

**Challenges faced by Professional Nurses in accessing
Information Technology in healthcare facilities
for healthcare delivery in northern KwaZulu-Natal**

**by
Flora Nah Asah
School of Family and Public Health Medicine
Nelson R Mandela School of Medicine
University of KwaZulu-Natal**

**Supervisor:
Prof SJ Reid**

**In partial fulfillment of the academic requirements for the degree of
MASTER OF PUBLIC HEALTH**

As, the candidate's supervisor, I have approved this dissertation for submission

Signed: _____

Name: _____

Date: _____

1 Dedication

I dedicate this dissertation to my parents, Ernestine and Martin Asah, who supported me throughout my quest for knowledge. According to them “a woman without education is like a golden ring on a pig’s nose.”

2 Declaration

I, Flora Nah Asah, do hereby declare that the content of this thesis is my own original work, and unless specifically indicated to the contrary in the text, is the result of my own investigation and research. All resources used have been acknowledged. This work has not been submitted as part or in full for any degree in any university.

Signature: _____

Date : _____

Supervisor's Signature: _____

Date : _____

3 Acknowledgements

I firstly would like to give sincere thanks to my creator, the Almighty God for the undying lead He has provided me throughout my stay in South Africa.

My supervisor, Dr Steve Reid, under whose supervision and support this thesis was written. The Nelson Mandela School campus library staff for their support during literature search.

My colleagues, who in one way or the other assisted me with data collection. A special thank to Dr C Cosser, Mr. N Ngomane, Ms R Subbaye, Mrs. P Nkosi, and Ms L Nxu for showing enthusiasm in my work and for their help and constructive criticisms throughout the realization of this work.

My sincere thanks to the hospital managers, nurse managers and principal of nursing colleges for allowing me to conduct the study in their institutions and a special word of gratitude to all the nurses who agreed to participate in the focus group discussions.

Without friends and family it is unlikely that I would have gone this far in my quest for knowledge. It is therefore fitting to thank my friends, Dr Addo, Dr Voce and Dr Brauchli, Dr Ngwa, Dr Akop and Prof. Ogunbanjo for their support and encouragement. My sincere gratitude to my siblings Miranda and Ivo, who bore the stress of this work and, to Devine, Stanley, Charles, Edith and Bridget for their love and relentless support. I love you all.

Flora Nah

4 Abstract

Information Technology (IT) is revolutionizing every sphere of human interaction. IT has changed the way individuals communicate. In the healthcare system, information technologies are considered the key to addressing challenges to healthcare delivery such as shortages of healthcare professionals, and networking. Therefore, healthcare providers need to possess information technology skills, knowledge, and resources to communicate and manage information effectively and efficiently and also to be able to perform their duties adequately in such an information technology age.

Nurses, the largest group of healthcare providers who spend the most time with patients, are also frontline healthcare managers and need to have access to IT and should be computer literate in order to perform their duties quickly and adequately.

In South Africa, the health system has been slow in integrating IT into healthcare delivery, particularly in rural and remote areas where such services are most needed. A “digital divide” exists, by which access to computers and the internet remain a privilege, and many nurses are unable to use a computer even after completing the computer literacy courses.

This study aims to investigate the challenges faced by professional nurses to access and use information technology in healthcare facilities after being trained.

Data was collected through focus group discussions conducted with professional nurses from two regional and four district hospitals. Participants who had received computer training offered by the Department of Health were selected to ensure that issues beyond a lack of training could be explored. Focus group discussions were recorded and transcribed verbatim. Content analysis was used to identify themes from the transcriptions.

Results show that professional nurses had little access to information technology. Reasons given were a lack of hardware and appropriate software, insufficient training and lack of support, irrelevance of the computer courses, and negative attitudes towards computers. Despite previous computer training, the professional nurses interviewed felt they lacked the skills to use computers confidently in their daily activities. The quality of the training was perceived as inadequate and irrelevant with a lack of ongoing support to cement new skills and build confidence.

The provision of training workshops for nurses is not sufficient to ensure that IT will be used for healthcare delivery. On-going support and motivation, among others, are needed to encourage nurses to use IT efficiently.

Number of words: 377 words

5 List of Abbreviations and Acronyms

CDMA	Code Division Multiple Access
ISDN	Integrated Service Digital Network
IT	Information Technology
ICT	Information Communication Technology
IDRC	International Development Research Centre
ITU	International Telecommunication Unions
SITA	State Information and Technology Agency
WHO	World Health Organisation
UNESCO	United Nations Education and Cultural Organisation
UNICEF	United Nations Children's Fund
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WWW	World Wide Web

6 Contents

1	Dedication	ii
2	Declaration	iii
3	Acknowledgements	iv
4	Abstract	v
5	List of Abbreviations and Acronyms	vii
6	Contents	viii
7	List of Figures	ix
8	List of Tables	ix
CHAPTER ONE: INTRODUCTION		9
1.	Background	9
1.1	Overview of IT training offered by the State Information Technology Agency (SITA)	10
1.2	Statement of the Problem	10
1.3	Research Question	11
1.4	Rationale for the Study	11
1.5	Objectives of the Study	12
1.6	Qualitative Methodology	13
1.7	Operational Definitions	14
1.8	Context of the Study	17
1.9	Challenges of working in rural KwaZulu-Natal	19
1.10	Conceptual framework	21
1.11	Chapter layout	28
1.12	Summary of Chapter One	28
CHAPTER TWO: LITERATURE REVIEW		29
2.	Introduction	29
2.1	Scope of the Literature Review	29
2.2	Information Technology	30
2.3	Information Technology in the Healthcare Sector	43
2.4	Summary of Chapter Two	57
CHAPTER THREE: RESEARCH METHODOLOGY		58
3.	Introduction	58
3.1	Aim and Objectives	58
3.2	Research Design	59
3.3	Research Setting	59
3.4	Research Population	60
3.5	Sampling	60
3.6	Data Collection	64
3.7	Study Period	68
3.8	Data Management	68
3.9	Data Analysis	68
3.10	Assuring the quality of the study	70
3.11	Ethical Considerations	71
3.12	Summary of Chapter Three	71
CHAPTER FOUR: PRESENTATION OF RESULTS		72
4.	Introduction	72
4.1	Presentation of results: quantitative analysis	72
4.2	Presentation of results: qualitative analysis	72

4.3	Proposed model of challenges to access information technology by nurses after being trained	78
4.4	The lack of information technology infrastructure	81
4.5	Access problems	85
4.6	Access to Intranet and/or internet	88
4.7	Lack of relevant computer programme	89
4.8	Attitude towards computers.....	89
4.9	Deficiencies in information technology training.....	90
4.10	Summary of Chapter four	95
CHAPTER FIVE: INTERPRETATION AND DISCUSSION OF RESULTS		96
5.	Introduction	96
5.1	Examining the computer literacy skills required by nurses.....	96
5.2	Identifying the obstacles faced in accessing and using information technology	97
5.2.1	The type of IT available	97
5.2.2	Lack of information technology.....	97
5.2.3	Lack of relevant computer activities/tasks.....	100
5.2.4	Attitudes towards computers	101
5.2.5	Limitations of the study.....	103
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS		106
6.	Introduction	106
6.1	Conclusions.....	106
6.2	Recommendations.....	108
7.	REFERENCES	112
8.	Appendix.....	i
8.1	Structured Interview Guide	i
8.2	Postgraduate Ethic Approval.....	ii
8.3	Biomedical Ethics Committee.....	iii
8.4	Approval for KZN-Health.....	iv

7 List of Figures

Figure 1: Map of KwaZulu-Natal.....	25
Figure 2: Overview of original conceptual framework.....	26
Figure 3: Adapted conceptual framework.....	27
Figure 4: Proposed model of challenges to access IT by nurses	79
Figure 5: A computer buried in papers.....	85

8 List of Tables

Table 1: Criteria for selecting hospitals	61
Table 2: List of Hospitals.....	62
Table 3: No. of nurses selected per facility	73
Table 4: No. of nurses by Focus Group Discussion.....	73
Table 5: Summary of issues identified in each FGD	75
Table 6: Analyses of major themes	78

CHAPTER ONE: INTRODUCTION

Healthcare is migrating from an environment based on data to a continuum based on knowledge. IT, however, cannot be viewed as a panacea for all of healthcare's information-based ills; rather, it is an enabler that will allow active, skilled users to make better decisions. To reap this benefit, we must stay informed of new directions and developments in technology (Ball 2000:302).

1. Background

Since the introduction of the primary healthcare strategy and district health system as the vehicle to achieve health for all, primary healthcare has become the central vehicle in implementing health systems' reform for most developing countries including South Africa. The primary healthcare approach and strategy used, emphasizes the following key principles in healthcare delivery; development of peripheral services; intersectoral collaboration; community involvement and participation in matters pertaining to health; appropriate and affordable technology. Thus, the roles of primary healthcare clinics have become more significant as these facilities are located at the heart of the plan to transform health services (Rensburg 2004:413; Couper et al. 2000). Thus, this dissertation is based on the fourth principle; appropriate and affordable technology and more specifically, on the use of information technology (IT) by nurses after being trained.

Primary healthcare clinics ensure accessibility and affordability of health services to communities and they refer patients to hospitals, if need be. In this strategy, nurses act as frontline managers; they spend about 30% of their time with patients offering primary healthcare services, providing mobile services and, in some cases, managing hospital activities. Nurses and, most particularly, professional nurses, manage clinics and wards in hospitals (Couper et al. 2000). Furthermore, nurses are educators to student nurses. Nurses cannot perform well in their tasks without the use of IT because they serve as enabler to facilitate healthcare delivery.

Today, information technology could be used to enhance education and training of nurses, i.e. the Internet provides access to vast quantities of stored data and visual information for nurses to retrieve and support decisions (*Ball 2000:302*). Therefore, nurses should be computer literate in both the clinical domain and in information search and retrieval in order to be able to perform their services efficiently. Unfortunately, computer literacy courses are not included in the existing nursing curricula, but are offered as in-service training by the State Information Technology Agency.

1.1 Overview of IT training offered by the State Information Technology Agency (SITA)

SITA offers computer literacy training to public servants, including nurses. Although commonly referred to as information technology training, it is aimed at providing computer literacy. The training focuses on Microsoft Office Suite and introduction to Windows. The courses are divided into the following levels:

- MS Introduction : PC/Windows XP Professional,
- MS Office Suite : Word Level 1 & 2, Excel Level 1 & 2, PowerPoint and Outlook.

Trainees are expected to write a test after each level and must obtain a pass mark of 80% to be allowed to proceed to the next level. Presently, the only category of nurses allowed to attend information technology training in KwaZulu-Natal is professional nurses (*Meade 2007*).

1.2 Statement of the Problem

Despite the fact that many healthcare personnel have received training in IT, it appears that the actual use of and access to computers, internet and the intranet by nurses in hospitals and clinics in northern KwaZulu-Natal remains very limited (*Centre for Rural Health 2007*). The KwaZulu-Natal Department of Health is concerned about poor access to and use of computers by nurses, after being trained. Considering the fact that healthcare systems are gradually becoming automated, it is imperative that professional nurses are equipped with information technologies' skills and knowledge, to be able to work comfortably and efficiently while delivering healthcare services (*Ball 2000:302*). Since IT is not yet

integrated into the existing nursing curricula, KwaZulu-Natal Department of Health in partnership with SITA, whereby the latter offers computer training to healthcare providers (including nurses) in the province. It is anticipated that the IT skills acquired by professional nurses will be used in the delivery of healthcare services. But research has shown that, although professional nurses are trained in computer literacy, they are nevertheless significantly disadvantaged with regard to access and use of computers and other IT services, in comparison with other healthcare professionals (Centre for Rural Health 2007). The question posed therefore, is why nurses face challenges of access to and use of computers at their job sites after being trained. And why are nurses not able to apply the information technology skills after having been trained?

1.3 Research Question

What are the challenges professional nurses in healthcare facilities in northern KwaZulu-Natal encounter to access and use computers and other technologies after being trained?

1.4 Rationale for the Study

Information technology is indispensable in healthcare management; to improve patient care, to facilitate and assist in the delivery. At the same time, these technologies have the potential to improve quality and to reduce scarce resources (Bouma 1997; InfoDev 2007).

In KwaZulu-Natal province, as it is a prevailing reality in most Sub-Saharan African countries, the major barrier to healthcare delivery remains access, directly attributed to scarce resources (Rensburg 2004:415). Information technology, if properly integrated into healthcare systems, could improve the problems of access to, and scarce resources in healthcare delivery (InfoDev 2007). Another problem posed is that lack of skills and knowledge about IT is an issue. State Information Technologies Agency offers information technology skills to public service staff, including nurses (Meade 2007). Staff who have undergone ICT training are expected to apply the skills acquired in the delivery of healthcare services. Unfortunately, such a development has not occurred: as identified from a study on the

learning needs of and opportunities for health professionals in northern KwaZulu-Natal. The findings show that nurses are significantly disadvantaged with regard to IT skills and access (computers, internet and intranet), compared to other healthcare professionals. The study also reveals that only 7% of professional nurses are computer literate after undergoing computer literacy courses, compared to 90% of therapists and 78% of managers (Centre for Rural Health 2007). This finding underlines the importance of identifying what factors hinder access to IT, by professional nurses after being trained, especially considering the fact that nurses are frontline healthcare providers (Simelane 2007).

As frontline healthcare providers and managers, nurses should be knowledgeable in the use of IT. They are expected to document the application of the nursing process using computer systems. They are also expected to make decisions based on the most current and best evidence accessible via the internet or electronic database, to seek medical or clinical assistance and advice from specialists in the tertiary hospitals if need be, and to provide information on guidelines and policies to team members (Mabaso 2006; McNeil et al. 2006:53). It is anticipated that the findings of this study will provide evidence on why nurses are unable to apply information technology skills after being trained. The outcome of the study could be used as a reference document when planning future training for nurses and it could also be used by nursing colleges to develop a health information technology module for nurses.

1.5 Objectives of the Study

The following objectives were formulated in accordance with the purpose of the study:

- To examine the computer literacy training needs of nurses in healthcare facilities in northern KwaZulu-Natal.
- To identify the obstacles faced by nurses in healthcare facilities in northern KwaZulu-Natal in accessing and using computers.

- To make recommendations/suggestions on how to overcome these challenges.

In order to achieve the set objectives, qualitative methodology will be used to collect data.

1.6 Qualitative Methodology

Qualitative methodology is referred to a general term used in scientific research which consists of a method of investigation that seeks to answer a question systematically, using a predefined set of procedures. Qualitative methodology helps the researcher to answer the WHY questions: e.g. why Tuberculosis patients refuse to take their medication, or why nurses cannot use a computer after being trained. This methodology allows the researcher to acquire in-depth information on subjects generally by simply talking to or observing participants. The qualitative method focuses on how the respondents experience and understand a particular situation (Mack et al. 2005:54).

There are three main ways of collecting data in qualitative methodology which include: in-depth interviews – used for collecting data on individuals' personal histories, perspectives' and experiences, particularly when sensitive topics are being explored; participant observation – procedures that study the natural and everyday set-up in a particular community or situation (Mack et al. 2005:53); and focus group discussions are effective in eliciting data on a particular product or service from a group (Vos et al.2005). For the purpose of this study, focus group discussions will be used to collect data for the study. This will be discussed in detail below.

