in the health service delivery for hospitals (mission, public and private) in the Khomas and Oshana regions.

The study covered detailed ICT use by both patients and the HSP. Further, ICT based Interactions between mission, private and public hospitals were explored. Factors that influence the use of ICT in the health service delivery to patients were examined. Future studies should probe ICT use in private or public health care focusing on a specific patient group or functional area, e.g. HIV and AIDS , maternity, emergency services etc. Alternatively, a similar study could assess the willingness to use modern technologies such as mobile phones, as there are likely future platforms for health services delivery; and some risks and benefits associated with such applications.

5.7 Conclusion

In conclusion, this study investigated the use of ICT for health service delivery in the Namibian context. Results from the interviews with HSP in the Khomas and Oshana regions highlight the potential and some of the constraints in delivering health services namely. While insights from the potential of ICT use in the region can be obtained from high penetration levels of some of the ICT, key constraints were low ICT budgets, poor infrastructure to support health services and lack of training for staff members.

Data collected from a patient's survey aimed to determine patient's access to and use of ICT for health services. Factors that influence ICT for health service delivery were functional literacy, sources of health services information, age, level of education, race, predisposition towards the importance to develop and improve ICT skills and positive perception on ICT use for health services. Even though the Namibian health sector, particularly that of Khomas and Oshana region, is faced with major challenges in delivering health services to patients, these challenges need to be overcome.

In conclusion, the Namibian national ICT policy has been developed to tackle ICT related issues (including health) that concern the country. Although it is not inevitable to overcome some if not most of the challenges faced by the Namibian health sector, results demonstrate high potential to use ICT to transform health service delivery in Namibia.

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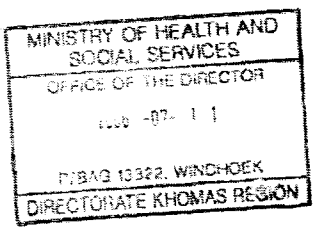
APPENDICES

APPENDIX A: Permission letter from the head office of the Ministry of Health and Social Services in Namibia

Heads of Health facilities in Khomas region
Please assist this student with her research.
Thank you
10/07/06



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198	**Ministerial Building**	**Tel: (061) 2032507**
Windhoek	**Harvey Street**	**Fax: (061) 227607**
Namibia	**Windhoek**	**E-mail: akulobone@mhss.gov.na**
Enquiries: Mr. A. Kulobone	**Ref.:** 17/1/6	**Date:** 22 May 2006

OFFICE OF THE PERMANENT SECRETARY

Ms. Meke Iyaloo Shivute
EWR 03 Kotze
Gardens
Cape Town
8001

Re: Submission of Research project titled: Adoption of Information and Communication Technologies for health service delivery in Namibia.

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. Kindly be informed that approval has been granted under the following conditions:

3.1 A quarterly progress report is to be submitted to the Ministry's Research Unit;
3.2 Preliminary findings are to be submitted to the Ministry before the final report;
3.3 Final report to be submitted upon completion of the study;
3.4 Separate permission to be sought from the Ministry for the publication of the findings.

Wishing you success with your project.

Yours sincerely,

DR. K. SHANGULA
PERMANENT SECRETARY

Directorate: Policy, Planning and HRD
Subdivision: Management Information and Research

Forward with Health for all Namibians by the Year 2000 and Beyond!

APPENDIX B : Permission letter signed at the directorate of the Khomas region.

22-MAY-2006 15:31 FROM:MOHSS POLICY&PLANNIN 0926461 272286 TO:0027214691002 P:1

8/08/2006
Assist this Masters degree student with her research in IT and other health facilities in Khomas Region

Research →

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198	**Ministerial Building**	**Tel: (061) 2032507**
Windhoek	**Harvey Street**	**Fax: (061) 227607**
Namibia	**Windhoek**	**E-mail: akulobone@mhss.gov.na**
Enquiries: Mr. A. Kulobone	**Ref.:** 17/1/6	**Date:** 22 May 2006

OFFICE OF THE PERMANENT SECRETARY

Ms. Meke Iyaloo Shivute
EWR 03 Kotze
Gardens
Cape Town
8001

Re: Submission of Research project titled: Adoption of Information and Communication Technologies for health service delivery in Namibia.

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. Kindly be informed that approval has been granted under the following conditions:

3.1 A quarterly progress report is to be submitted to the Ministry's Research Unit;
3.2 Preliminary findings are to be submitted to the Ministry before the final report;
3.3 Final report to be submitted upon completion of the study.
3.4 Separate permission to be sought from the Ministry for the publication of the findings.

Wishing you success with your project.

Yours sincerely,

DR. K. SHANGULA
PERMANENT SECRETARY

Directorate: Policy, Planning and HRD
Subdivision: Management Information and Research

Forward with Health for all Namibians by the Year 2000 and Beyond!

APPENDIX C: Permission letter from the senior medical superintendent of Windhoek Central Hospital

9-0-0001

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Telephone: (061) 2033064
Fax: (061) 222886

Enquiries: Mrs. S. Katjivirue

Date: 20 July 2006

MS. MEKE IYALOO SHIVUTE
P.O. BOX 326
ONDANGWA

Dear Ms. Meke Iyaloo Shivute

RE: RESEARCH PROJECT TITLED: ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGIES FOR HEALTH SERVICE DELIVERY IN NAMIBIA.

Kindly be informed that your request to conduct above mentioned study at Windhoek Central Hospital has been granted.

Could you kindly report at the Senior Medical Superintendent Office for further information before the commencement of your studies at the Hospital.