1.6.1 Focus group discussion

Focus group discussion is a method of data collection used to understand how people feel or think about a service(s) or product from a group. Participants in the focus group discussions are selected because they have certain characteristics in common that relate to the topic under investigation ((Vos et al. 2005). The group is focused in that it involves some kind of collective activity. The researcher creates a tolerant environment in the discussion that encourages participants to share perceptions,

points of view, experiences, wishes and concerns, without pressurizing them to vote or reach consensus. Detail regarding issues discussed by participants in the group during the discussions constitutes the essential data in focus group discussion (Burns & Grove 2001:543).

A focus group discussion possesses the ability to produce concentrated data on a particular topic of interest. During the discussion, as participants discuss and interact within the group, rich data is elicited. In addition, the comparisons the participants make between one another's experiences and opinions are a valuable source of insight into complex behaviours and motivation. The group may provide a stimulating and secure setting for members to express ideas without fear of criticism.

As compared to other methods of collecting data, the synergy of the group has the potential to uncover important constructs, which may be lost with individually generated data. It creates fuller, deeper understanding of the phenomenon being studied and stimulates a spontaneous exchange of ideas, thoughts and attitudes in the "security of being in a crowd" (Burns & Grove: 2001:542).

Focus groups can be quite costly and require a researcher who is skilled in facilitation. Findings of focus group discussions cannot be projected onto the population at large. If the group facilitator is unskilled, the expression of the active participants only may be voiced. Such a factor creates the risk that passive participants may be unduly influenced by active participants (Vos et al. 2005).

1.7 Operational Definitions

In this study, the terms used are defined as follows:

Information Technology

The term information technology (IT) is an umbrella term used to describe complex hardware and software, lined with a vast array of technical protocols. However, it has been defined as follows:

Information technology is defined as “*the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware.*” Information technology deals with the use of electronic computers and computer software to convert, store, and process, transmit, and retrieve information (Wiki answers 2006). Knowledge, skills and understanding are needed to employ information and communications technology appropriately, securely and fruitfully in learning, employment and everyday life (KENT ICT: 2007).

As mentioned above, information technology includes a vast array of equipment and services. In this study, information technology refers to equipment such as computers and their accessories (computer systems, printers) and services (internet, intranet) used for healthcare delivery for services such as patient management and access to health and other relevant information for nursing practice, administration, education, research and networking (Wiki answers 2006).

Computer literacy

Computer literacy is the knowledge and ability to use a computer system efficiently. It also refers to the comfort level someone has with using computer programs and other applications that are associated with computers. Another valuable component of computer literacy is to know how computers work and operate (Wikipedia 2009).

Nursing computer literacy

However, there are a variety of definitions of nursing computer literacy. Nursing computer literacy simply means the ability of a nurse to use a computer efficiently. In another definition, a computer literate nurse must possess basic knowledge about computers, be able to use computer-assisted instruction programs, and be able to utilize the computer as a tool in nursing practice and should be able to have an understanding of the strengths and weaknesses of computers (Bryson:1991; Hsu et al.2008).

In today's workplace, it is difficult to imagine how professionals in any field of work can escape the need to be computer literate. Many researchers have studied what level of computer literacy nurses a nurse

should possess. According to a study on the important competencies for the nursing profession, the following were identified: hardware, software, and network concepts, the principles of computer applications, the skills of computer usage, the limitations of computer, personal and social issues; and general attitudes towards computers (Jiang et al. 2004:213).

The concept of computer or information technology literacy has always been difficult to define. This has been partly due to a reluctance to endorse detailed strategies that quickly become obsolete as technologies rapidly change. However, efforts are being undertaken to harmonize expectations in relation to levels of computer literacy. For this study, the definitions of (Hus et al. 2008; Bryson 1991:213) as defined above will be used.

Professional Nurses

According to the South African Nursing Act [No. 33 of 2005 section 30(1)], a professional nurse is a person who is qualified and competent to practice independent and comprehensive nursing in the manner and to the level prescribed, and who is capable of assuming responsibility and accountability for such practice (Republic of South Africa 2006). Furthermore, the scope of practice of a professional nurse comprises of: the provision of comprehensive nursing treatment and care of persons in all healthcare settings; taking responsibility and accountability for the management of nursing care of individuals, groups and communities; providing emergency care; ensuring safe implementation of nursing care; taking responsibility and accountability for the care of persons who have unstable and complicated health conditions; ensuring that nursing care is only delegated to competent practitioners (Subedar 2005).

Looking at the scope of practice of a professional nurse, three fundamental nursing principles can be identified: the importance of good documentation, information gathering and information sharing to

reach his/her goal of making a meaningful decision (Saba 2001:178). Information technology can help professional nurses to enhance these principles. For example, a computer system will help the nurse to keep a good record of the clinical practices and procedures which can be easily stored and retrieved. The intranet will facilitate a) communication with colleagues, b) the access of procedures and guidelines, c) on-line resources which can be used for health education also, teach student nurses and most importantly help them to stay informed. For example, at the nursing colleges, educators still write on a whiteboard during teaching. With a computer at their disposal and it knowledge, they could use presentation software such as Microsoft PowerPoint to prepare their lectures in a more professional manner.

1.8 Context of the Study

From the background to the problem highlighted in Section One above, IT can be used as a vehicle to enhance healthcare delivery as already mentioned in the previous paragraph and computer literacy is required to be able to use the equipment. Therefore, nurses need to be skilled in IT to be able to work efficiently. Unfortunately, in healthcare facilities in rural KwaZulu-Natal, nurses are unable to access and use information technology after training.

Before looking at the problem, it is thus necessary to understand the context within which these health practitioners operate.

Northern KwaZulu-Natal (KZN) refers to the northern part of the province (Figure one, attached) is where this research was conducted. According to the demarcation of health districts, northern KZN has three health districts; uThungulu, uMkhanyakude and Zululand. This area possesses two regional hospitals, 18 district hospitals, 146 clinics, and 33 mobile clinics, serving a population of approximately 2.3 million (South African Health Review 2005).

Northern KwaZulu-Natal is largely rural and it retains a legacy of previously being part of a homeland and being under-developed, isolated, with poor infrastructure, high staff turn-over, and lack of access to information. For example, information on learning opportunities, information to enable the pursuit of studies, job vacancies, etc. Access to and affordability of healthcare is compromised due to the rural nature of the area. Healthcare facilities experience difficulty in recruiting, training and retaining qualified healthcare professionals. There exists a shortage of staff and a rapid turnover of healthcare professionals, mostly doctors and nurses of all categories. Newly qualified and inexperienced professional nurses are employed and tasked with high levels of responsibility, with little or no supervision and work under very appalling conditions (Xego 2006). Although these characteristics are related to the Eastern Cape, it is worth noting that the rural areas of Eastern Cape are similar to those of northern KZN (Chetty et al. 2008). According to the 2007 state of the nation address, the shortage of nurses is a serious issue of concern as the nurse to patient ratio is 1:50 in the public sector and 1:3 within the private hospital groups (SONA REPRO 2007). According to the PERSAL report of 2000 and 2002, the professional nurses to patient ratio in KwaZulu-Natal province, stands at 1:7984 and 1:8078 respectively whilst the average number of patients seen per PN a day ranges from 13 to 60. Consequently, this has resulted in an increase in the workload of nurses. As a result, nurses have suffered from both physical and emotional exhaustion, a factor which has adversely affected their productivity and performance (South African Health Review 2005).

There exists an inequitable distribution of resources, a re-emergence and emergence of new diseases and the subsequent poor management thereof. Thus, there is a need for learning processes and structures to be linked to skills acquisition, attitude change and appropriate training of health personnel. Other challenges faced by healthcare professionals and professional nurses, in particular include lack of skills and competence of staff, lack of support, shortage of equipment and transport, poor access (road infrastructure, communication problems), insecurity and a lack of safety (Chetty et al. 2007).

1.9 Challenges of working in rural KwaZulu-Natal

According to the SANC (South African Nursing Council), a professional nurse is a person who is educated and competent to practice comprehensive nursing, who assumes responsibility and accountability for independent decision-making in such a practice; in addition, who is also registered and licensed as a professional nurse under the Nursing Act (Republic of South Africa 2006). Due to a lack of healthcare professionals, professional nurses manage primary healthcare clinics and, in some exceptional situations, such as where there are no doctors, they function as managers of the hospital. For example, at Ekombe Hospital, in the area, from 2005-2006, where only one medical doctor in the hospital serving a catchment population of over 100,000, prevailed, the sole doctor would not have been able to perform his services properly without the support of professional nurses (Kanana 2006).

1.9.1 Skills and competence of staff

Due to the high turnover of staff, skills are constantly lost from the district and basic in-service training is continuously needed to upgrade the skills of newly qualified staff working in unsupported environments in rural areas. Clinic managers complain of limited managerial and clinical support from district hospitals. Thus, due to staff shortages, primary healthcare supervision at clinics is not done regularly. A study on the role of primary healthcare supervisors in northern KwaZulu-Natal showed that 32% of clinic supervisors and doctors are unable to do regular clinical visits due to the shortage of doctors (Nkosi 2008).

1.9.2 Shortage of equipment

Hospitals in this area experience a shortage of beds and bed linen, bedside lockers, and medical equipment such as blood pressure machines. Bedside lockers are old, rusty and difficult to clean, and in some hospitals, without wheels; such a situation results in difficulties to push or pull where necessary. For example, in the maternity wards, mothers share beds and when it becomes too busy,

mothers sleep on mattresses on the floor. When a shortage of equipment is experienced, nurses become more stressed and frustrated as patients who were admitted with threatening bed sores develop further such bed sores in the hospital because the bed linen is either lacking or not cleaned (Mtshiya 2009; Ntuli 2007).

1.9.3 Poor access to health facilities

Poor access to healthcare facilities arises as a result of bad roads and poor communication. Bad roads are a major challenge to both patients and health workers using health facilities in rural areas as roads are not tarred, and furthermore become slippery when it rains. As a result, patients and staff experience difficulty in traveling to the hospitals and clinics in these areas (Xego 2006).

In rural areas, road transportation is the main mode of transport. The minibuses are usually old and invariably overloaded and in a poor condition. The poor condition of the roads affects transportation of patients to referral hospitals. Thus, for example, in Nkuzana clinic in rural KwaZulu-Natal, it was reported that a 12 year learner who had suffered a snake bite died after walking for three hours to the nearest clinic (Mthembu 2008). The poor condition of the existing roads to the clinics in the rural and remote areas and the lack of transportation to access these facilities pose major challenges, as people invariably need to spend much time on the road waiting for transportation. As a result thereof, some people choose not to go to the clinic when they are ill (Rensburg 2004:415; South African Health Review 2005). Although ambulances are available, the reality of bad roads and the high demand for conveying patients results in the turnaround time for an ambulance being three hours (South African Health Review 2005).

1.9.4 Poor communication facilities

Access to a reliable medium of communication constitutes a major challenge facing nurses in rural areas. As already mentioned above, in rural areas, where nurses manage clinics and wards in the

hospitals, a faster and more reliable means of communication is vital to enable nurses to seek second opinions from specialists such as general practitioners, and other colleagues in regional or referral hospitals. Unfortunately, the main means of communication (telephones) in these facilities, are sadly either broken or not functional. Although clinics have telephones and radiophones, they are often out of order. The situation deteriorates further when it is windy and during winter periods as frequent power failures occur (South African Health Review 2005). For example, when there is a power failure, the telephone systems goes out of order and it becomes difficult to communicate with the hospital, especially when there is either an emergency or a patient needs to be referred urgently. Consequently, communication with the referral hospital becomes extremely difficult. It is important to emphasize that the telephone remains the only means of communication as there is no access to intranet in most of the clinics (Mthembu 2008). Although at certain clinics, sisters-in-charge have cellular telephones and airtime is being provided by the Department of Health, on most occasions it is difficult to communicate due to poor connectivity. As a result the sister-in-charge spends more time on the phone than expected. There have been complaints from sisters-in-charge at clinics that the monthly airtime provided on cellular phones is not sufficient, as the airtime often expires prior to the end of the month (Mthembu 2008; Zulu 2008). Thus, it is difficult to communicate via cellular telephones. The challenges encountered by healthcare professionals working in northern KwaZulu-Natal are numerous and worsened by frequent power failures.

1.10 Conceptual framework

A conceptual framework is an intermediate theory that has the potential to connect to all aspects of enquiry. It can also be defined as a link of all sets of agencies that assist in the critical analysis which can be discussed together or separately.

Conceptual frameworks have been widely used in research to help researchers to identify where his/her

particular research study fits in the broader picture. For this research problem, various conceptual frameworks were examined but it was found that limitations in their applicability to this project existed. Among these are the following; the technology acceptance model and computer attitudes scale (Barry et al. 2007). These frameworks were utilized to examine the relationship between computer attitudes and ease of use, and retained and applied skills. From the literature, these frameworks were applied in situations where an organisation was in the immediate process of introducing an innovation or a certain new technology. However, in this study, information technology has been introduced and professional nurses have been trained on how to use such technology. Secondly, these frameworks remain limited to results only. In the present study, a conceptual framework has been adapted from mapping capacity in the health sector (Lafond et al. 2002). See figures two and three below.

1.10.1 Description of conceptual framework

Information technologies are cross-cutting tools and services that can be integrated at any level of the healthcare system. The conceptual framework for this research was adapted from mapping capacity in the health sector. The national health system possesses four main levels of capacity; health system, organisational, health programme personnel and individual or community level. All levels are further discussed in detail below. Health system performance includes access to services, quality of care, equity and efficiency, although there are doubtless other relevant performance measures. Access, quality and efficiency are accepted markers of health system performance, while equity is a performance variable that reflects the ability of the health system to provide appropriate and acceptable healthcare to all those who are in need thereof, particularly the poor (Lafond et al. 2002).

Health system level – this refers to the totality of the healthcare system in a country which comprises preventive and curative private health services, the public-private sectors, and primary, secondary and tertiary care. This level can be considered as a collection of institutions or organizations collaborating to

deliver health care and/or promote better health. The health system level is influenced by organisation, personnel, individuals and communities (Lafond et al. 2002). The variables at this level include human and financial resources, and the infrastructure that may enable the process of delivering effective health care. Information technology such as information systems can be deployed to manage financial resources and monitor the financial policies of the system. Accountability refers to both the financial and programmatic transparency of the health systems to funders as well as internal units of the health system. Thus, for example, IT systems can be used to facilitate the timely submission of financial reports to both funder and senior managers.

Organisational level – focuses on the structure, processes and management systems that enable specific health related organisations to function effectively. Examples include health service organizations (government, private for profit, or not-for-profit) and civil society organisations (non-governmental or non-health service agencies). Examples thereof are the human, physical and knowledge resources of an organisation and the processes employed to transform these resources into services or products. At this level, information technology which is relevant to organisational performance could be used for strategic planning, financial management, information management, logistics systems, or for communication and networking.

Human resource (health programme personnel) level – the term refers to the collective body of individuals who work in the health system and perform clinical, managerial or advocacy, technical, managerial and support services. For health personnel to perform effectively and contribute to performance, sufficient resources must exist, i.e. for training and remuneration and materials for basic professional education and training events. Training in information technology can equip personnel to acquire skills and knowledge which will assist them in the performance of their services. Managers can be trained to use information technology, such as web-based e-learning, and videoconferencing to

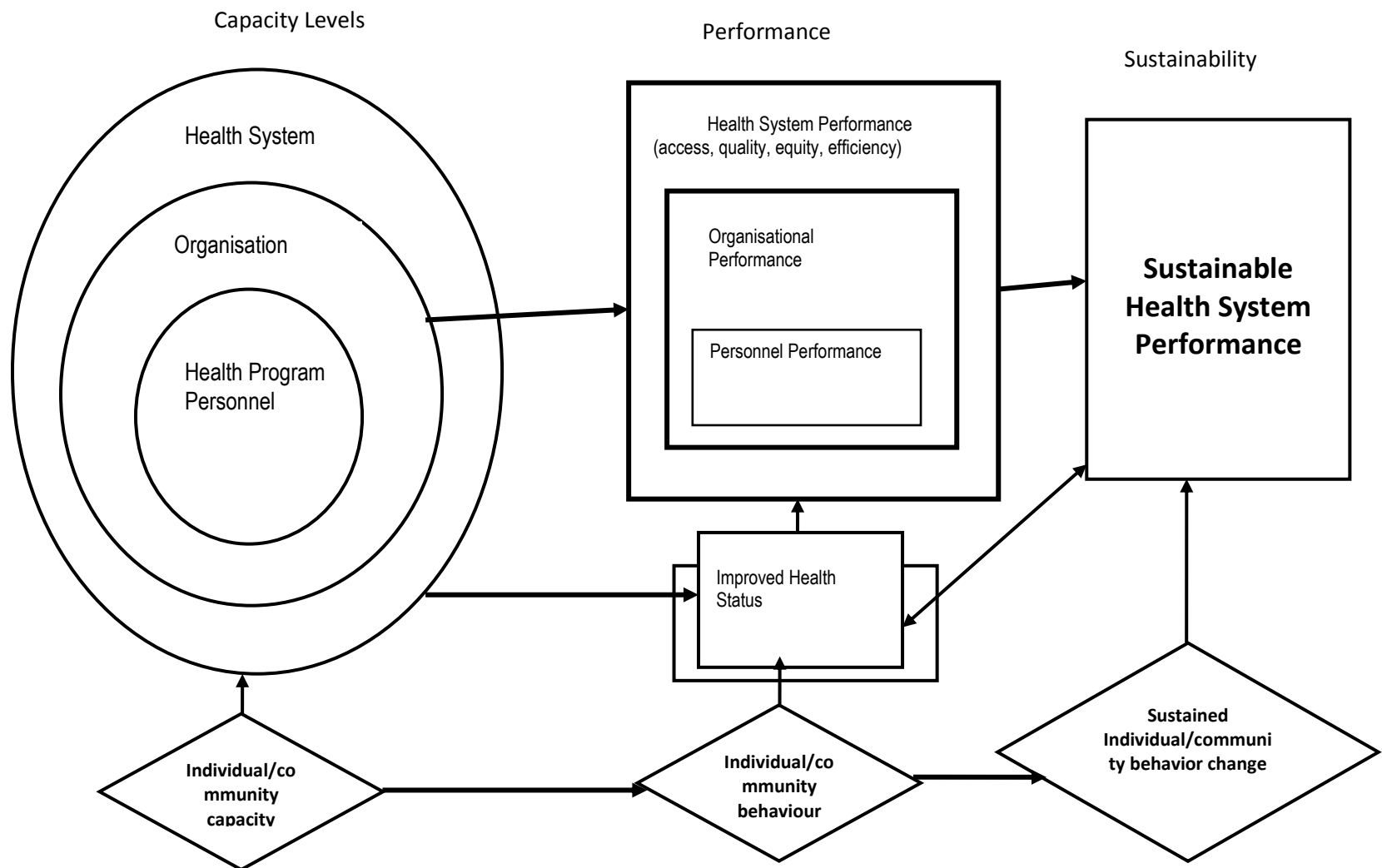
provide services without having to leave their offices. For example, the introduction of telemedicine services between King Edward VIII and Edendale hospitals. Here dialogues and images are sent via telephone lines from the sending site to the receiving site where diagnoses can be done (Health KwaZulu-Natal 2005). Here, services providers do not have to travel to clinics to attend to patients and it also reduces the numbers of referrals sent to referral hospitals.

Individual or community level – is the key to building a sustainable health system for the people who benefit from the health system. Individual members in the health sector can be situated at organisational or health system level. Individuals can help increase the quality of services by supplying health personnel with important information about their previous health problems (Lafond et al. 2002). Information technology can be used to provide health education to clients. For example, the internet and Call Centers e.g. AIDS and CANSA (Cancer Association of South Africa) helpline whereby people call in via telephone to seek assistance on health-related advices. Such services have provided a platform to offer information in the context of an on-line social network.

Analyzing the function of a conceptual framework for this research project, in figure two below, information technology is viewed as a vehicle to enhance delivery at any level of the system. Therefore, looking at the framework below, information technology can be placed at any level of the healthcare system.

Figure 1: Map of KwaZulu-Natal

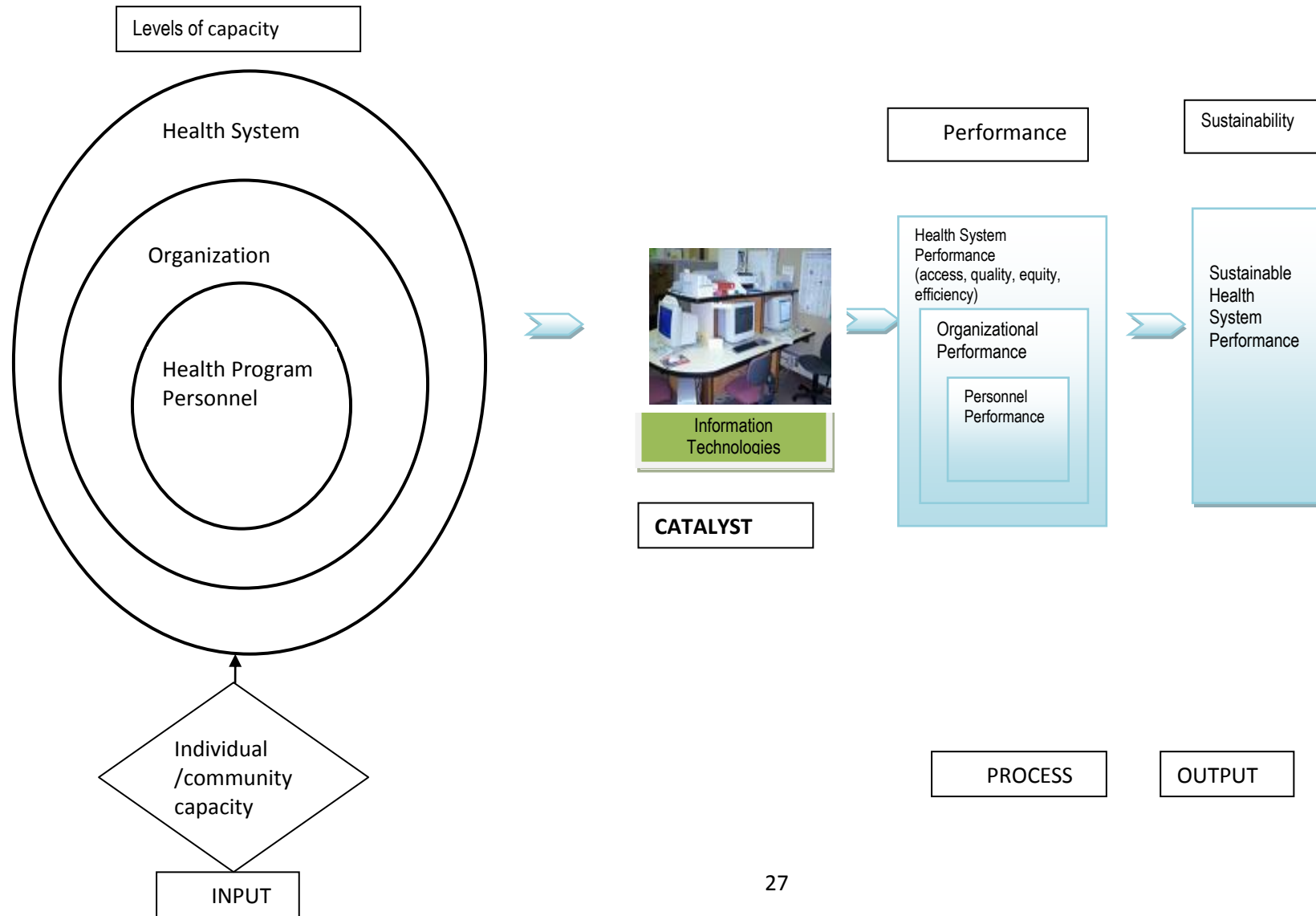




Conceptual framework from Lafond A., L Brown & K. Macintyre (2002).

Figure 2: Overview of original conceptual framework

Figure 3: Adapted conceptual framework



1.11 Chapter layout

The thesis is divided into the following chapters:

Chapter 2: Literature review

Chapter 3: Research methodology, research design, data collection tools and the study population

Chapter 4: Presentation of results

Chapter 5: Discussion

Chapter 6: Conclusion, recommendations

1.12 Summary of Chapter One

The chapter commenced with a general background to information technology in healthcare delivery.

The problem statement and purpose of the study were provided. The afore-mentioned was followed by

the research objectives and the significance of the study. The definitions of key terms used therein were

included. The following next chapter presents a review of literature relevant to the research problem.

CHAPTER TWO: LITERATURE REVIEW

2. Introduction

Literature was reviewed from different sources by the researcher in order to provide a more comprehensive understanding of the research topic. Major areas of literature review covered are; the digital divide and interventions to bridge the divide, information technology in healthcare, factors that hinder access to information technology by healthcare professionals, adults and computers, learning theories, and qualitative methodology with more focus on focus group discussion.

2.1 Scope of the Literature Review

Relevant materials were collected from the library and the Internet. The literature search was done using databases such as South African Bibliographic and Information Network (SABINET), South African National Bibliography (SANB), Dissertation Abstracts Ondisc, and the EBSCOhost Web. Online packages were also consulted, such as the British Medical Journal (BMJ), Electronic Journal of Information Systems in Developing Countries (EJISDC), Elsevier Gateway to Science, AHIMA, Pub Med and Google-Scholar. Also, librarians working at University of KwaZulu-Natal Medical School were consulted and other health related information centres, WHO (World Health Organisation) in Geneva and the Regional office in Brazzaville, were consulted.

In the course of writing this dissertation, the researcher intends to draw her examples from South Africa and most particularly KwaZulu-Natal Province for illustration. From the literature reviewed, there are very few empirical studies from South Africa and KwaZulu-Natal in particular that have focused on the use of computers by nurses thus there is little documented literature on this topic. However, examples have been used mostly from the USA and Europe and from other rural provinces within South Africa e.g. Eastern Cape. This choice is dictated by their being the only countries and provinces she was able to come across with literature on the above issues.

On issues relating to ICT, internet usage, cover and connectivity is at a particularly dynamic stage all over the Africa continent, which means that there are new developments and announcements happening on a daily basis somewhere on the continent. Therefore, some statistics in this dissertation should be seen as a “snapshot” that was available at the time of writing this report; it is expected that certain facts and figures presented in this report may become dated very quickly.

2.2 Information Technology

The power of IT as enablers of change for good, as well as for bad – is undeniable (InfoDev 2007). For the past two decades, the world and, most particularly, the developed countries have witnessed significant changes in all aspects of life (economic, education, communication, health, banking, finance, social, cultural, geo-political, etc) that can be traced to the advancement of information technology. These changes have resulted in what is known as “the knowledge society.” Information technology has made possible a) finding fast access to information, b) the distribution of information as well as a new way of providing healthcare in real time.

Information Technology have been described as a powerful tool to boost the economic growth of the world as they have the potential to increase efficiency, provide access to new services, create new opportunities for income generation and also important for sustainable development. Through the advancement and development of information technologies services such as e-government, e-banking, e-commerce, e-learning, etc have emerged to facilitate service delivery. These services are discussed below.

E-government – Is the use of information technology to increase civic engagement, improve transparency and accountability, efficiency and effectiveness of government operations and service

delivery to its citizens and the general public at large. E-government is used to empower individuals and communities and enable governments to be more efficient and responsive to the needs of citizens (InfoDev 2007).

In Africa for example a number of countries have developed comprehensive e-government programs. Some examples include:

- **Egypt** has one of the most developed e-government programs on the continent. The Egyptian government has established a service portal that is used to enhance service delivery.
- **The Cape Gateway Project** provides government services through an electronic medium to citizens in the Western Cape Province of South Africa. It focuses on developing an information resource which will be accessible to the public through an online portal, a telephone contact centre and a centrally located walk-in resource centre in Cape Town (Bridges 2007).
- **E-Rwanda** was developed to modernize government systems in Rwanda.
- **E-Ghana** was created to support e-government initiatives and to facilitate high speed connectivity within the country.
- **E-Gambia** was introduced in 2005 to support the delivery of government services through mobile technologies.

It is worth mentioning that countries with e-government programmes have benefited from the World Bank grant to establish these programmes (ICT for Africa 2007).

E-banking – is the deployment of information technology services to the banking sector, new types of banking opportunities such as cell phone, telephone and internet banking have emerged. The advantages inherent in these new opportunities rest in their ability to overcome barriers of time and distances. In addition, it has reduced the costs of a banking transaction and has made banking more accessible.

E-commerce is business on line or on the web. Presently, Africa has developed some e-commerce ventures though many are concentrated in South Africa and a few ventures are emerging in Kenya and Nigeria. Some examples are:

- South Africa: M-web commercezone.sa – South Africa’s biggest business to business portal, offering procurement solution; Quadrem Africa – Africa’s digital market place, Pick ‘n Pay online, Kalahari.net for music, CDs, DVDs, games, electronics and books; NetFlorist, an online flower and gifting company; Woolworths Online, etc.
- Nigeria – shopforless.com and computerPort online retailer and distributors of office supplies.
- Ghana and Uganda are still gradually entering the sphere of e-commerce. In these countries, the ventures deal mostly with contemporary African arts and crafts (ICT for Africa 2007).

In education, information technology has been used to increase access to education, to improve teaching and learning by improving the efficiency of educational management. Information technology has the potential to break down the traditional classroom walls and extend education to anyone, anywhere and anytime (Addo 2007). In education, emphasis has been to use the internet, radio and television technologies to provide distance education at tertiary level with courses offered by institutions such as the virtual universities and classrooms, videoconferencing, etc (Trucano 2007).