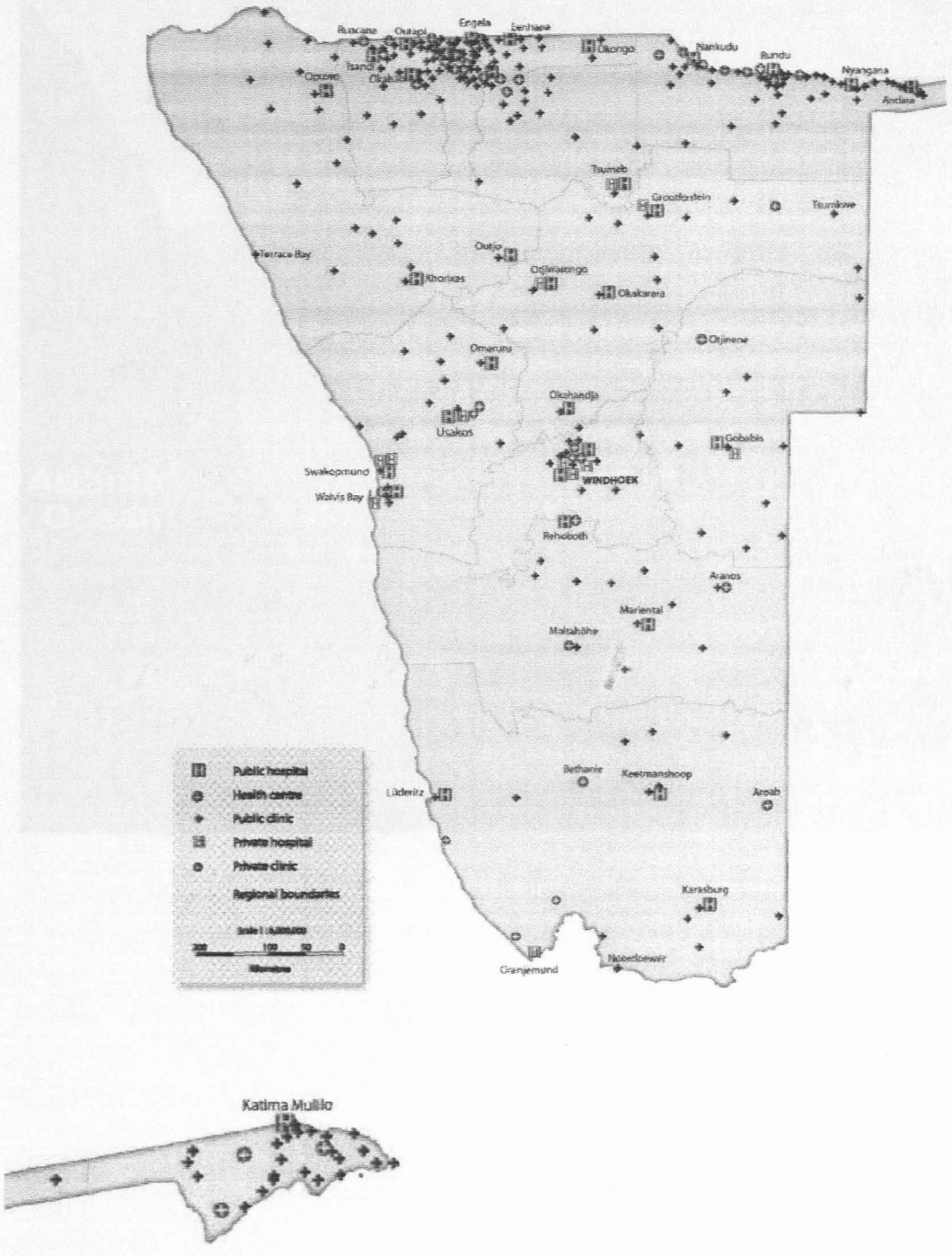
Yours sincerely

SENIOR
MEDICAL SUPERINTENDENT
WINDHOEK HOSPITAL
MINISTRY OF HEALTH
AND SOCIAL SERVICES
NAMIBIA

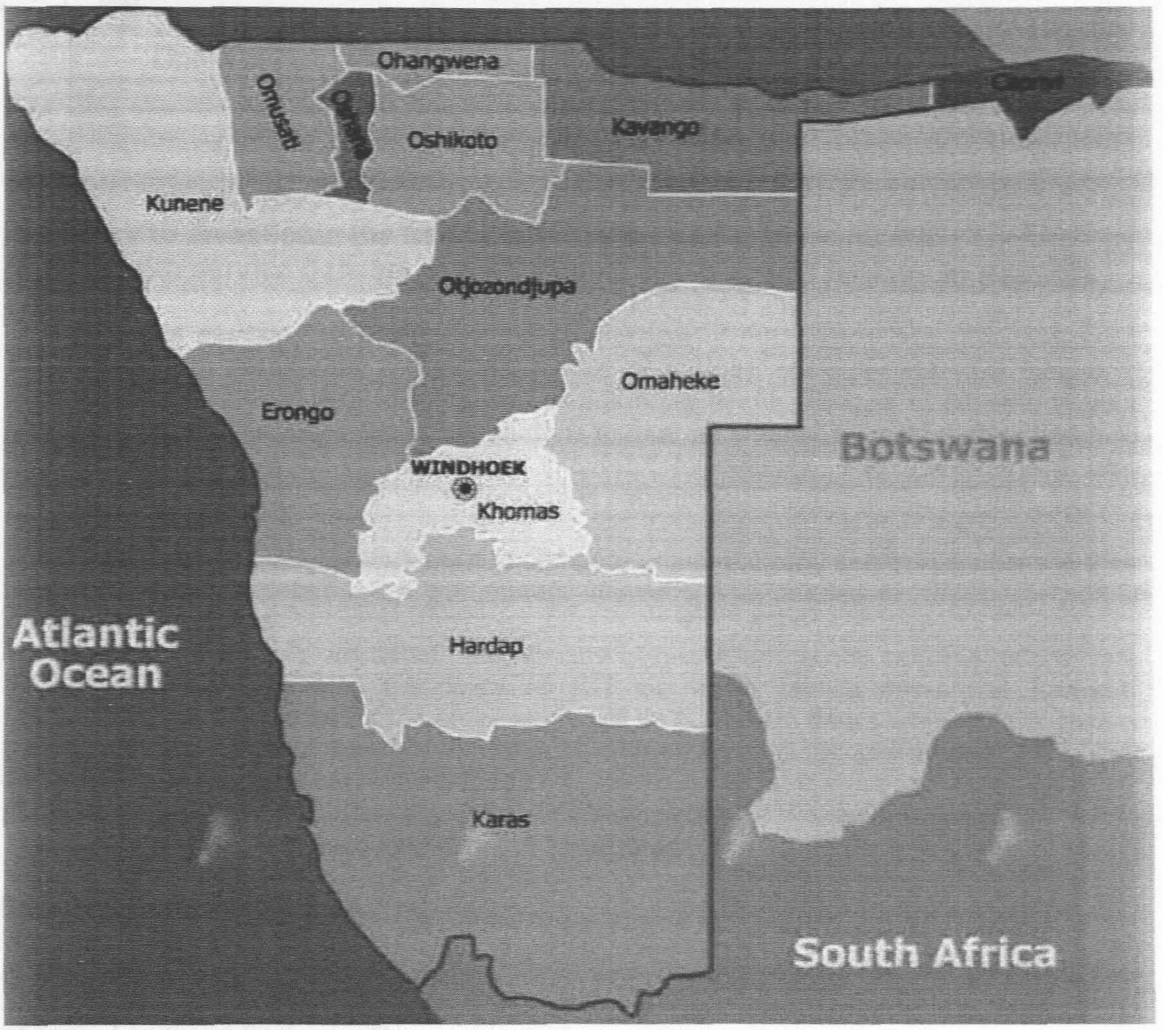
DR. H. NKANDI-SHIIMI
SENIOR MEDICAL SUPERINTENDENT.

"Health for All"

APPENDIX D: Health facilities in Namibia, Source: (El Obeid et *al.*,2001:6-7)



APPENDIX E: Thirteen regions in Namibia (Source: Namibia, 2004d)



APPENDIX F: Questionnaire for Health Service Providers

Survey questionnaire to be used for structured interviews with Health service providers

A Survey to investigate the use of Information and Communication Technology for health service delivery in the Oshana and Khomas regions in Namibia.

This survey is designed to investigate the current use of Information and Communication Technology (e.g. telephones, fax, pagers, mobile technology, computer systems, Electronic patient records, Internet etc) for purposes of delivering health services to patients in your health institution. The main aim of the study is to find out what ICT are available, and how they are being used for health service provision to patients. The questionnaire also investigates how ICT is used to ultimately benefit patients.

The researcher will use this information to compare urban and rural health institutions in their use of ICT, and to determine if government intervention is needed to help some health institutions in this area.
The results of this study will benefit the Ministry of health and social services as they are actively involved in shaping the policy on ICT for health service delivery in Namibia. Furthermore the final output of the entire study will be a Masters thesis where all the results will be summed up. As a token of appreciation preliminary findings and a copy of the final thesis will be made available to the MOHSS.

The questionnaire is expected to take about 15 minutes.

Informed Consent:

Participation of your health institution in this survey will be highly appreciated as permission from the Ministry of health and social services was granted to conduct this research in various health institutions. The respondents are assured that the responses to this questionnaire will be treated strictly confidential and they will be used for purposes of academic research only. However, only aggregated data will be communicated to the Ministry of health and social services (MOHSS).

Sponsor: Cape Peninsula University of Technology, Cape Town, South Africa

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Meke Iyaloo Shivute
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Professor Blessing Maumbe
Supervisor
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E-Innovation Academy, Cape Peninsula University of Technology
Cape Town Campus.
+27214691042

Co-supervisor: Mrs. Rertha Dela harpe
Cape Peninsula University of Technology
Cape Town Campus.

Section 1: Personal Particulars

NAME OF HEALTH INSTITUTION:	
Type of Health Facility:	
Name of person interviewed:	
Title of individual interviewed:	
Department:	
Date of Interview:	

Key Definitions:

Information and Communication Technology (ICT) – "A set of activities that facilitate or make it easy to capture, store, process, transmit and display information using electronic means, this includes computers, software, telephones, fax, Internet, email, mobile phones etc.

Health services: services provided to patients e.g. diagnosis, treatment. Health services also involve communication with patients in different ways e.g. using mobile phone to make appointments.

Section 2: Current ICT use in the health facility

Q1. When was this facility established?
(Please tick one box)

1 ☐ Less than 5 years

2 ☐ 6-10

3 ☐ 11-15

4 ☐ 16 and more

Q2. Does your institution have an Information Technology section/unit?

1 ☐ Yes

2 ☐ No

Q3.Do you currently use any ICT at your institution?
(Please tick one box)

1 ☐ Yes

3 ☐ No **Please go to Section B**

*Please answer **Q4 and Q5** by ticking in the shaded areas.*

	Q4: Which if any of these have you heard of?	**Q5**: Which ICT do you use at your institution?
1.Personal computer		
2.Internet		
3.Mobile phone		
4.Radio		
5.Television		
6.Telephone		
8.Fax machine		
9.Pagers		
10. Electronic Patient Record		
11.None		
12. Other (please specify) e.g. Blood Pressure Monitors		

Please note: if you answered **NONE** to **Q4** please go to Section **B**

Q6.When were the technologies introduced at your institution? *[Please tick one for each option]*

	Less than a year ago 1	1-3 years ago 2	4-6 years ago 3	7-9 years ago 4	More than 10 years ago 5	Do not know 6
1.Personal computer						
2.Internet						
3.Mobile phone						
4.Radio						
5.Television						
6.Telephone						
8.Fax machine						
9.Pagers						
10. Electronic patient record						
11. Other technologies (please specify)						

Q7.What are the main purposes of ICT use in following functional areas? *[Please state your purpose of ICT use for the functional areas]*

ICT	Admission	Consulting/ Clinical Support	Maternity	Family planning	Emergency services	Referral Service Unit	Other areas(Please specify)
1.Personal computer							
2.Internet							
3.Email							
4.Mobile phone							
5.Radio							
6.Television							
7.Telephone							
8.Fax machine							
9.Pagers							
10.Electronic Patient Record							
11.Other (please specify)							

Q8.For what purposes are you using the computer for?
(Please tick all the purposes you use a computer for)

1. Text processing	
2. Make reports	
3. Data entry	
4. Make graphs	
5. Analyse Data	
6.Financial programmes	
7.Other specify:	

Q9.Are there any computer literacy programmes or other programmes to help staff in ICT use?

1 ☐ Yes

2 ☐ No

Q10. In which areas of your institution is it important to use Information and communication technology? *(Please Rank in order of importance areas that require ICT most)*

	1 Very important	2 important	3 Neutral	4 Not important	5 least important
1. Clinical support services					
2. Diagnosis/Nursing services					
3. Medical Services					
4. Emergency Services					
5. Hospital Administration					
6. Research Support					
7. Knowledge Management					
8. Referral Service Unit					
9. Other(please specify)					

Section 3: Collaborations with other institutions or levels e.g. referrals

Q11. What are your main means of communication with other institutions *(Please tick means of communication with other institutions, employees and patients)*

ICT	Other Institutions/Departments	Employees	Patients
Telephone			
Email			
VOIP			
Courier			
Postal			
Other (please specify)			

Key: VOIP=Voice over Internet protocol

Q12.How does your institution send reports to the higher level? E.g. District, national level etc.

1.Telephone	
2.Email	
3.Send with people going the same way	
4.Postal services	
5.Courier	
6.Other(please specify)	

Section 4: Factors that influence the use of ICT in HSD

Q13. What are some of the ICT related constraints your institution face in delivering health services to your patients? *[Please tick all possible options]*

1.Budget constraints	
2.Low Priority to ICT Investments	
3.Low ICT skills Internally	
4.Low Computer employee ratio	
6.Poor Service Providers /Technical Support	
7.Unreliable Energy/Electricity Supply	
8.Other (please specify)	

Q14. How important do you think the following key issues need attention in enhancing ICT use in your health facility? *(Please Rank in order of importance)*

	1=Very important	2=important	3=Neutral	4=Not important	5=least important
1. Free\cheaper machines\software 2.					
3. Free\cheap computer lessons					
4. To make ICT more widely available					
5. Make ICT easier to use					
6. Other(Please specify)					

Q15. How important do you think it is to use ICT for health service delivery?
(Please tick one box)

1.Very important	2. Important	3.Not very important	4. Not at all important	5.Do not know

Q16. If any, what are the government regulations that restrict the use of ICT in your health institution?
[Please list all the possible options]

_____
_____
_____
_____

Section 5: Future investments in ICT

Q17. Approximately how much has your institution spent on ICT equipments, support and services in last 12 months? *[Please tick one box]*

1 ☐ N$ 0 - N$ 1000

2 ☐ N$1001 - N$ 5000

3 ☐ N$5001 - N$9000

4 ☐ N$9001- N$ 10000

5 ☐ N$ 10001 or More

6 ☐ Not disclosed

7 ☐ Do not know

Q18. What ICT does the institution contemplate on using in the future?
[Please list down]

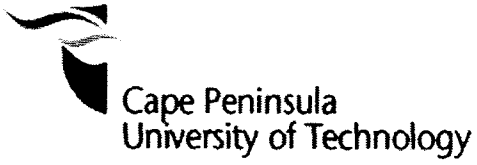
Q19. Considering the benefits of your institution investment in ICT, to what extent do you agree with the following?

	1=Strongly agree	2=Agree	3=Neither agree nor disagree	4=Disagree	5=Strongly Disagree	6=Do not know
1.ICT is helping us access new health information						
2.ICT provide ways to improve health services						
3.ICT is helping us in interacting with health service providers(e.g. hospitals, nurses, doctors)						
4. Privacy is of importance when it comes to personal health information.						
5. Government must do more to provide ICT for health service delivery						
6. More training in ICT use for health services is needed						
7. Cost of ICT services is a major hindrance to the use for health services in Namibia						

Q20. As a Health service provider which ICT would you recommend to the Ministry of Health and Social services to add to the existing health services to facilitate ICT use for Health service delivery in health institutions *(Please comment freely)*

Thank you for your assistance!! ☺

APPENDIX G: Questionnaire for Patients (English version)



A Survey to investigate the use of Information and Communication Technology for health services delivery in the Oshana and Khomas region in Namibia.

This survey is designed to investigate the current use of Information and Communication Technology (e.g. telephones, fax, pagers, mobile technology, computer systems, Electronic patient records, Internet etc) for purposes of delivering health services to patients in your health institution. The main aim of the study is to find out what ICT are available, and how they are being used for health service provision to patients. The questionnaire also investigates how ICT is used to ultimately benefit patients.

The researcher will use this information to compare urban and rural health institutions in their use of ICT, and to determine if government intervention is needed to help some health institutions in this area.