According to a survey on IT in education in Africa, South Africa is gradually integrating IT in all aspects of education. It boasts more than a decade of accumulated experiences from a wide range of projects and programmes by noteworthy champions across the spectrum of communities. It has introduced a variety of IT models; digital content development, teacher training and professional development, optimal usage, partnerships, and resource mobilisation have encouraged significant learning among innovators, practitioners, and policymakers. Being the host for the 2010 World Cup, the national

government has embarked on accelerated economic growth strategies, to move to broadband and promote ubiquitous ICT access. As a result of these advances, South African educational systems are set to grow significantly in IT for education (Shafika 2007).

Within the communication sector, the medium of communication has increased exponentially. The world has experienced the emergence of mobile phones, wireless communication, and a wide range of broadband connectivity infrastructure; VSAT and fibre, DSTV, etc. aimed at improving communication globally. In the health sector, the benefits of information technology lie both in its flexibility to interact and ability to reach a wide spectrum of communities. Information technology has been utilized as a tool for disease prevention, control and monitoring and for health promotion, etc (Jensen 2005).

2.2.1 Overview of the digital divide

Whilst the developed world is living in a global knowledge economy where knowledge, learning in communities, and information technologies are the basis for social and economic development and the use of IT sector have been integrated into virtually every aspect of life, meanwhile, Africa's information technology is gradually growing. The phenomenon is referred to as the digital divide. In Africa, a significant proportion of the population has no realistic opportunity of tapping into the global store of knowledge (Chisenga 2002).

While the developed nations are experiencing massive proliferation of information technology, in Africa, there is a dying demand for more access to reliable and adequate information (Godlee et al. 2005; European Space Agency 2007). There are various definitions of the digital divide, each with a different emphasis. Some emphasise access or lack of access to the internet, while some place the emphasis on the entire spectrum of information technology. The following explanations were found relevant to the research. The Digital Divide website describes it as follows

In just about every country, a certain percentage of people has the best information technology that society has to offer. These people have the most powerful computers, the best telephone service and fastest internet service, as well as a wealth of content and training relevant to their lives.

There is another group of people. They are the people who for one reason or another don't have access to the newest or best computers, the most reliable telephone service or the fastest or most convenient internet services. The difference between these two groups of people is what is referred to as the Digital Divide (Bracey 2000).

Another definition emphasises the gaps that exist between those in the cities and those in the rural areas, between the educated and the uneducated, between the economic classes and between the industrialised and less-industrialised nations of the world. The disparities also exist between economic status, gender, race, physical abilities and geographic location between those who have and who have not with regard to:

- access to information, the internet, and telecommunication facilities (fax and phone, etc),
- the skills, knowledge and abilities to use information and the internet and other technologies (American Library Association 2000).

In Africa, the digital divide is multifaceted as there exists a gap of access to IT between urban and rural/remote populations. In addition, other categories are affected, inter alia females, children, the elderly, those with health problems and disabilities, ethnic minorities, the illiterate and poorly educated and others—both within and between nations. It is therefore more accurate to understand the “digital divide” as encompassing a plurality of divides (Chisenga 2002). The major issue in Africa is not that of having access to the best information technology that the society can offer as is the case in the developed nations. In most cases, it is a question of having access to the very basic information technology that the society can offer. The extent of the digital divide can be illustrated by examining the following:

2.2.2 Characteristics of the digital divide

Access to fixed telephone lines usage

Within the continent, there are great disparities regarding availability and access to telecommunication facilities. Fixed line telephones are the most unevenly distributed form of communication. Of the 26 million fixed lines in Africa, 75% are found in just six of the 55 African nations. According to statistics from the International Telecommunication Union for 2005, telephone density among many African countries revealed a prevailing telephone density of less than one main line serving every 100 people. The report also demonstrated that the majority of people on the African continent have never made a telephone call. Africa remains by far the world's lowest penetration of fixed telephone lines. In the continent, there remain over 20 countries which record a national average of one main line serving every 100 people. While access to a telephone in the developed countries is taken for granted, in the developing countries telephone access, remains a luxury if the purchase thereof even becomes available to ordinary people. Dial-up remains the most widespread form of internet access, and fixed lines remain a common means of accessing the internet (International Telecommunication Unions 2003; Ernberg 1998). The situation is worse in rural areas as a result of the geographical distances, low population densities, low levels of economic development and low levels of skills (Westerveld & Maitland 2002).

The gap in fixed telephone usage has been complemented by mobile telephones. For example, in 2004, cellular networks coverage rose to 80% in Tanzania, 85% in Senegal and 96% in South Africa. In South Africa, through the introduction of cheap cellular telephones and prepaid phone cards, has made communications more accessible to millions of South Africans and this has had a concrete impact on people's lives. Together, the two GSM networks MTN and Vodacom cover more than 71% of the population of South Africa (Internet Usage Statistics for Africa 2009).

[Access to personal computers](#)

Although Africa has experienced an increase in the availability of computers, it is difficult to obtain the latest and up-to-date computer equipment, especially personal computers. A large proportion of the population with access to computers operates only from their work places, whilst students have access

in universities or colleges. The concept of computers for home use remains of a very limited nature partly due to the cost of a computer. In Africa, the cost of a personal computer, usually imported, far exceeds the means of most people. In certain countries, the personal computer is still considered as a luxury item and thus, attracts high import duties and tax, thereby making the equipment more expensive and unaffordable to the majority (Jensen 2005).

Although there have been notable efforts in some countries to reduce import duties on computers, communication equipment and peripherals are still often charged at higher rates. The high cost of computer hardware in Africa has a major impact on the continent's ability to improve network readiness, as the cost often remains the largest component of a network startup budget (Jensen 2005). This situation may change in the near future as some African countries (South Africa, Egypt, Nigeria, Rwanda) have started assembling and manufacturing computers. Such development reduces the cost of computers and has increased access (Jensen 2004).

[Access to the Internet](#)

In 2004, less than 3 out of every 100 Africans use the Internet, compared with an average of one out of every 2 inhabitant of the G8 countries (Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States of America). Furthermore, the developed world enjoyed 8 times the Internet user penetration rate than in the developing world. However, due to the advancement of IT, there has been a significant increase. According to the Internet World Statistics, Internet access stands at 6.7% and in South Africa internet usage is 9.4% (Internet Usage Statistics for Africa 2009).

The level of literacy rate on the continent is an issue of concern because a large number of people on the continent are not able to read and write. This proves most detrimental to sustainable development on the continent (Omolewa 2004). Such a factor arises because illiteracy remains the number one

enemy to Africa's development, contributing greatly to poverty and the marginalisation of its people. Another disadvantage of illiteracy to development is located in the populations' inability to use the various forms of information technology to access digital and electronic information sources (The Horn of Africa Bulletin 1995).

2.2.3 Interventions to bridge the Digital Divide

In 1987 President Boigny, the former President of Ivory Coast warned his fellow countrymen as quoted:

"Africa missed the industrial revolution, we can't afford to stand aside and let the communication revolution go by too" (Rahedi 2000). The statement was made to call on the continent to make every effort to be part of today's information age.

This section focuses on interventions towards the development of low cost technology aimed at reducing the digital divide in Africa. A number of initiatives have been implemented. These interventions are discussed below:

2.2.3.1 Regulation of telecommunication policies

One of the most important limiting factors to affordable and efficient use of IT in sub-Saharan Africa is the frequent ineffective regulation coupled with the large share of the market being held by monopolies which has resulted in ineffective competition, high prices and limited investment from the private sector. The dominance of monopolies together with the lack of independent telecommunication sector regulators which are able to encourage effective competition in the sector, remain a key challenge (Gerster & Zimmerman 2003).

African governments can promote internet access by ensuring the implementation of laws and policies that would make it easier for individuals, organisations and donors to provide public internet access.

This would include reducing importation taxes on IT equipment, and instituting telecommunication

policies to facilitate the provision of access to the internet (Jensen 2005). For example, South Africa is one of the few African countries that have introduced new regulations policies that will bring limited competition into the fixed-line and mobile markets. This new policy is aimed at the liberalisation strategy to deregulate telecommunications (South Africa Bridges 2009).

2.2.3.2 Public Internet Facilities

“The internet’s potential for improved information access can never be fully achieved if a significant segment of the population cannot reach the Internet” (Information Access Institute 2007). Since a majority of people on the continent cannot afford computers, public internet access can be used to provide access to a large community. Internet facilities could be provided in certain public places such as post offices. The postal offices in most countries are well established and situated in the cities or towns. Other public places where public internet access can be provided include libraries, archives, and museums (Mayanja 2009).

2.2.3.3 Telecentre and information resource centre

A telecentre is an alliance of telecentre practitioners and organisations, who have a stake in telecentre activities, and who believe in the power of working together to learn and address issues of common interest. It aimed at working together to share experience and create a platform for action to increase social and economic in the grassroots (Mayanja 2009).

This is a first-stop business centre. It offers a wide range of basic communication services to communities depending on the services they provide and the needs of their customers and their surrounding area. These services range from the provision of basic communications services, including voice telephony and fax, photocopying, progressing to the more advanced applications such as computer processing, Internet and computer training. It can be either governmentally or privately

owned. The depth of services offered by these centres is defined by the owners (IDRC 2007).

The governments of African countries should encourage and support the use of telecentre and information resource centres. Such centres will provide access to information technologies to a wider population. The literature distinguishes between four types of telecentres: Public call offices, community telecentres, multipurpose community telecentres and mobile Internet Units. Some examples of telecentres in South Africa are Botlokwa, Phalala, and Makuleke, Mankweng, Bakgaga-ba-Mothapo, and Thakgalane (IDRC 2007).

Public call offices – provide access to public telephone(s), fax, photocopying and/or receipt of incoming calls or faxes. They are situated all over the country possessing a low purchasing power, and where consumers are not able to afford individual access to telecommunication. Senegal ranks as the country with the most public call offices in Africa, with about 9.000 offices spread throughout the country (UNESCO 2006).

Community Telecentres – uses information technology services to support specific activities needed by the communities in urban or rural areas. The services provide information-based services for sustainable development, with a focus on training and educating the inhabitants of the communities. An example thereof is the Telecenters Communautaires Polyvalents in Mali (UNESCO 2006).

Multipurpose Community Telecentre – extended basic Community Telecenters by offering more advanced IT services such as Tele-education, telehealthcare and community online services. Particular examples include the Asante Akim MCT in Ghana, and telecentre programmes in Uganda and Mozambique (UNESCO 2006).

Mobile Internet Units – bring the benefits of information technology and the internet to rural and underdeveloped areas. These units retain the advantage of potentially reaching larger numbers of consumers. Although their impact on local communities is more limited, important leadership programmes introducing information technology and raising awareness among rural populations can possibly be instituted and the market for potential IT may thus be explored at reduced risk (UNESCO 2006).

Furthermore, technologies are changing and there have been wide range new developments and protocols that are suitable and more user-friendly in resource constrained environments. Some examples include:

The Wireless and Satellite technologies

In Africa, during the period when Internet access depended on fixed lines, very few people had access to the internet. The need remains to shift from analog to wireless and satellite technologies. Among major benefits of satellite and wireless transmission in developing the rural parts of the world, are the following; satellite data services have the capacity to cover vast areas, provide access to remote or underserved areas, and can function properly in resource constrained environments. In particular, two-way VSATs provide a potential solution to internet services in rural areas. Some examples of such projects are the AED-SATELLIFE network which is targeted at increasing access to health and medical information through the use of handheld computers which are connected via the local cellular network (AED-SATELLIFE Bulletin 2005). Another example is the Dudal distance educational and ipath secure tele-consultation platforms. These initiatives are specially tuned to function on satellite technology over low-bandwidth connection of 25 kilobits/second (Geissbuhler et al. 2003). The telemedicine project at Eastern Cape (Chetty et al. 2007) just to mention a few.

Mobile Telephone Technology

In Africa, the recent development in cellular telephone technology has proved significant. Africa's mobile cellular growth rate has ranked as the highest over the past 5 years, with an average close to 60% annually. At the end of 2004, the total number of mobile subscribers continent-wide was 76 million. Today, mobile phones have become the basic means of communication, providing more advanced features such as the internet, radio and email services. The 3G mobile phones have inbuilt Wireless applications protocol (WAP) which can be used to access sporting results, news headlines, send and receive text messages using the short message system. Most recently, the GPS feature has been included on cellular phones (Westerveld & Maitland 2002).

In the health sector, for example, mobile phones can be used for a wide variety of services. Some examples include: mobile phones keep track of HIV and TB treatments. Counselors use mobile phones to follow the treatment plan for anti-retroviral drugs and by sending text messages to TB patients to remind them to take their drugs (InfoDev 2007). In India, mobile phones and wireless technologies are used to transfer an ECG and to listen to heartbeats via a stethoscope with the doctor and the patient several thousand miles apart from each other (Ganapathy 2008) and the use of telemedicine in KZN and Eastern Cape provinces respectively (Chetty et al. 2007; Health KwaZulu-Natal 2007).

WiMAX (Worldwide Interoperability for Microwave Access)

WiMax is an interface that allows the utilization of a low cost, always operable, and truly mobile broadband wireless network. Among the most promising technologies may be WiMAX. It also provides wireless data in a variety of ways.

Such technology offers high-speed connectivity over a range of up to 50 kilometers and a wide geographical range. WiMAX is relatively quick, easy to use and economical to install. A particular

advantage with WiMAX is derived from the fact that the main investment burden falls on users rather than on network or service providers, or the government. The start-up costs are much lower, thus the investment burden is more widely shared (Wireless Webopedia 2005).

“Fixed-wireless” as a formula for low-cost Internet access

The fixed wireless can ensure greater user affordability, particularly by virtue of low-cost installation and the use of license-exempt frequencies. Fixed wireless systems utilize a small, inexpensive microwave antenna that is attached to a local radio network at the customer’s premises. The provision costs are far lower than practical costs inherent in installing copper-based cables. They are also cheaper to install in countries with rugged terrain—as long as the line of sight is available. Along with low-cost equipment and installation, the lack of regulation over the supply of fixed wireless also presents a considerable cost advantage. The advantage of fixed wireless rests in its ability both to connect with users in remote areas without the need for laying new cables and the capacity for broadband width that is not impeded by fibre and cable capacities (International Telecommunication Unions 2003).

In February 2002, Telkom South Africa selected a technology for providing fixed wireless access telecommunication services throughout South Africa that operates in the 1.9 Gigabits frequency band. It takes advantage of frequency-hopping CDMA (Code Division Multiple Access) technology and supports toll quality voice, low-speed voice band data (V.90) and ISDN (Integrated Service Digital Network)-Basic Rate Interface (International Telecommunication Unions 2003).

Wi-Fi (Wireless Fidelity): Cheap, unregulated and unlicensed broadband

Wi-Fi is a local area network that uses high frequency radio signals to transmit and receive data over distances of a few hundred feet, via Ethernet protocol. Such technology contains an advantage in enabling an increase in wireless access by constructing the systems from the bottom up, by small and

local entrepreneurs. The model is relatively inexpensive and is responsive to the local needs and realities. It can also create employment, especially where the provision of Wi-Fi service is combined with the sale of other services (e.g. mobile prepaid recharges, photocopying, etc). As the number of local providers increases, the overall capacity of the network is likewise enhanced. Each new operator increases the number of pathways between any two points (International Telecommunication Unions 2003).