The results of this study will benefit the Ministry of Health and Social Services (MOHSS) as they are actively involved in shaping the policy on ICT for health service delivery in Namibia. Furthermore, the final output of the entire study will be a Masters thesis where all the results will be summed up. As a token of appreciation preliminary findings and a copy of the final thesis will be made available to the MOHSS.

The questionnaire is expected to take about 15 minutes.

Informed Consent:

Participation in this survey is completely voluntary and the researcher gives assurance that responses from this questionnaire will be treated as confidential, and they will be used for purposes of academic research only. However, only aggregated data will be communicated to MOHSS.

Sponsor: Cape Peninsula University of Technology, Cape Town, South Africa

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Key Definitions:

Information and Communication Technology (ICT) – "A set of activities that facilitate or make it easy to capture, store, process, transmit and display information using electronic means, this includes computers, software, telephones, fax, Internet, email, mobile phones etc.

Health services: services provided to patients e.g. diagnosis, treatment. Health services also involve communication with patients in different ways e.g. using mobile phone to make appointments.

Section 1: Screening of respondents

Q1.Have you visited a health facility in past three months? *[Please tick your answer]*

1 ☐ Yes

2 ☐ No

Q2. Where do you normally receive your health services?

1 ☐ Clinics

2 ☐ Health centre

3 ☐ Intermediate Hospital

4 ☐ Referral hospital

5 ☐ Mission health Facility

6 ☐ Other (Please specify) _____

Q3. Which if any of these have you heard of? *[Please tick all the options possible]*

1.Personal computer	
2.Internet	
3.Email	
4.Mobile/Cell phone	
5.Radio	
6.Television	
7.Telephone	
8.Fax machine	
9.Pagers	
10.Electronic patient record	
11.None	

If your answer is **None** Please go to Section 3 and continue answering from Q10.

Q4, Q5 and Q6. *[Please tick your responses and leave the spaces blank for those that do not apply to you]*

	Q4. Which if any of the following have you used before?	**Q5**.Which if any of the following are you currently using?	**Q6**.Which if any do you have at home?
1.Personal computer			
2.Email			
3.Internet			
4.Mobile/Cell phone			
5.Radio			
6.Television			
7.Telephone			
8.Fax machine			
9.None			

If your answer is **None** to **Q4** and **Q5 and Q6**. Please go to Section 3

Q7.Please indicate what purposes you use the ICT for in the following table: *[Please tick in the grey boxes for purpose of use for each ICT]*

Purpose	1.PC	2.Internet	3.Mobile/Cell phone	4.Radio	5.TV	6.Telephone	7.Fax machine
1 Work-related							
2 Personal e.g. Leisure							
3 Health services							
4 Educational							
5Other purposes: (please specify)							

Key:
PC=Personal computer
TV=Television

Section 3: Factors influencing ICT usage

Q8. What are your main sources of health services information? *[Please tick only one]*

1 ☐ Radio

2 ☐ Cell phone

3 ☐ Television

4 ☐ Internet

5 ☐ Community health worker

6 ☐ Other (Please specify) _____

Q9. Are you able to use/operate the following ICT? *[Please tick your answer]*

	1= Yes	2= No
1.Personal computer		
2.Internet		
3.Mobile/Cell phone		
4.Radio		
5.Television		
6.Telephone		
8.Fax machine		

If you answered **YES** to all the questions in Q9 please continue with Q11

Q10.For those ICT you cannot use/operate—state the main reasons why you are not using the following ICT at the moment?

	1.Personal computer	2.Internet	3.Mobile phone	4. Fax	5.Radio	6 Other technology (please specify)
1. Expensive/cannot afford						
2. Do not know how to use one						
3. No time						
4. Not user friendly						
5. No need to use one						
6. Other reasons(please specify)						

Q11. Do you wish to develop your skills in using ICT? [Please tick one]Just to remind you, ICT includes, computers, mobile phone, telephone, Internet etc.

1 ☐ Yes ☐ Do not know

2 ☐ No

Q12. .Are you willing to share the following ICT related contact details with your health service providers with the trust or for purposes of improving health services?

*[Please tick either **Yes** or **No** for your choice] If your answer is **NO** please give your reason in the next column]*

	1=Yes	2=No [if your answer is No give your reason in the next column]	3 Choose reason for not sharing contact details? **1=Security; 2=Privacy;3=Personal 4=Not necessary; Other**
1.Telephone number			
2.Mobile telephone number			
3.Email			

Q13.To what extent do you agree with the following? *[Please tick your choice]*

	1=Strongly agree	2=Agree	3=Neither agree nor disagree	4=Disagree	5=Strongly Disagree	6=Do not know
1.ICT is helping us access new health information						
2.ICT provide ways to improve health services						
3.ICT is helping us in interacting with health service providers(e.g. hospitals, nurses, doctors)						
4. I am willing to share my contact details with health service providers for purposes of improving health services.						
5. Privacy is of importance when it comes to personal health information.						
6. I wish to develop my skills in using ICT						

7. Government must do more to provide ICT for health service delivery						
8. More training in ICT use for health services is needed						
9 Cost of ICT services is a major hindrance to the use for health services in Namibia						

Please answer Q14 ONLY if you are a patient in the public/government health facility.

Q14. In your opinion what would you like the Ministry of Health and Social services to add to the existing health services to facilitate ICT use in health institutions.

(Please comment freely, list down your opinions)

Please answer Q15 ONLY if you are a patient in the Private health facility.

Q15. In your opinion what would you like the private health institution(clinic, hospital) to add to the existing health services to facilitate ICT use in health institutions.

(Please comment freely, list down your opinions)

Section 4: Patient Demographics
To finish off, could you please tell me a little bit about yourself?

Q16.What is your age? [Please tick one]

1 ☐ Under 21

2 ☐ 21- 30

3 ☐ 31-40

4 ☐ 41-50

5 ☐ 51-60

6 ☐ 61 or older

Q17.Gender [please tick one]

1=Female	2=Male

Q18. Please indicate your highest level of education *[Please tick one option only]*

1=Primary school [grade 1- 7]	
2=High school [grade 8- 12]	
3=Tertiary College	
4=University	
5=Other (Please specify)	

Q19. Which of the following best describes you?

1 ☐ Black

2 ☐ White

3 ☐ Colored

4 ☐ Other/ please specify: _____

Q20.Please Identify an income range that best describe yourself/household

1 ☐ Less than N$ 5,000

2 ☐ N$5001-10000

3 ☐ N$11000-15000

3 ☐ N$16000 and more

Thank you very much for your cooperation and assistance! – Have a nice day ☺

APPENDIX H: Questionnaire for patients (Oshiwambo version)

Cape Peninsula
University of Technology

Epekapeko okukonakona elongitho lyomauyelele nomakwatathano gopautekenika okugandja omayakulo gopaundjolowele miitotopolwa, Oshana noKhomas moNamibia.

Epekapeko ndika olyanuninwa okukonakona elongitho lyomauyelele nomakwatathano gongaashi geyi gopautekenika (Oshiholelwa: ocell phona, okompiuta, oongodhi nosho tuu) nelalakano okugandja omayakulo gopaundjolowele kaavu miipangelo yayooloka. Enenelalakano lyekonakono ndino oku mona kutya iilongitho yini yopautekenika yili po hayi longithwa okugandja omayakulo ngaka kaavu.Omapulo otaga konakonawo nkene aavu taya kwathwa kiilongitho mbika.

Omupekapeki ota ka longitha omauyelele ngano okuyelekanitha omandiki gopaundjolowele moondolopa nomomikunda melongitho lyiilongitho yopautekenika noku tala ngele epangelo olyapumbwa okukutha ombika nokukwatha omandiki ngaka miinima mbyoka.

Iizemo yekonakono ndika otayi ka kwatha Oshikondo shuundjolowele nonkalonawa,moku opalekulula omilandu nomakotampango ge na sha niiyakulitho yopautekenika okugandja eyakulo lyopaundjolowele moNamibia.

Shagwedhwako ,oshizemo shahugunina shekonakono alihe otali kakala oshinyolwa shonkatu yoMasta moka iizemo ayihe tayika ngongwa.Oshinyolwa shahugunina otashi ka gandjwa kOshikondo shuundjolowele nonkalonawa onga epandulo.

Omapulo ogatelelwa ga ka kuthe ominute omulongo nantano lwaampoka.

Tangi kethimbo lyoye!!!

KONEKA: Ekuthombinga mekonakono olyopamanguluko. Nomupekapeki ota shilipaleke kutya omayamukulo komapulo taga ka gandjwa mekonakona ndika otaga ka kala oshiholekwa na otaga kalongithwa ashike nomalalakano gopailongo.Nando ongawo,omayamukulo agehe ga tulwa kumwe otaga ka gandjwa koshikondo shuundjolowele nonkalonawa.Epitikilo oku konakona noku shanga omauyelele taga zi momapulo ngaka olya gandjwa kOshikondo shuundjolowele nonkalonawa.

Omuyambidhidhi pashimaliwa : Cape Peninsula University of Technology, Cape Town, South Africa

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Professor Blessing Maumbe
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E-Innovation Academy, Cape Peninsula University of Technology
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+27214691042

Co-supervisor: Mrs. Rertha Dela harpe
Cape Peninsula University of Technology
Cape Town Campus.

Omafatululo giitya:

Omauyelele nomakwatathano gopautekenika – Kehe oshitopolwa to ka adha momapulo tashi popi kombinga yOmauyelele nomakwatathano gopautekenika otashi ti: iilongitho mbyoka hayi kwatha nenge hayi hwepopaleke omapungulo, omalongitho nomataambathano gomauyelele melongitho lyopautekenika.Shika oshakwatelamo:ootelephona,osellphona, oofax,ookompiuta,olnterneta nosho tuu.

Omayakulo gopaundjolowele : omayakulo haga gandjwa kaavu oshiholelwa:omakonakono,epango. Omayakulo gopaundjolowele oga kwatela mo woo, omakwatathano pokati kaavu nomandiki(ngaashi,iipangelo) gopaundjolowele oshiholelwa:elongitho lyoongodhi okuninga oshilage no shipangelo.

Oshitopolwa 1: Ehogololo lyaayamukuli

Epulo1 .Owa talelapo oshipangelo oomwedhi ndatu dha piti? *Tula okangombe peyamukulo tali ku opalele]*

1 ☐ Eeno

2 ☐ Aawe

Epulo2 . Shito openi ho taamba omayakulo gomapango gopaundjolowele

4 ☐ Okokaklinika

5 ☐ Okokapangelo

3 ☐ Okoshipangelo shopokati

4 ☐ Okoshipangelo oshinene

6 ☐ Okoshipangelo shongeleki

7 ☐ Palwe (Gandja ehala)_____

Epulo3 Oyini yomwaa mbika u uva nale?*[Tula okangombe pwaambyoka uva]*

1. Okompiuta	
2. Olnterneta	
3. Oe-maila	
4. Osell phone	
5. Oradio	
6. Oradio yomuzizimba	
7. Otelephona	
8. Eshina lyokufax	
9. okangodhi kukwiithana ondohotola	
10. Omakalata gavuu gomokompiuta	
11. Inandi uva nale ayihe yatumbulwa pombanda	

Ngele eyamukulo lyoye **onomola 11**, inda koshitopolwa 3 eto yamukula okuza pepulo etimulongo (Q10).

Oshitopolwa 2: Ompito yomalongitho gomauyelele nomakwatathano gopautekenika kaavu.

Epulo 4, 5, 6, *[Kwatha ndje u gandje uungombe komayamukulo tageku opalele thiga omahala geeguluka pwaangoka inaa ge ku pamba]*

	Epulo 4. Oyini yomwaa mbika wa longitha monakuziwa?	**Epulo 5**.Oyini yomwaa mbika ho longitha paife?	**Epulo 6**.Oyini yo mwaa mbika una megumbo lyaandjeni?
1.Okompiuta			
2.OInterneta			
3.Oe-maila			
4.Ocell phone			
5.Oradio			
6.OTV/Oradio yomuzizimba			
7.Otelephone			
8.Eshina lyokufax			
9.Kapuna shoka handi longitha/ ndina megumbo lyaalyetu.			

Ngele eyamukulo lyoye onomola 9 **kepulo etine netitano netihamano** Kwatha ndje u tsikile noshintopolwa 3 .

Epulo 7.Kwatha ndje u lombwele ndje kutya Omauyelele nomakwatathano gopautekenika kutya oho ga longitha peni ulika kutya iilonitho yopautekenika ohyilongitha nelalakano lyashike, tula eyamukulo lye muukololo tau landula.

Okuku dhimbulukitha : Omauyelele no makwatathano gopautekenika, iilongitho mbyoka hayi kwatha nenge hayi hwepopaleke omapungulo, omalongitho nomataambathano gomauyele. Mbika oyakwatelamo nee:ootelephona,ocell phona, oofax, Internet nosho tuu. *[Kwatha ndje u gandje uungombe mpoka ho longitha iilongitho mbika]*

Elalakano lyelongitho	1.Okompiuta	2.OInternet	3.Ocell phone	4.Oradio	5.OTV/Oradi yomuzizimba	6.Otelefona	7.Eshina lyokufax
1 Kiilonga							
2 Opaumwene							
3 Omayakulo gopaundjolo wele							
4 shopalongo							
omalongitho palwe : (Kwatha ndje u ga tomone)							

Oshitopolwa 3: Iinima mbyoka tayi gandja enwethemo kiilongitho yomakwatathano gopautekenika.

Epulo 8. Openi hapukuzile omalunza omanene gomauyelele gomayakulo gopaundjolowele?

1 ☐ Okoradio

2 ☐ OkoCell phona

3 ☐ OTV/Oradio yomuzizimba

4 ☐ OkoInterneta

5 ☐ Okaagandji yuuyelele momikunda

6 ☐ Palwe (Gandja mpoka uuyelele hau zi) _____

Epulo 9.Oto vulu/ ou shi oku longitha mbika tayi landula mpaka? [Gandja okangombe keyamukulo lyoye*]*

	1= Eeno	2= Aawe
1.Okompiuta		
2.OInterneta		
3.Ocell phone		
4.Oradio		
5.OTV/Oradio yomuzizimba		
6.Otelephona		
8.Eshina lyokufax		

Ngele omayamukulo goye agehe oEeno **kepulo9** kwatha ndje utsikile **nepulo 11**

Epulo 10. Miilongitho yopautekenika mbyoka waa shi okulongitha –hogolola omatompelo omanene kutya omolwashike ihoo yi longitha ngaashingeyi?

	1.Okompiuta	2.OInterneta	3.Ocell phone	4. Eshina lyokufax	5 Yilwe (gandja edhina)
7. Ondilo					
8. Kandi shi okushi longitha.					
9. Kandina ethimbo					
10. Oshidhigu okulongitha					
11. Kapu na ompumbwe					
12. Omatompelo galwe					

Epulo 11.Owahala okwiihumitha komeho muunongo wo kulongitha omauyelele nomakwatathano gopautekenika ?