It should be noted that the list of examples presented above should be considered as a snapshot and not exhaustive.

As mentioned above, these new technologies and protocols can provide broadband connectivity, which is suitable in resource constrained areas. Thus, access will be increased. The following section will focus on IT in the health sector.

2.3 Information Technology in the Healthcare Sector

Information Technology is a tool to enhance healthcare systems to prevent, monitor, and treat illness and disease. Given the right policies, organization, and resources, information technology can act as a powerful tool in the hands of those working to improve healthcare delivery in developing countries (UNECA 1999).

The latest advances in information technology in the 21st century have improved the ability of healthcare providers to access accurately individual health risks, to understand more comprehensively basic physiologic and pathologic processes and to revolutionize diagnosis through new imaging and scanning. For example, with the internet, radiological images such as X-rays, CT (Computed

Technology) and MRI (Magnetic Resonance Imaging) can be scanned, stored and transmitted via the Internet for second opinions, the use of cell phone to aid compliance with drug therapy for HIV patients in Cape Town (Bello et al 2004; Ahmed & Berlin 1997; Skinner et al. 2006).

In the areas of networking and communication, healthcare professionals' means of communication have also changed considerably. Mobile telephone, electronic mail and videoconferencing have provided new and fast options of sharing and networking with one another. Digital technologies are making visual images and the voices of people more accessible through TV, video, portable disk players and the internet, which have improved opportunities for people to share opinions, knowledge and experiences.

Reliable information and effective communication are crucial factors in healthcare practices. The use of appropriate technologies can increase the quality of and save the lives of many individuals/patients. Increased access to reliable and up-to-date information not only helps healthcare professionals but also assists the communities to improve their health and lifestyle. Furthermore, information technology can be utilized to disseminate public health information to enable remote consultation; further uses are to enhance the capacity to monitor and to perform disease surveillance, and to educate and assist in research in the workplace (Dubow 2006; Willmer 2005; Saranto & Leino-Kilpi 1997; Miller et al.1997).

Unequal distribution of services and resources remains a major problem in the healthcare sector. Information technology services such as telemedicine and telehealth present opportunities to provide access to other services equally throughout the country (Klecun-Dabrouska & Cornford 2000). For example, in the USA, telemedicine is used to provide health services and health promotion education to residents in rural areas. PDAs (Personal Digital Assistant) have been customised specifically to suit the needs of the nurses. They are used to provide access to accurate and reliable breadth of information

resources, including clinical drugs, lab guides, free CME (continuous medical education), and prescribing tools at the point-of-care, thus allowing nurses more time to attend to patients' needs. Personal Digital Assistants have been described as the tool that has revolutionized the nursing profession in the USA (Skyscape 2000; Davenport 2003).

2.3.1 Some examples of using Information Technology in the health sector

In developing countries, UNECA (United Nation Economic Council for Africa) and WHO (World Health Organization) have challenged African ministers of health to develop policies that would facilitate the integration of IT into health systems, thereby to complement scarce resources. Though the pleas by UNECA and WHO have been adhered to, the integration thereof in healthcare remains rudimentary; it is only on a low scale and mostly available in urban and territory and/or academic hospitals. Certain examples on information technology usage in developing countries include: the use of PDAs (Personal Digital Assistants) by healthcare providers in Uganda, Kenya and the Gambia, to upload medical reference materials on HIV/AIDS, TB, and malaria, with specific attention to local treatment issues (Dubow 2006; Morris et al. 2004; Galblum 2002; Ojo 2006). In Ghana, community volunteers use PDAs to collect data as part of a measles vaccination programme. In remote primary healthcare facilities in Zambia, email is used to seek specialised advice or second opinions from specialists located at Ndola Central Hospital situated in the city (Chanda 2004). In South Africa, telehealth facilities are employed to improve access to healthcare services in the vast regions of the Eastern Cape and telemedicine to provide continuing medical education (CME) to healthcare professionals in KwaZulu-Natal (KwaZulu-Natal Health 2007; Rajeev 2006). Also, in some French speaking African countries, RAFT (Reseau en Afrique Francophone pour le Telemedicine) has been introduced. This system is used as a platform to provide continuous medical education. In the Eastern African countries, AMREF (African Medical and Research Foundation) uses telemedicine to bring healthcare to the people (AED-SATELLIFE Bulletin 2005).

Along with the benefits of IT comes “increased awareness” that the amount of skills for their optimal functioning has increased exponentially. Those who do not have these skills or are not computer literate risk being left behind as the healthcare systems become increasingly computerised. Healthcare professionals, including nurses, are suddenly challenged to incorporate information technology into their clinical activities. In some health institutions, such as the Albert Nkosi Luthuli Central Hospital, computer literacy is now a job requirement (Mthembu 2007).

As the health sector continues to be technology driven, there is an urgent plea to healthcare professionals, especially nurses, to be skilled in information technology. Such a situation arises because the nursing profession is information intensive, and up to 35% of a nurse’s time is consumed by information-related activities. Therefore, it is imperative that they are trained on how to use information technologies in order to be able to work effectively and efficiently (Barry et al. 2007; Romano 1990; Gerrish et al. 2006). Studies have emphasized that without information technologies skills, nurses might fall behind developments in their profession and not be able to perform competently, as the profession is becoming technology driven (Ball 2000:3001; Bouma 1999). Although nurses are interested in acquiring computer literacy, studies have shown that they are confronted with various challenges in applying such new skills into their daily activities. The challenges encountered are discussed below.

2.3.2 Hindrances to IT by healthcare professionals in the work environment

The following examines factors that hinder access to and use of information technology by nurses in the work environment after training. “Work environment” refers to primary healthcare facilities, hospitals and district health offices.

2.3.2.1 Nurses’ mixed and ambiguous attitudes towards information technology

Prior studies on the use of information technologies by nurses have reported on the fact that such

professional workers are uncomfortable and inexperienced regarding the use of computers in relation to their work (Alquraini et al. 2006: 358; Marasovic et al.1997:93). However, these studies were conducted at an earlier stage but findings from recent studies show that nurses attitudes towards computer demonstrate a positive change (Gerrish et al. 2006:95; Iliyasu et al. 2005).

The literature has also highlighted the level of anxiety and resistance displayed by nurses towards the use of information technology. Anxiety is associated with attitudes manifested in behaviour, either for or against the use of computers by nurses (Lee et al. 2005: 172; Webster et al. 2003:145; Sultana 1990: 700). In these studies, the authors measured how various behaviours and attitudes could influence attitude, either negative or positive, to the learning of a variety of computer skills. However, these studies have often omitted the manner whereby nurses perceive the computer learning experience. Thus, for example, a nurse who views the introduction of technology as a threat to her livelihood will perceive the computer in a different manner from another nurse who considers the computer to serve as a tool to support her make decisions to help her complete her work (Bouma 1999).

Attitudes toward the use of computers can be either positive or negative, and different factors influence thereon. Among these are the age of the nurses and the duration in years of exposure to computers.

➤ **Age**

The age of the nurse can influence the attitude toward computer use as younger nurses are inclined to harbor more positive attitudes towards technology than their counterparts who are older (Alpay et al. 2000:7; Alpay & Russell 2002:138). However, this factor was also supported by Simpson & Kendrick in their study that younger health professionals at a British hospital were notably more enthusiastic concerning the application of IT to healthcare, compared to their older colleagues (Simpson & Kendrick 1997:826).

➤ **Lack of interest**

Lack of interest expressed by nurses towards the use of IT is an issue of concern. This arises as a majority of elderly nurses are only exposed to IT after they have completed their formal nursing education and thus mastering the new IT becomes quite difficult. As a result, after completing their training they often exhibit a lack of interest (Alpay et al. 2000:8).

➤ **Lack of computer support**

Another factor identified is the lack of a support system to encourage continuity as a result; nurses tend to forget the newly acquired IT skills (Roberts & Peel 1997: 826). It has been stressed that the existence of a supportive working environment facilitates the transfer of skills. The provision of continuous support enables nurses to use computers efficiently and confidently (Webster et al 2003:141). Studies advise that, after training, the trainees need to be supported by management. Managers or key persons who strongly influence the work environment are mostly effective in impacting on the user's beliefs. The promotion of the use of information technologies in an organization require the management thereof to act as a driving force to implement the decision and put in place the supportive services. Furthermore, such a support system must be both active and continuous. The creation of an information centre serves as a means to encourage, support and nurture novice IT users (Mills & McQueen 1997).

➤ **Lack of exposure**

The number of years of exposure to a computer has also emerged as a significant guide in assessing attitudes toward computer use. Sultana indicated that nurses with previous exposure and hands-on experience, exhibited a positive attitude and were more willing to use computers than those without any previous exposure. The author also reported that 59% of respondents in her study preferred using

computers because it both saved time and was more accurate, as compared to the 29% who indicated that they preferred manual control because of a lack of instruction and hands-on experience (Sultana 1990: 700). Those who prefer to use computers enjoy prior exposure thereto.

2.3.2.2 Information Technology modules within the nursing curricula

The nursing curricula have no modules on information technology. As a result thereof materials used for training nurses on information technology originate outside the healthcare sector. Such training materials are either too generic or fragmented and fail to demonstrate to nurses the causal link between information technology and healthcare delivery. The same issue has been raised by (Saranto 1998:85) who advised that if information technology training for nurses is not further developed as an integral part of the curricula itself, nurses fail to acquire any understanding of the purpose of information technology in their career. They viewed information technology as an add-on or supplement to their learning needs and not as a priority in their professional development. In the USA and the UK, Nursing Associations advocated for the integration of information technology into the nursing curricula. This contributed significantly to the high level of information technology literacy among nursing practitioners (Gaumer et al. 2005:165). However, in developing countries, very little has been written on integrating IT training into the existing nursing curricula. In South Africa, for example, some para-public health institutions have included computer literacy skills as pre-requisite for the employment of nurses. But it is of significance to note that in a majority of government nursing colleges in the province, IT training is not part of the existing nursing curricula. Information Technology skills and knowledge is acquired at the students' discretion. Presently, nursing students who are computer literate and have access to and use computer are those studying in a university environment. While those nursing students at the government nursing colleges acquire IT skills and knowledge at their own discretion (Mthembu 2007).

2.3.2.3 The content of the curriculum

The content of the curriculum for teaching information technology to nurses is limited. However, Alpay et al (2000:6) lament the fact that educators offering information technology to nurses often fail to explain its role in healthcare delivery. Although nurses are trained in the use thereof, there remain areas of training that require further attention on topics such as practical examples of how to use a information systems and doing an information or literature search (Sanranto 1998: 85).

The literature has indicated that it is important to integrate IT training into the existing nursing curricula as it will enable nurse educators to identify information technology skills and competencies required by nurses (Alpay et al. 2000:7; Alpay & Russell 2002:137). Furthermore, (Yaghmaie & Jayasuriya: 2004:165) also alluded to the fact that the content should be carefully selected as this will lead to positive feelings on the part of the subject, as the training becomes useful when it is associated with the relevance to the professional development of the trainees (Barry *et al* 2007:199). In a study accessing IT skills among nursing and midwifery students, the respondents revealed that since their activities do not require the use of IT for professional development they tend to forget the computer skills acquired. However, Yaghmaie & Jayasuriya (2004:165) also stressed that, the introduction of IT training into the nursing curricula is important as it will compel students to understand that being able to use the computer is part of their professional development. Such a development will lead to more exposure, greater IT knowledge and, hence, improved service delivery (Wilson *et al* 2000:2189).

Furthermore, Russell & Alpay advise that, in relation to teaching information technology to nurses, such education should not only rely on teaching computer operations, but should also involve the message concerning the benefits and necessity of information technology in healthcare, and that such teaching should be linked to nursing practice itself. In addition, (Wilson *et al* 2000:2189) explain that it is not technology that changes the clinicians' practice, but the manner in which it is taught. Miranda *et al* recommend that the teaching process involves the necessity of making users realize the limitations of a

computer system for the purpose of decreasing unrealistic expectations about such a system (Miranda *et al* 2001:148). Furthermore, it was suggested that if the users' perception of an innovation is positive, acceptance thereof will increase, resulting in favorable outcomes and increased usage (Frantz 2001:11).

2.3.2.4 Lack of support

Support remains a major factor in enhancing continuity of IT competencies but this is either not sufficient or lacking after training. Lack of support is due to the fact that IT in nursing is new, and support systems to encourage novice users are not available. The provision of an information centre has been suggested as an appropriate educational support system. Such a support system could enhance the development of positive attitudes toward the use of computers as it exerts a direct effect on behaviour (Mills & McQueen 1997). It has been emphasized that the support system should have IT accessories; computer peripherals including printers, certain other facilities, inter alia the internet, intranet and email services, scanners, video and sound outputs, etc (Jayasuriya & Chapman 1997:192).

2.3.2.5 Lack of information technology infrastructure

The new or emerging technologies such as computers, internet and/or intranet to support healthcare delivery remain a major obstacle in most developing countries. Information Technologies have been used in the healthcare sectors for administration, billing and human resource management but access to and use of the emerging technology in respect of health care delivery is still limited (Ball 2000:305). For example, in one of the regional nursing colleges in the area, nurses do not have access to computers at their workplace or offices and, in cases where they are available, the computers either operate too slowly or the parts are broken or are obsolete (Centre for Rural Health 2007; Zabani 2007). When the instrument is both old and outdated, nurses become perturbed. As a result thereof, their stress levels increase remarkably. In northern KwaZulu-Natal, only one of the twelve nursing colleges possesses computers for nurse educators. In yet another college, 17 educators are required to share

one computer (Mthembu 2007). The literature further reports that due to lack of computers, nurses are required to wait and compete with students for computer time (Webster *et al* 2003:141; Couper *et al* 2000).

The lack of information technology in healthcare systems in developing countries has been attributed to the high cost involved in purchasing the necessary equipment. For example, the costs of installation, connectivity and maintenance of information technology systems are often too high (Kanamugire 1998:126). This was also confirmed by Edwards & Drury (2000:52) who reported that the cost of developing good programme is expensive. However, the authors concluded that although the cost of the hardware may be dropping consistently, software development costs are not (Margart *et al.* 2000:52). However, Ballantyne & Addison, argued that, although IT costs are high, if properly installed, maintained and managed, it can maximize scarce resources (Ballantyne & Addison 2000:16). Thus, an example hereof is the use of videoconferences to link specialists in tertiary hospitals to nurses in rural and remote clinics (Health KwaZulu-Natal 2007), or using telehealth to provide lectures to nurses in rural clinics (Chetty *et al.* 2007). Nonetheless, many countries on the African continent have started assembling and manufacturing computers locally. This will eventually reduce costs and increase access. But the costs of installation, connectivity and maintenance still remain a major issue. However, Amanda suggests that, due to the high cost of computers, it is necessary to examine the potential possibility of introducing alternative technologies which retain the capabilities of duplicating the performance of computers. An example hereof is the Personal Digital Assistant (PDA) (Amanda 2002:128). PDAs remain both accessible, simple to use and have similar functions to a desktop computer and are less expensive.