1 ☐ Eeno 3 ☐ Kandishi wo

2 ☐ Aawe

Epulo 12. Ou na ehalo oku gandja uuyelele womakwathano kiipangelo neinekelo nenge nelalakano oku humitha komeko omayakulo gopaundjolowele? *[Kwatha ndje u gandje okangombe kamwe akeke to ka tula peyamukulo.Ngele oyamukulo lyoye oAAwe komayamukulo goye gandja etompelo kutya omolwa shike inoohala okugangndja uuyele mboka.Hogolola pomatompelo ngonga gandjwa.*

	1 =**Eeno**	2= **Aawe** [ngele eyamukulo lyoye oAawe,gandja etompelo lyoye mokakololo kolulyo]	3 Hogolola etompelo lyoye kutya omolwashike inoo hala okugandja uuyelele mboka? **1= Egameno 2= Oshipashiholekwa;3= Shopapumwene** **4=Inashi pumbiwa 5 omatompelo galwe**
1.Onomola yongodhi			
2.Onomola yosell fona			
3.Ondjukithi yo E-maila yandje			

Epulo 13. Hogolola shimwe shomiinima mbika u wete tashi ku opalele okuza muukololo tau landula? *[Hogolola ashike shimwe]*

	1=Onda zimina lela	2=Onda zimina	3=ondili pokati)	4=Itandi tsu kumwe nasho	5=Itandi tsu kumwe nasho nande nande	6=Kandi shi wo
1. Omauyelele nomakwatathano gopautekenika ota getu kwatha okumona omayelele omape gopaundjolowele.						
2. Omauyelele nomakwatathano gopautekenika ohaga humitha komeho omayakulo gopaundjolowele.						
3. omauyelele nomakwatathano gopautekenika ota getu kwatha oku kala mekwatathano naagandji yomayakulo gopaundjolowele(ngaashi iipangelo,aapangi,oondohotola)						
4. Ondina ehalo okugandja uuyelele womakwatathano kiipangelo nosho tuu,nelalakano oku humithakomeho omayakulo okuza kiipangelo.						
5. Oshasimana kungame ngele omauyelele gopaumwene gena sha nomapango,uundjolowele wandje nosho tuu, taga kala oshiholekwa.						

6.Ondina ehalo okwiihumitha komeho muunongo ,montseyo nomelongitho lyomauyelele nomakwatathano gopautekenika.						
7. Epangelo Olya pumbwa oku ninga oshindji okugandja iilongitho yopautekenika okugandja eyakulo lyopaundjolowele.						
8.Opuna ompumbwe yedheulo melongitho lyomauyelele nomakwatathano gopautekenika omolwa okugandja omayakulo gopaundjolowele.						
9. Ondando yomayakulo giilongitho yopautekenika otayi imbi elongitho lomakulo gopaundjolowele moNamibia.						

Epulo 14 otali yamukulwa ashike ngele ouli omuvu moshipangelo/mokaclinika shepangelo/shongeleka.

Epulo 14. Pamadhidhiladhilo goye oshike wa hala oshikondo shuundjolowele nuukalinawa shi gwedhe ko komayakulo ngoka hashi gandja mongashingeyi okuhumithakomeho omalongitho nomayakulo giilongitho yopauteketika. *(Gandja omadhidhiladhilo goye memanguluko,na gatula momusholondondo)*

_____
_____
_____
_____
_____

Epulo 15 otali yamukulwa ashike ngele ouli omuvu moshipangelo/mokaclinika kopaumwene.

Epulo 15. Pamadhidhiladhilo goye owa hala iipangelo yopaumwene yi gwedheko komayakulo ngoka hayi gandja ngashingeyi okuhumithakomeho omalongitho giilongitho yopauteketika.

(Gandja omadhdhiladhilo goye memanguluko,na gatula momusholondondo)

_____
_____
_____
_____
_____
_____

Section 4: Omauyele gopaumwene

Pehulilo mpaka nandiku pule u lomwele ndje kashona kombinga yoye?

Epulo 16.

Ou na oomvula ngapi? [Hogolola eyamukulo lyoye]

1 ☐ Ondili kohi yoomvula 21

2 ☐ 21- 30

3 ☐ 31-40

4 ☐ 41-50

5 ☐ 51-60

6 ☐ 61 nopombanda

Epulo 17.Uukashikekookantu [kwathandje u hogolole eyamukulo limwe alike]

1=Omukiintu	2=Omulumentu

Epulo 18. Kwathandje u hogolole onkatu yoye yopombanda melongo*[Hogolola eyamukulo limwe alikey*]

1=Osikola yopevi [Ongundu 1- 7]	
2=Oseko/Osikola yopombanda[ongundu 8- 12]	
3=Okoliiyi	
4=Onkatu yopombanda[Ouniversity]	
5=Yilwe (gandja ondondo)	

Epulo 19. Ngoye gumwe gwayeni yoomwaambaka?

1 ☐ Omuluudhe

2 ☐ Omutiligane(Oshilumbu)

3 ☐ Ombaatili

4 ☐ Gulwe/ kwathandje u gandje: _____

Epulo 20. Kwathandje u hogolole oshiyemo shomegumbo lyaayeni moongundu tadhi landula?

1 ☐ Kohi N$ 5,000

2 ☐ N$6000-10000

3 ☐ N$11000-15000

4 ☐ N$16000 kwagwedhwa

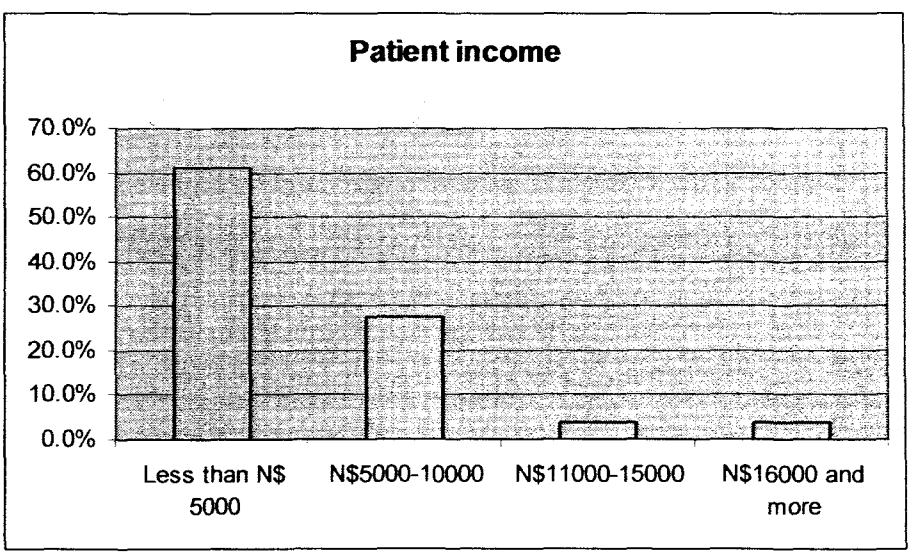
Tangi unene kelongelokumwe lyoye nokekwathlo lyoye, Omuwa nayambeke,nesiku nalikale ewanawa! ☺

APPENDIX I: Namibia's state of ICT 2000-2004

	2000	2004
Telephone main lines (per 1,000 people)	58	63
Mobile subscribers (per 1,000 people)	43	111
Internet users (per 1,000 people)	16	39
Personal computers (per 1,000 people)	40	95
Households with television (%)	37	39

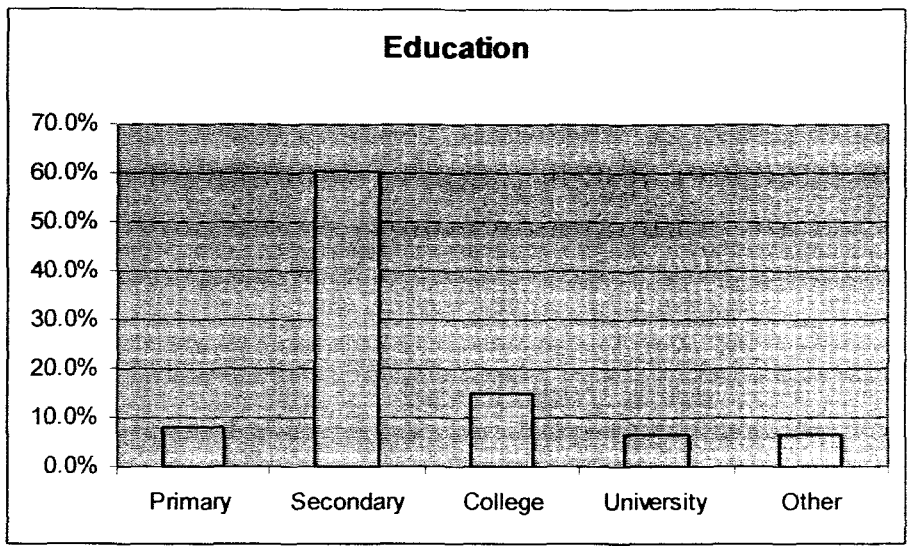
(Source: World Bank report on ICT in Namibia, 2006:1)

APPENDIX J: Patient's income



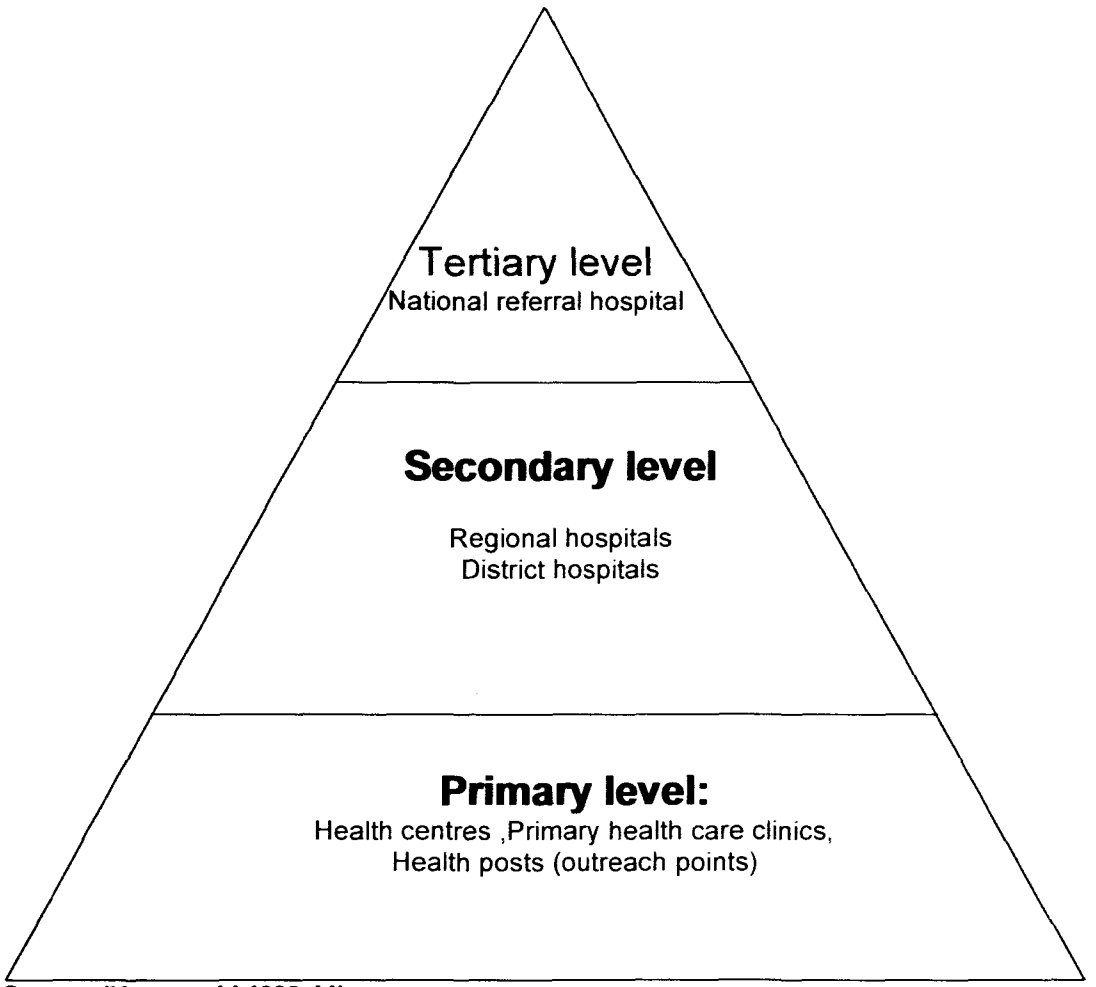
Source, Survey data, 2006

APPENDIX K: Patient level of Education



Source, Survey data, 2006

APPENDIX L: Classifications of health facilities in Namibia



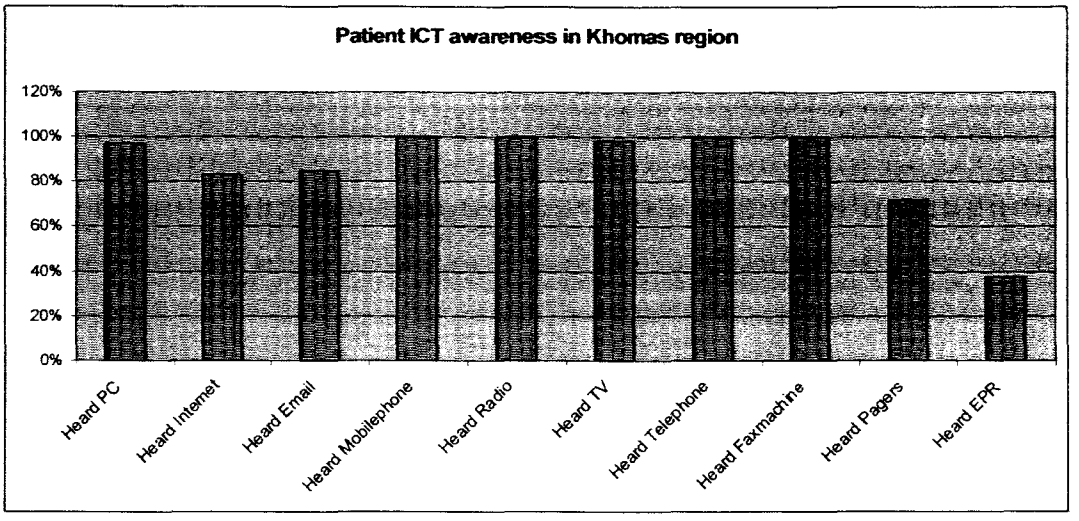
Source, (Kavezembi,1999:11)