2.3.2.6 *The learning environment*

The learning environment wherein nurses are taught on how to use information technology is crucial.

Various studies have demonstrated that nurses are dissatisfied with the learning environment where IT trainings are offered. Nurses require a calm, conducive environment when studying information technology; such an atmosphere will reduce computer anxiety and enhance learning (Bouma 1999; Xego 2006).

2.3.2.7 Method of training information technology

The method whereby information technology training is taught is of great importance. Usually, the instructor fails to facilitate the learning process without provoking anxiety and discomfort (Nagelkerk et al. 2000:6). Studies have mentioned cases of nurses being treated in an inappropriate and condescending manner during information technology training. According to Bouma, the training process and facilitation techniques of the information technology instructor frequently leaves much to be desired. As a result thereof, certain negative attitudes toward the computer are developed. The author suggests that when the facilitator falls into an expected educator role and treats those learning as juveniles, conflict frequently arises (Bouma 1999). The following sections will focus on learning theories in relation to adults studying and acquiring computer skills and literacy.

2.3.2.7.1 Learning theories

Learning is the process of acquiring knowledge or skills throughout the life cycle via education, training, work and general life experiences. Adult learning constitutes the process of educating adults, particularly those whose ages range beyond that of traditional undergraduate college and university students. Adult training occurs at the workplace through the extension or continuation of various educational courses. It is also referred to as “training development” or “andragogy”-to distinguish it from “pedagogy” or “non-formal education”. Knowles has been described as the founder of adult learning, through his introduction of the concept of andragogy which constitutes the “art and science of helping adults learn” According to Knowles, adult learning needs to be voluntary: therefore, participants exhibit improved levels of motivation (Knowles 1984). Generally, adults frequently apply their knowledge in a

practical fashion to learn effectively and must possess a reasonable expectation that the knowledge gained will assist them to further their goals (Lieb 1991).

Knowles has identified five principles of learning which are: autonomous and self directedness; life-experience and knowledge; goal-orientation; relevancy-orientation, and, practical and respect to be applied when teaching adults (Lieb 1991). The principles of adult learning, as advanced by Knowles, are supported by research findings and hold particular relevance to the manner wherein nurses are trained to use a computer. The literature further reveals that, at present, IT does not form part of the nursing curricula and, as a result thereof, training is offered as in-service training on a continuous basis. Studies have shown that the training process is frequently characterised by anxiety and discomfort (Nagelkerk et al.1998:7). In the subsequent paragraphs, these principles will be discussed in the context of teaching adults how to use computers. Brookfield revised the principles as follows (Brookfield 2005).

Self-directed and competency

As a person ages, he or she moves from dependency to self-direction. This functions as an essential principle in creating an effective learning experience for an adult. Therefore, when teaching information technology to adults such as professional nurses, the instructor, of necessity, must allow nurses to be free to direct themselves. The teachers must actively involve adult participants in the learning process and must serve as facilitator. They must acquire participants' perspectives concerning the topics to be taught and adult learners need to be allowed to work on the activities that reflect their interests. During the learning session, adults should be permitted to assume responsibility and group leadership and the teacher should act as a facilitator, guiding participants to obtain their own knowledge of the subject rather than merely supplying them with facts (Brookfield 2005).

Learners need guidance in solving problems for themselves. When teaching information technology to adults learners, the facilitator should allow the learners to “figure out” details on the subject for themselves, while offering assistance and support. Adult learners resent being belittled, controlled or directed. Facilitators can use relevant instructional software that includes features of self-pacing, illustration and substantial feedback (Coffman:2000:262).

Life-experience and knowledge

Adults have accumulated a foundation of life experiences and knowledge that may include work related activities and previous education. Adult learners need to connect learning to knowledge and certain experiences. To aid them herein, it is vital that they draw out participants’ experience and knowledge which is relevant to the topic. They must relate theories and concepts to the participant and recognize the value of experience in training. The learning opportunity needs to be both relevant and applicable to the learner’s past experience. This principle assists the learner to create, retain and transfer knowledge (Brookfield 2005).

Instructors ought not to assume that all adults enter the learning situations with the same experience. When teaching adults the use of computers, the instructor needs to permit learners to use information technology for different experiential purposes. Furthermore, those with previous experience in computers ought to be situated in a separate group from those who lack such prior experience, and both groups should be taught separately. In addition, the reality that learners are a diverse category necessitates that educators use needs assessments and informal questioning to plan educational sessions rather than merely teaching the entire group the identical material simultaneously.

Goal Oriented

The benefits inherent in the use of computers in healthcare delivery must be clearly outlined prior to learners becoming motivated in the utilizing thereof. An adult's value system is crucial in the successful utilization of an educational programme. For example, the nurse who believes that the computer dehumanizes healthcare is less likely to exhibit any motivation to acquire knowledge concerning computers. Therefore, it remains the duty of the facilitator to explain to nurses the manner whereby information technology will help them attain their goals. This classification of goals and course objectives must be completed before the commencement of the training session. In addition, hands-on experience with and exposure to the computer, needs to be provided as early as possible and must, of necessity, be an ongoing part of the educational sessions (Brookfield: 2005).

Relevancy-oriented

Nurses, being adults, should be assisted to understand the reason for further learning. Such learning has to be applicable to their work or other responsibilities to be of any value thereto. Adults want to be practical, focusing on those aspects of a lesson most useful to them in their work, as they may indicate less interest in acquiring knowledge for its own sake. The facilitator must clearly explain to nurses how the session will be useful to them. Such a factor remains relevant in the use of computers by nurses who need to possess the capacity to link the new skills to the present work and the manner whereby more efficient performance of information technology can aid them in their activities (Brookfield: 2005).

Practical and respect

Similarly to all learners, adults need to be shown respect. The facilitator must acknowledge the wealth of experiences that the adult brings to the classroom. Such adults should be treated as equals in experience and knowledge and be allowed to voice their opinions freely in the learning situation. Finally, when teaching adults the relevant aspects of computing, it is important to accept that adults as

individuals harbor their own unique experiences and learning needs (Brookfield: 2005)

2.4 Summary of Chapter Two

Chapter two commenced with information technology and the digital divide. It also provides an overview of interventions relating to the shrinking of the digital divide, the use of information technologies in the healthcare sector, and particular challenges of access to and use of information technology in the working environment. Learning theories and adult learning techniques were also included. The following chapter presents the methodology and data collection techniques relevant to the research problem.

CHAPTER THREE: RESEARCH METHODOLOGY

3. Introduction

In the previous chapter, aspects relevant to the research problem found in the literature were discussed.

This chapter outlines the procedures used to collect data, research design, sampling techniques, and the research instrument used, data analysis, as well as the ethical considerations observed in this research study.

3.1 Aim and Objectives

The overall aim of the research is to explore the challenges that professional nurses face in accessing healthcare delivery in northern KwaZulu-Natal after being trained. Specific research questions were developed to achieve each objective of the study.

OBJECTIVE 1:

To examine the computer literacy training needs of professional nurses in healthcare facilities in northern KwaZulu-Natal

- a) What are the computer literacy training needs of professional nurses in healthcare facilities?
- b) What do professional nurses use computers for in the healthcare facilities?

OBJECTIVE 2:

To identify the obstacles that professional nurses face to access and use information technologies in healthcare facilities in northern KwaZulu-Natal

- a) What information technologies are available to professional nurses in healthcare facilities?
- b) What challenges do professional nurses face to access information technologies in healthcare facilities?
- c) What factors hinder access to and use of information technologies by professional nurses for

healthcare delivery in health facilities after being trained?

OBJECTIVE 3:

To make recommendations/suggestions on how to overcome these challenges

- a) Which factors would enable professional nurses in healthcare facilities in rural areas to access and use of information technologies successfully for healthcare delivery?

3.2 Research Design

A research design is a blueprint for the conduct of a study that maximizes control over factors that could interfere with the study's desired outcomes (Babbie 1992; Manen 1997:345). Research design directs the selection of the target population, sampling procedure, data collection technique, and analyses (Burns & Grove 2001:40).

This research was intended to gather and analyze data on factors that hinder access to and use of information technologies by professional nurses for healthcare delivery after being trained. Reading through the literature, the design best suited to this study would be descriptive health systems research using qualitative methodology.

Descriptive research presents social setting relationships and focuses on "how" and "why" questions which serve as the questions this research intends to answer (Neuman 2000). Descriptive research gives service providers and planners information that will help them design services and allocate resources efficiently, a factor which remains significant to this study.

3.3 Research Setting

This research took place in northern KwaZulu-Natal. This is situated in the northern part of the province. It comprises of uThungulu, uMkhanyakude and Zululand health districts. It has two regional hospitals, 18 district hospitals, 146 clinics, and 33 mobile clinics serving a population of approximately 2.3 million (Centre for Rural Health 2007).

This area is largely rural, under-developed, isolated, and under-resourced and has a poor infrastructure, with a high staff turn-over, and lack of access to information. Access to and affordability of healthcare is largely compromised due to the nature of the area. Healthcare facilities are unable to recruit, train and retain qualified healthcare professionals. There is both a shortage and rapid turnover of healthcare professionals, mostly doctors and nurses of all categories. Professional nurses face an increase in workload as the average number of patients seen per professional nurse a day ranges from 13 to 60. Newly qualified and inexperienced professional nurses are employed and burdened with a high level of responsibility with little or no supervision (South African Health Review 2005).

3.4 Research Population

A research population is the total group of persons or subjects that meet the sampling criteria (Burns & Grove 2001:41). The population for this study was nurses working in government healthcare institutions (i.e. clinics, nursing colleges and hospitals) in northern KwaZulu-Natal.

3.5 Sampling

Sampling is the process of selecting a group of people, events, behaviours, or other elements with which to conduct a study (Mack *et al* 2005). In this study, sampling was undertaken at two levels. Firstly, sampling of the healthcare institutions and secondly, the selecting of professional nurses for the focus groups.

3.5.1 Selection of hospitals

This study was done under the umbrella of a project aimed at creating organizations of learning in Area three. The entire project involved 18 government hospitals, including the clinics and nursing colleges attached to these hospitals. For this study, seven out of 18 hospitals were selected. These involved the two regional hospitals (Ngwelezane and Lower Umfolozi War Memorial) because they serve as the referral hospitals in the Area. The five district hospitals (Benedictine, Vryheid, Itshelejuba, Mbongolwane and KwaMagwaza) were initially selected from a baseline study on learning opportunities

for health professionals in northern KwaZulu-Natal, on the basis of the highest rate of computer literacy and access to computers amongst nurses (Centre for Rural Health 2007). See table two below on computer literacy and access to computers by nurses.

Table 1: Criteria for selecting hospitals

Hospital	Able to send an e-mail			Nursing college	Resource centre
	No. of Nurses	Yes	%		
Lower Umfolozi	31	8	26	No	No
Ngwelezane	63	9	14	Yes	Yes
Benedictine	41	8	20	Yes	Yes
Vryheid	21	7	33	Yes	Yes
Itshelejuba	27	5	19	No	No
Mseleni	23	4	17	Yes	Yes
KwaMagwaza	25	3	12	No	No
Mbongolwane	15	3	20	No	No
Bethesda	12	3	25	Yes	Yes

In order to gain a deeper insight of the problems encountered by professional nurses regarding access to and use of information technology after training, it was decided that hospitals, with clinics including resource centres and nursing colleges will be those institutions to be selected for the study. This is because all categories of nurses will be purposively selected. However, the following institutions did not meet certain criteria, for example, Lower Umfolozi War Memorial, St Mary's, Mbongolwane, and Itshelejuba hospitals that functioned without resource centres and nursing colleges were replaced by Bethesda and Mseleni. Table two below provides a list of the hospitals, nursing colleges and clinics selected.

Table 2: List of Hospitals

Level	Name of hospital	Name of Nursing college	Name of PHC Clinics
Regional Hospital	Ngwelezane	Ngwelezane nursing college,	Ngwelezane gateway, Thokozani
District Hospitals	Benedictine	Benedictine nursing college,	Benedictine gateway, Njoko, Mahashini
	Vryheid	Vryheid nursing campus,	Vryheid gateway, Eye clinic
	Mseleni	Mseleni nursing college	Mseleni gateway, Mseleni ARV, Manaba, Ezimpondweni, Oqondweni
	Bethesda	Bethesda nursing college	Jozini, Bethesda OPD

3.5.2 Sampling of Nurses

Prior to data collection, the researcher, in consultation with the supervisor and a senior researcher defined the characteristics of the sample based on the research problem and purpose of the study. In qualitative research, sampling techniques do not seek to quantify data or to identify a statistically representative set of respondents (Mays *et al* 2000:321). The purposive sampling method was agreed as the sampling method to use.

Purposive sampling was employed in this study because it affords the researcher the opportunity to select participants based on their knowledge and insight into the research question. It allows the researcher to seek deliberately to include “outlier” data, conventionally discounted in quantitative approaches (Vos *et al.* 2005). The size of the sample does not constitute the guiding principle in purposive sampling because the purpose is not to generalize the findings but to obtain insight and information in answer to the research questions.

In this study, the target group was professional nurses. This occurred because professional nurses form the only category of nurse allowed to attend the information technology courses offered by the State Information Technology Agency. Thus, criteria for inclusion in the study were:

- The professional nurse must be working in one of the healthcare institutions (hospital, nursing college or clinic) as listed in table two above
- The professional nurse must have undergone some formal computer literacy training.

The reason for using professional nurses who have undergone computer training is to ensure that issues beyond lack of training could be explored in the discussions, and to improve the likelihood that they would supply relevant information on the difficulties they encounter in implementing those computer skills they had acquired once back in their facilities.

3.5.2.1 Recruitment of professional nurses for Focus Group Discussion

Upon obtaining ethical approval for the study from University of KwaZulu-Natal Bioethics Committee and permission to collect data from the KwaZulu-Natal Research Committee, a written request was sent to the facility information officer and Super Users of the five hospitals listed in table two. The letter requested a list of professional nurses who have undergone information technologies training. Thereafter, letters of introduction were sent to the Nursing Service Managers requesting permission to recruit professional nurses for the focus group discussions.

The participants for Focus Group Discussions

From the literature, the number of participants for a focus group discussion ranges from six to ten. However, a smaller group consisting of between four to six members was preferable. Such a size would allow everyone to participate, while still eliciting a range of responses. In this study, the number of participants for a focus group discussion depended on the availability of professional nurses and those who met the criteria and were also willing to participate in the study (Vos et al. 2005). In this latter-mentioned research, it was agreed that the number of professional nurses per focus group discussion would range between four - six professional nurses.

Number of Focus Group Discussions planned

The number of focus groups for a particular study varies, depending on the research aims and purpose of the study. No hard-and fast rule exists. Conducting too few group discussions may result in important information being missed, or otherwise lead to premature conclusions, but conducting too many obviously risks constituting a waste of valuable time and money (Vos et al. 2005). In this research study, ten focus group discussions were planned, that is five with hospital-based professional nurses and nursing tutors and another five focus group discussions with clinic-based professional nurses. Since nurses are working in divergent healthcare settings, the existence of more diverse points of view or responses could be anticipated.

Before the commencement of the data collection phase, the researcher wrote to the head of the institutions selected in the study to provide names of all the nurses who have been trained on ITs. When the names were submitted, names was randomly selected based on the criteria outlined for selection. After selecting the number of nurses per institution to participate, the researcher wrote to the nurse manager and principal of each hospital and nursing college requesting the names of six professional nurses from each institution who were computer literate to participate in the study.

Upon receiving the names of the nurses who were computer literate, the researcher wrote to each one professional nurse individually. The purpose of the letter was to introduce the research and to seek their permission to participate in the research study.

3.6 Data Collection

This is the procedure used to collect data for the study. Primary data for this study was collected through focus group discussions with nurses. Informal discussions were held with the Principal of

3.6.1 Focus Group Discussions

Based on the research design, the appropriate data collection method was to be focus group discussion. Focus group discussions are designed to obtain participants' perceptions in a focused area, in a setting that is both permissive and non-threatening. The phenomenon of being in a group affords participants a sense of "safety in numbers" to those wary of the researcher or those who are anxious (Burns & Grove 2001:542).

A focus group discussion was considered appropriate because of its flexibility in bringing professional nurses to share their experiences and challenges in accessing and utilizing information technology at their workplace, once fully trained. In a focus group discussion, the professional nurses selected would be able to focus on the issue at hand and discuss freely, expressing their views, interact with their colleagues on the research questions within a non-threatening environment; this provides an important aspect which cannot be obtained in the other method of data collection (Neuman: 2000).

The researcher, with the help of a colleague, conducted the focus group discussions. Each discussion took place in the facility where the professional nurses were based at a venue identified by them. During the discussions, the colleague acted an assistant. She assisted in taking notes whilst audio-recording the focus group discussions. Participants for the focus group discussion were professional nurses who originated from the health facilities selected (hospitals, nursing colleges and clinics).

Discussions and interviews were conducted in English owing to the fact that all participants were fluent in the English language. The study details and other information about the study were explained telephonically to participants prior to the day of the discussion and verbally on the actual day.

An hour before the commencement of each focus group discussion, the research team arrived at the clinic or hospital. The research team informed the nursing manager or sister-in-charge of their presence in her facility. The team verified that the venue for the discussion was clean and that enough chairs were available and that their sitting position was conducive to ease discussion. The information document and consent forms were arranged before the nurses arrived. As the nurses walked into the venue, they were welcomed by the research team.

Once the professional nurses had all arrived, the aim and purpose of the study was explained to them and time was allowed for any questions to be raised to clarify the study. The researcher informed the nurses of their rights and also explained to them the essence of the consent form. Written consent was obtained from the Nurses after receiving questions for further clarity on the study. Participants were also informed that their participation was purely voluntarily and anonymous. They possessed the right to withdraw or not to participate in the discussion at any stage, without prejudice. Participants were assured that any information obtained would not be used against them and remained strictly confidential. This was important as honesty in answering the questions was a crucial factor in ensuring the quality of the data collected. To ensure confidentiality, participants were requested not to use their names during discussion. Participants were informed that the focus group discussion would be audio taped, whilst the duration of the discussion and certain housekeeping rules were stipulated before the discussion started.

The discussions were conducted with professional nurses in their healthcare facilities. The venue chosen was either in the board room, the sister's room or in the nursing manager's office, in order to ensure confidentiality and, furthermore, to prohibit observers from listening to the discussions. Discussions were held during the afternoon. This constituted the period chosen by participants so that it

least interrupted their daily clinical activities. To ensure confidentiality and to enable the nurse to discuss freely, participants nick-named themselves and used the name during the discussion. The nick-name was written on a name tag and was placed in front of the participant. In the groups that were merged (i.e. the groups made up of nurses from the hospital and nursing college), nurses were advised that whenever they were about to speak or respond to any question, they should indicate, for example, in my clinic or hospital so that when transcribing it would be easier to identify and code where the statement came from.

A focus group discussion guide was used by the researcher for purposes of direction. The guide was comprised of open questions only. The broad structure of the guide could be summarized as follows:

- To share experiences in using information technologies at their facilities after being trained.
 - Uses of computers by professional nurses
 - Information technology skills required by professional nurses
 - Description of the training processes
 - Duration of the computer training course (s);
 - Access to computers and usage at their work place
 - Availability of ongoing support

3.6.2 Pre-testing of Focus Group Discussion Guide

Before the researcher started collecting data, the focus group discussion guide was pre-tested. To (Brink & Wood: 1998), pre-testing of the data collection tool enables the researcher to test the feasibility of using a given instrument in a formal study.

In this study, the focus group discussion guide was pre-tested by conducting a focus group discussion with a group of six professional nurses from the same health facilities but this facility was not among

those selected for the study. The six nurses, two each, were recruited from a hospital; clinic-based and from a nursing college. All were computer literate but not part of the main study. This was undertaken to:

- enable the researcher to make any improvements and corrections before embarking on the process of actual data collection
- ascertain the clarity and reduce any ambiguity in the questions
- assess the validity of the questions and whether the data collected would be reliable
- determine the weakness in the organization and administration of the research instrument

The focus group discussion guide was duly amended (**See appendix One**).

3.7 Study Period

Data was collected through focus group discussions. The discussions were conducted over a period of three months, starting from 1st April 2007 and continuing until September 2007. All the discussions were held at the facilities of the nurses.

3.8 Data Management

All the discussions were conducted by the researcher who was assisted by one of her colleagues. Each focus group discussion was audio taped and transcribed. During the focus group discussions, some notes were recorded and major points were summarized on newsprints by the researcher's assistant. The major themes that emanated were transcribed on the newsprint sheet as per the broad idea. After discussing each session, the major points were summarized and validated by the nurses before moving on to the next section.

3.9 Data Analysis

According to (Patton 2002:432) data analysis is the method whereby the interviewer, after transcribing the audio-tapes, reads through the notes in search of any recurring patterns, categories and themes. To Bogdan & Biklan as quoted in (Silverman: 2006), qualitative data analysis involves working with data, organizing, breaking into manageable units and synthesizing it. It further includes searching for

patterns, discovering what knowledge is important and what is to be learnt, and deciding what will be recounted to others. Inductive content analysis is utilized to direct observation to confirm ideas and the additional linking together of observed facts to form theories or explanations of how natural phenomena work. Such a process also involves the identification of core consistencies and relevant meaning. It is used to discover patterns, themes, and categories in one's data (Mays *et al* 2000: 115).

In this research, data analysis began during data collection. The researcher probed participants during the focus group discussions, reflecting, re-questioning, and paraphrasing the responses provided by the nurses. This process helped the researcher in the identification of common gaps and the asking of further questions which provided much needed answers.

The second level of data analysis occurred after data collection. After transcribing the audio-tapes, the researcher and a senior researcher thoroughly read through all the notes. Thereafter, content analysis was used to analyze the data. Content analysis using the inductive method was used.

In this study, the following steps were applied during data analysis:

- After the audiotapes were transcribed and validated by the researcher, they were further forwarded to a senior researcher who also thoroughly perused each and every transcript and validated it in relation to information on the tapes and the transcribed notes. The consequence thereof permitted researchers both to familiarize themselves with the raw data and further to identify key ideas and recurrent themes.
- Identifying a thematic framework – thereafter, both researchers independently identified the key issues, concepts, and themes whereby examination of the data could proceed. The themes were then categorized in relation both to their speaker and in the prevailing context including particular quotes that illustrate the themes described. This was achieved by drawing on prior issues and questions derived from the aims and objectives of the study. From the themes and

key issues identified, both researchers once again paused and compared notes. Any discrepancies were discussed between both the researcher and a certain consensus was arrived at.

- Interpretation - finally, the categories were re-examined to determine their links. This was completed by creating typologies and discovering associations between themes with a view to the provision of explanations for the findings i.e. compared and combined in order to enable the researcher to group the larger prevailing reality and, also, to acquire a new understanding of the topic under discussion.

3.10 Assuring the quality of the study

Research remains worthless unless proof that the processes applied therein are reliable and valid. In this research, the following was performed to ensure its reliability and validity.

3.10.1 Clear exposition of method of data collection and analysis

According to (Mays *et al* 2000:115), providing sufficient data allows the reader to judge whether the interpretation provided is adequately supported by the data. In this research, a clear account of the process of data collection and analysis has been supplied. In addition, the results section includes particular verbatim quotes.

3.10.2 Fair dealing

Such a technique ensures that the research design explicitly incorporates a wide range of different perspectives so that the viewpoint of one group is never presented as representing the only truth concerning any situation (Patton 2002). In this study, the view points of nurses from three different levels (hospital, primary healthcare and nursing college) were considered.

3.10.3 Inter-rate reliability

The focus group discussions were recorded and the audiotapes were carefully transcribed by the researcher. Subsequently, the transcribed notes and the tapes were forwarded to a senior researcher for the purpose of listening to the same tapes and validating the transcribed notes. Thereafter, both the

senior researcher and the researcher independently read through the transcribed notes to identify any possible patterns and categories. Any discrepancies were discussed between both researchers and a consensus was arrived at. According to Weber (1990), this process provides an important check on selective perception and blinds the interpretive bias.

3.11 Ethical Considerations

This section focused on the steps taken to ensure that the research was conducted in an ethical manner.

3.11.1 *Permission to collect data*

Permission was sought and obtained from the KwaZulu-Natal Department of Health Ethics committee. This included the hospitals, nursing colleges and primary healthcare supervisors where the participants originated from (see appendix below), the Biomedical Ethics Committee of the Faculty of Health Sciences at the University of KwaZulu-Natal (see appendix three) and the researcher also observed the following during the data collection: the right of self-determination, the right of confidentiality, anonymity and privacy and, informed consent. Each participant signed the consent form and the document was returned to the researcher.

3.12 Summary of Chapter Three

In this chapter, the following have been discussed: research methodology, sampling techniques, data management and data analysis. Ethical procedures and testing of the research instrument were also discussed. The next chapter presents an analysis of the data collected.

CHAPTER FOUR: PRESENTATION OF RESULTS

4. Introduction

The purpose of this study was to explain why nurses in healthcare facilities are unable to apply information technology skills after being trained. The chapter presents a summary of data collection and findings based on inductive content analysis. The presentation of the results conforms to the objectives set for the study. The results will be divided into two sections; quantitative and qualitative results.

4.1 Presentation of results: quantitative analysis

A total of forty professional nurses participated in the study, comprising 16 nurses (37.5%) who were hospital-based, 10 nurses (25%) from the Nursing Colleges and 15 nurses (37.5%) who were clinic-based. Out of 40 nurses, 2(5%) were males and 38 (95%) were female. Two (5%) nurses had completed the entire IT training programme which comprised the following: Introduction to Windows XP, Word level 1, Word level 2, Excel level 1, Excel level 2 and PowerPoint. The rest had completed only two of the six courses. The two nurses who had completed the entire programme were nurses in managerial positions, i.e. the nurse manager and the college principal of nursing college.

The nurses interviewed attended computer training between 2001 and 2007. Of the 40 nurses, 2 (5%) were trained privately, and only one nurse possessed a computer at home. The mean number of years of nursing experience of those interviewed was 12 years. This result confirms with the literature that IT does not constitute part of the nursing curricula as nurses were only exposed to information technology relatively recently, i.e. six years previously.

4.2 Presentation of results: qualitative analysis

Data presented in this section was collected through focus group discussions from five (5) hospitals i.e. one regional and four district hospitals. Lower Umfolozi War Memorial hospital did not participate because there were no volunteers. Seven focus group discussions and two mini-focus group

discussions were held. Mini-focus group discussions were organized with clinic nurses from Ngwelezane and Bethesda hospitals owing to the fact that less than four nurses who were computer literate volunteered to participate in the study. See table 3 below for the number of nurses per facility per level.

Table 3: No. of nurses selected per facility

Hospital selected	Hospital base	Nursing Tutors	Clinic-base	Total No./ by facility
Ngwelezane	3	3	3	9
Benedictine	4	1	4	9
Vryheid	2	0	2	4
Mseleni	4	3	4	11
Bethesda	2	3	2	7
	15	10	15	40

From the literature, the number of nurses per focus group range from four to six. Unfortunately, the numbers who met the criteria set were less than planned. Therefore, in consultation with the senior researcher and supervisor, lesser numbers were accepted. Furthermore, in order to obtain the required number of nurses per group, the following alterations were made:

- Nurses from the nursing colleges were merged with nurses from the hospital to form a single group. The nursing colleges and hospitals are located in the same environment, share the same resources and so too, the problems of access, and the use of information technology.
- In the clinics, hospitals and nursing colleges whereby the researcher was able to recruit less than four nurses, a mini-focus group discussion was conducted instead. See table 4 below for the number of nurses per group who participated in the study.

Table 4: No. of nurses by Focus Group Discussion

Hospital	No. of PN from hospital base & Nursing College	No. of Nurses from Clinics
Ngwelezane	6	3
Benedictine	5	4
Vryheid	4	0
Mseleni	7	4
Bethesda	5	2

All the discussions and interviews were audio-taped. Inductive content analysis was used to identify core consistencies and meaning. The tables below provide the major and minor themes that emanated during the analysis. Table 5 sets out a summary of the main issues that arose from each FGD in turn, while table 6 presents an overview of the major and minor themes that arose from the analysis.

Table 5: Summary of issues identified in each FGD

No. of discussion	Description of Participants	Summary of issues raised during Focus group discussion
FG1	6 Nurses (3 each from hospital & nursing college)	The training was good but no computer to practice. Computers in the hospital are password protected and we do not have login name. Computers are given to the top management team. There is only one computer shared among 17 nursing tutors. The library time is not convenient to use the computer in there. No assistance when needed. Need IT to be integrated into the nursing curricula. The composition of the group during training was not good. No access to the internet or intranet for us the tutors. Need more computers for nurses at nursing college. Need to be involved in the telemedicine activities of the hospital. (Is this all that they talked about?)
FG2	5 Nurses (3 from hospital & 2 from nursing college)	No computer to practice. No assistance as the phone of service provider is always on voice mail. Whenever there is a problem it takes a while to the service provider to attend to the problem. No support from the hospital or DIO. No access to the internet. The computer programme installed on the computer is not relevant to our activities so we cannot use them.
FG3	4 Nurses from the clinic	We went for the course but there are no computers to practice. The composition of the training group was not good. The length of time in between one level to another is too long, since we do not have computer to practice, by the time we go back we have forgotten what we had learnt. The hospital does not give us assistance whenever there is a problem. No access to the internet.
FG4	4 Nurses (2 from hospital and 2 from the clinic)	No computers for us to practice. The computers are still packed in cartons and the technician has not yet come to connect them. In our department we have one computer shared by staff of three units. The composition of the computer training group was not good. There were so many computers and the facilitator was too fast for those of us sitting in front of the computer for the 1 st time.