APPENDIX M: Namibian Health Service Providers Particulars by Region, 2007

Area	Institution	Type of Facility	Target respondent
Khomas	Katutura state hospital	intermediate hospital	Matron
Khomas	Roman catholic	Private hospital	Matron
Khomas	Rhino park	Private hospital	Medical director
Khomas	Khomasdal	Health centre	Officer in charge
Khomas	Katutura	Health centre	Matron
Khomas	Hakahana	Clinic	Acting officer in charge
Khomas	Wanahenda	Clinic	Supervisor
Khomas	Okuryangava	Clinic	Supervisor
Khomas	Robert Mugabe	Clinic	Supervisor
Khomas	Donkerhoek	Clinic	Acting officer in charge
Oshana	Oshakati	State Hospital	HIS officer
Oshana	Oshakati	State Hospital	Chief medical officer
Oshana	Ou Nick	Health centre	Acting officer in charge
Oshana	Okatana	Health centre	Matron
Oshana	Ondangwa	Health centre	Supervisor
Oshana	Uukwiyuushona	Clinic	Supervisor
Oshana	Eluwa	Clinic	Supervisor
Oshana	Ompundja	Clinic	Supervisor
Oshana	Eheke	Clinic	Acting officer in charge
Oshana	Okaku	Clinic	Supervisor
Oshana	Ongwediva	Clinic	Supervisor

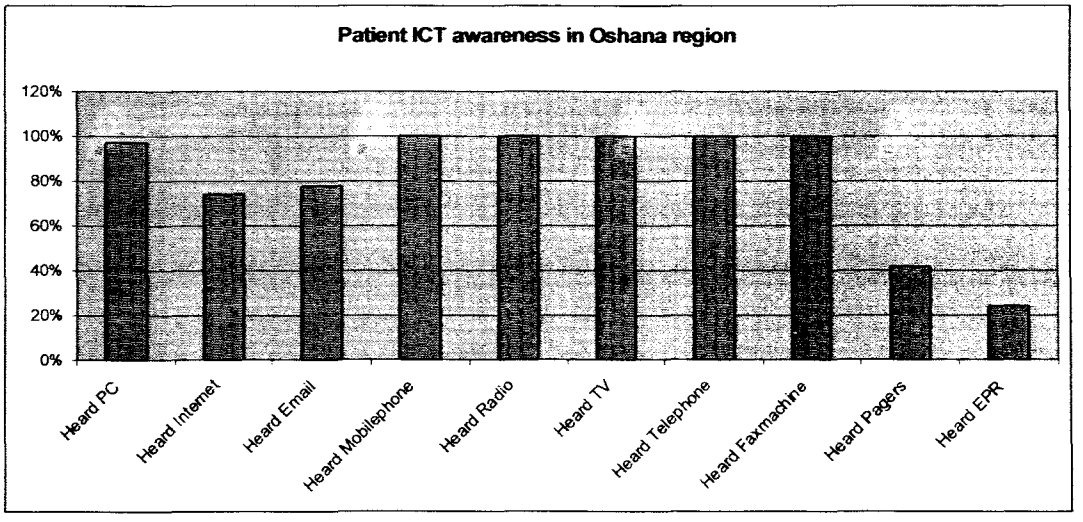
Source, Survey data, 2006

APPENDIX N: Patient's ICT awareness in the Khomas region



Source: Survey data, 2006

APPENDIX O: Patients ICT awareness in the Oshana region



Source: Survey data, 2006

APPENDIX P: Summary of functions for health institutions in Namibia.

Health institution	Functions
Clinic	This is an entry point in the health service system and its main functions comprise the provision of maternal health services, treatment of common diseases and basic emergencies.
Health centre	This facility is larger than a clinic but smaller than a district hospital. Health centers can be categorized as: rural health centres or a day care centers. **Rural health centers**: admits patients and they can have a maximum of ten beds and it provides inpatient care for normal deliveries, short illnesses up to a maximum of 48 hours. **Day care center:** These are normally located in urban areas and they do not admit patients but provide day care services. They have an advantage of more regular visits by a medical practitioner.
District/ Intermediate Hospital	This is the ultimate referral point in at district level. Its functions entails provision of comprehensive care (promotive, preventive curative and rehabilitative) on 24 hour basis.
Regional Hospital	Provides regional specialized health services and function as a referral hospital for the relevant region.
Referral Hospital	This serves as the national tertiary referral hospital for the whole of Namibia. Its main functions are to handle all tertiary care referral cases from all the hospitals in Namibia.

APPENDIX Q: Summary of the Namibian Vision 2030 as it relates to ICT goals. (Source: Namibia, 2004d)

Overview of the Namibian Vision 2030 as summarized in Namibia, 2004d.
The Namibia's Vision 2030 was launched by H.E. President Sam Nujoma, in June 2004.
1.Why Vision 2030
• In his statement to the Cabinet in January 1998, His Excellency, the President, Dr. Sam Nujoma, emphasized the need for members of the Cabinet, in the interest of the Government and the people, to be clear "about where we are, where we want to go from here, and over what time frame". • He then called on the Cabinet to deliberate on a vision that will take Namibia from the present into the future. "*A vision that will guide us to make deliberate efforts to improve the quality of life of our people to the level of their counterparts in developed world by the year 2030*".
2. The rationale
• A national Vision provides long term alternative policy scenarios on the future course of development in a country at different points in time up until the target year 2030. • The dynamic process in the long-term future is more important for planning than the end point of the process. Perspective thinking is particularly relevant for the short and medium term implementation of long term planning targets. • Long-term perspective plans are also useful for anticipating changes and for understanding events that are likely to happen.
3. Management
• The challenge of coordinating the activities that lead to the development of a shared national vision for Namibia was given to the National Planning Commission. • The process started late in 2000 and it is planned to be concluded early in 2003; thereafter, Namibia Vision 2030 will be published and disseminated widely. • At the apex of the organizational structure for visionary management was the National Core Team, made up of experts in various fields, and supported by the National Committee, the Steering Committee and the National Planning Commission.
4. Creating Vision Awareness
• People must be made aware of the Vision and be part of the formulation process; otherwise they are likely to regard it as another official Government paper. • It was to this end that Vision management team called a Media Conference in May 2001 at which all and sundry were invited to be part of the process. • In August 2001, the project management undertook a sensitization mission to all the 13 regions of the country and, through workshops organized for representatives of communities and organizations collected information on people's aspirations for the future of themselves, their families and the country. • To further assure people's participation, a National Aspirations Conference was scheduled for one week, in Windhoek, from 20 to 24 May 2002. • This conference attracted a broad spectrum of the Namibian society (private and public bodies, organizations and agencies representing the various interest groups in the country). • The vision team designed and implemented a 'Media Programme', meant to publicize aspects of the visioning process (through radio, television and print media) and encouraged public participation; these promotional activities continued through the stage of development planning, that is, the vision implementation phase.

5.Vision Formulation Process

- The vision is based on careful analyses and reviews of Namibia's past and current experience in development, given its natural, material and financial resources, and its cultural, regional and international context.
- In this context, by mid-May 2001, the Steering Committee for Vision 2030 was able to put together 8 Multidisciplinary groups of researchers to undertake the scientific research work that visioning entails.
- In support of the research process, the National Planning Commission conducted a survey of 'opinion leaders' in the country in April 2000, asking for their views on the future of Namibia. Based on analysis of data collected from this study, a report titled: Views of Opinion Leaders has been prepared to serve as input into the vision formulation.
- Following extensive consultations, the Vision management identified the eight themes as the major issues around which the Vision will be formulated. These themes were Inequalities and social welfare; Political stability, peace and sustainable development; Human resources, institutional and capacity building; Macro-economic issues; Population, health and development; Natural resources and environment; Knowledge, information and technology; and Factors of the external environment.

6. Vision statements that relate to ICT are found in chapter 4 of the document, under section 4.3.1 it is summarized as:

"Advanced microelectronics-based information and communication technologies are used to achieve social and economic transformations in Namibia; the costs of ICTs continue to fall as their capabilities increase and ICTs are being applied throughout all sectors of the economy and society to serve development goals."