No. of discussion	Description of Participants	Issues raised during Focus group discussion
FG5	7 Nurses (4 from hospital & 3 from the college)	We went for IT training but the problem is no time to practice. No computers practice. The composition of the groups during IT training was not good. The group was too big to be managed by one facilitator. She was always very fast. We need internet access in the clinics. The IT training is not relevant to what we do. Want to be able to use computer. Want to use computer to access patients' information, to access guidelines/protocols. There is lack of support after training
FG 6	4 Nurses from Clinic	Can't practice because there are no computers in the clinics. Those that are there are not functional as they are not yet connected. The duration of time in between one level to another is too long. No access to the internet. Computers are password protected. We do not have login ID. IT training should be included in the nursing curricula. The location of the computer room is not good as it only for the Drs. We need to ask for permission whenever we want to use the computers there.
FG7	5 Nurses (3 from hospital & 2 from nursing college)	We have attended but no computers to practice. No computers in our unit. Computers are packed are kept in a room not being used. The duration in between level is too long. No access to the intranet. Need computers to be able to communicate with district office. No email addresses. Composition of group duration training was not good. Need more service provider to the district. Need access to the internet in order to access protocols and procedure to teach student nurses. Need more computers. Need access to the intranet in order to access patients' lab results.

No of discussion	Description of participants	Issues raised during discussion
Mini- FG 1	3 Nurses from the clinics	No computers to practice. No support when needed. The facilitator is not available, will not return our calls whenever we seek for assistance. Takes too long for the service provider to respond when the computer has a problem. No access to the internet. The computer programme installed on the computers in our clinic is different from those we are taught with, we cannot use them. The computers in our clinics are still packed in the cartons, they have not been connected. The groups were too big. First time computer users were put together to attend the same course
Mini-FG 2	2 Nurses from the clinics	Training was good but time was too short as there was too much to learn within a short time. Selection of participants was not good; mixing of people who know how to use computer with those who have never used a computer. Those who have used computer was disturbing as most of the time chatting online with friends, the teaching environment was not conducive. Too much work and no time to learn what was taught. Good for tutors to be computer literate as it is very important. No access to internet to keep ourselves update as most books are outdated.

Table 6: Analyses of major themes

Major themes	Minor themes
Lack of information technology infrastructure	<ul style="list-style-type: none"> • Insufficient or no computers available • Lack of support (software related) • Lack of support (hardware related)
Access problems	<ul style="list-style-type: none"> • Location of computers = geo-location • Password/permission problem • Access to intranet and internet
Lack of relevant software programmes	<ul style="list-style-type: none"> • Computer programme no installed • Lack of relevant activities
Attitudes towards computers	<ul style="list-style-type: none"> • Increase in workload • Deficiencies in IT training • Composition of group during training • Manner in which the training sessions are organized
Recommendations	<ul style="list-style-type: none"> • Incorporation of computer training into the nursing curricula • Organization of training • Training should be decentralized • Trainees should be grouped by profession • Want to get involved in telemedicine • Train more nurses and provide more computers with internet access to nurses • Computer training should be made relevant • Need local support

4.3 Proposed model of challenges to access information technology by nurses after being trained

For this study, a model explaining the factors that affect access to and use of information technologies by nurses after being trained has been developed. The model has four major categories of variables related to access and use of computers (see figure below).

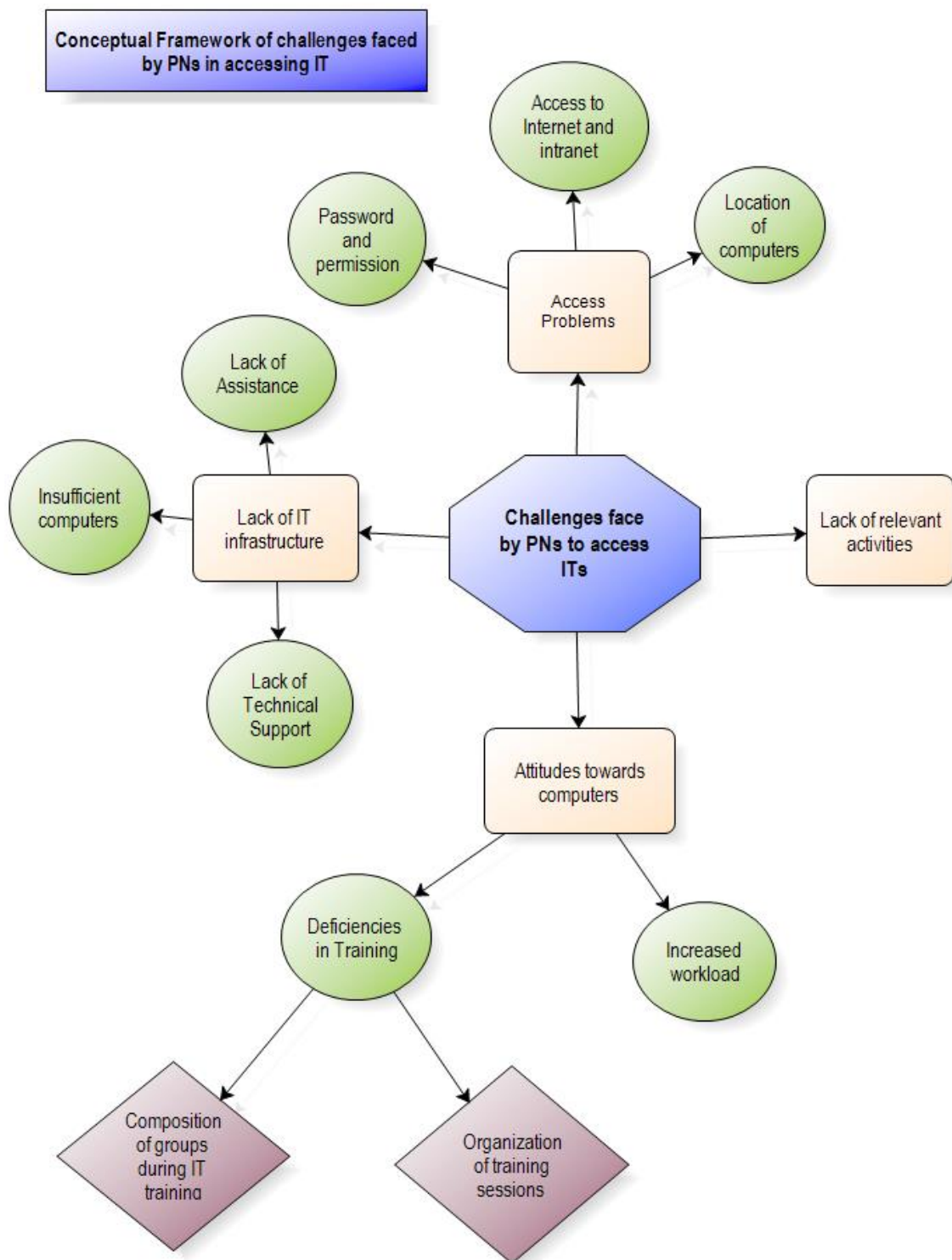


Figure 4: Proposed model of challenges to access IT by nurses

4.3.1 Examining computer literacy training needs of Professional Nurses

➤ Computer literacy skills required by professional nurses

Computer literacy defined as the ability to use computer systems efficiently. In this study, the nurses interviewed expressed an understanding of basic computer literacy.

"We will like to be able to understand how to operate the computer. To understand how the computer works. Need to know what is Windows and other computer programmes". (PN, Hospital-based)

"I need to be able to know how to type my reports and work plans, how to use the printer to print my documents. In short I need to know how the entire computer works and to be able to use it well"(PN, Clinic-based)

"I need to be able to retrieve a document when doing my assignments and preparing notes for the students using the PowerPoint." (PN, nursing college)

➤ Use of computers by professional nurses

In terms of what they would like to use computers for, the nurses indicated a wide range of activities that they would like to use them for as expressed in the verbatim quotations below

"We spend most of our time running around looking for patients' ARV and CD4 count results. Some come on appointment days and we haven't received the results. If we have access to the intranet we will be able to access these result on NAL website and attend to patients quicker. This is what I'd like to do with the computer." (PN, Clinic)

"At our nursing college we are still using the old protocol on TB management to teach student nurses. This is because the college does not have access to the intranet for us to download the new protocols on TB management." (Tutor, Nursing College)

4.3.2 Identifying obstacles faced by professional nurses to access and use IT

➤ The type of IT available to professional nurses

Information technologies as defined above comprises of a wide range of equipments. In the healthcare facilities identified in the study, the nurses interviewed mentioned that IT available are computers, printers, intranet and/or internet and videoconference equipment. These are available in the institutions they are attached to. It was also mentioned that although they have IT, those commonly available are computers. Computers are given to the management staff at the hospital and to the college principal

while at the clinics, computers are given to clinic managers or the matron. Access to this equipment was a major concern.

➤ **Challenges faced by professional nurses to access and use IT**

Information technologies courses are offered by SITA as in-service training. The courses are organized by the provincial Department of Health, Information Technology Department. This department also appoints the facilitator who organizes the training. Although it is called IT training, it specifically focuses on computer literacy. The training is divided into the following levels:

- Introduction to PC/Windows XP.
- Microsoft Office Suite (Word levels 1 & 2, Excel levels 1 & 2, PowerPoint and Outlook).

4.4 [The lack of information technology infrastructure](#)

Lack of IT infrastructure comprises of insufficient hardware (computers and printers) and lack of support.

4.4.1 [Insufficient computers](#)

During IT training, nurses are trained how to use a computer and are exposed to Windows XP Operating System and the Microsoft Office Suite. The nurses complained that, after training, on their return to their offices or place of work, there are no computers to use.

Twelve (30%) nurses reported that they neither have computers in the wards wherein they conduct their duties nor where they are assigned to work. Since there are no computers, application of the new skills acquired is impossible. As a result, they tend to forget such computer skill. This was expressed as follows:

"In my site I attended the IT training and then there is no computer in my site. So there is a problem. I am not able to practice what I was taught." (PN, Hospital-based)

"I attended the computer training. Unfortunately when you come back to work there are no computers. In the college you are in the office maybe you are in the high position but there is no computer. You need to move up and down the building looking for a computer to use. This is waste of time. In our nursing college

we are 19 tutors, we and the student nurses share one old computer that is situated in the library.” (Tutor, Nursing College)

“So our biggest challenge is not having computers to practice whatever we were taught at the courses that we attended with the results that by the time we get to the next course we are sharp. But we are not as sharp as we are supposed to be, because we have forgotten some of the things. So that is our biggest challenge.” (PN Clinic-base)

The nurses also complained that computers are often given to senior managers in hospitals whilst in the wards there are no computers. Their frustration was expressed as follows:

“We have been waiting for computers since... since... since.... People have gone for training and then they come back and there are no computers. People that have got computers are the HR and the hospital managers. With us, TB department, we don’t have any computer. We have a Data Capturer, but we don’t have a computer.” (PN, Hospital-based)

“There is one computer that is used by the physiotherapist, psychologists, social workers and EAP. We are all rushing for the information to that computer. At the end of the day you just feel: let me don’t use that computer. Because whenever you go there, there is somebody using that computer. You come back again; you want to use it there is somebody on the computer.” (PN, Hospital-based)

The nurses also reported that sometimes they do have computers but cannot be used for printing because there is no printer or the printer has not been installed.

“We cannot use the computer because the printers are not installed. They left the printer and when one tries to print something the machine tells you there is no printer installed. The stupid thing they did was that they left with all the software, and the printer is not installed. I tried to get it running and it tells me it needs the administrator password. Since I don’t have the password, I can’t do anything.” (PN, Clinic-based)

4.4.2 Lack of support (software related)

Lack of support refers to follow-up or assistance provided to nurses after training. The nurses recounted, that after training, no one is available to assist them or to call upon as a resource whenever they encounter any difficulty or need assistance.

Normally, support or assistance on software-related problems is provided by the Super User and hardware problems are handled by the Service Provider (SP).

The SuperUser is a title given to an identified staff member who has been trained in the use of computer. At the hospital level, the SuperUser could be a secretary or the hospital information officer.

The SuperUser in addition to his/her designated tasks, is expected to provide software related support

to other staff members in the institution. Unfortunately, due to the heavy workload the duties as SuperUser are often neglected.

Service Provider (SP) is a private and independent computer service provider employed by the Department of Health to offer technical support and attend to hardware related problems at specific district offices and hospitals. Whenever there is a hardware related problem at the district office or hospital, he attends to. He visits the district office or hospital only when there is a problem.

During the focus group discussion, ten of the 40 nurses indicated that the common areas where they would need assistance on software were: how to insert a table or picture, prepare a PowerPoint presentation, and how to send an e-mail. The nurses interviewed complained that, whenever help is sought from the SuperUser who happened to be based in the hospital, he/she is often too busy and, in most cases, cannot help, and the situation is even worsened as the facilitator resides in the city and cannot be easily accessed except via her phone.

“We had a problem with our computer and asked one guy from the hospital and he told us that computers are supplied by Informatics at the head office, and the hospital has got nothing to do with it. So everything to do with computers we must phone the head office. When we phone the head office, they tell us to contact our local information officer and you run around in circles.” (PN, Hospital-based)

“After training the facilitator gave us her contact details that we could call if ever we need assistance. But when we call her, she will tell us, I am presently busy and promise to call back and she will not call. We are tired of calling the facilitator because she will not return our calls. She is always attending meetings, very busy.” (PN, Clinic-based)

“We have got the computers but they are not connected. We also have computers given by the provincial office which came in last year but we cannot use them because they were left unconnected, still in their cartons until a few weeks ago.” (PN, Clinic-based)

The nurses also reported that, in cases where they were unable to get assistance, they passed over the tasks to be performed to the clerk or secretary.

“The College Secretary helps us but we are too many who rely on her alone and she also has her own things to do. When we have a problem and we call for her, although she does not refuse to help but you could

see from her body gestures that she does not want to assist or we are disturbing her.” (Tutor, Nursing College)

“Being the Nursing Manager, I don’t have the time to use the computer. I turn to the secretary for assistance. My schedule is very tight and I also do not have the time. I wish they could give us laptops which we could take at home and use at our convenience.” (PN, Hospital-base)

Those nurses who possess computers at home asserted that they take problematic tasks home and seek assistance from their children. Thirty of the 40 nurses confirmed they do not have a computer at home or a clerk to assist them with their work. Others reported that, after trying to contact the facilitator to no avail, they become frustrated and abandoned their efforts to fulfill their tasks.

4.4.3 Lack of support (hardware related)

These are problems such as: to connect a printer or mouse, or the keyboard is not functioning. Following the terms and conditions of the Information Technology unit of the KwaZulu-Natal Department of Health, hardware related problems are dealt with by the Service Provider only. The procedure to report hardware related problems are as follows:

At the hospital or nursing college levels, hardware-related problems are reported to the Facility Information Officer (whom at some facilities is also the SuperUser) who then contacts the Service Provider. The Service Provider will then visit the institution at his or her convenience. At the clinic level, the sister in-charge will inform the Primary Healthcare Manager (Supervisor) who will then contact the Super User. The SuperUser will in turn have to contact the Service Provider who will finally visit the clinic (Shamase 2007). The nurses interviewed also complained that the procedure’s duration is too long. This is the reality, most particularly at the clinics as they are situated very far away.

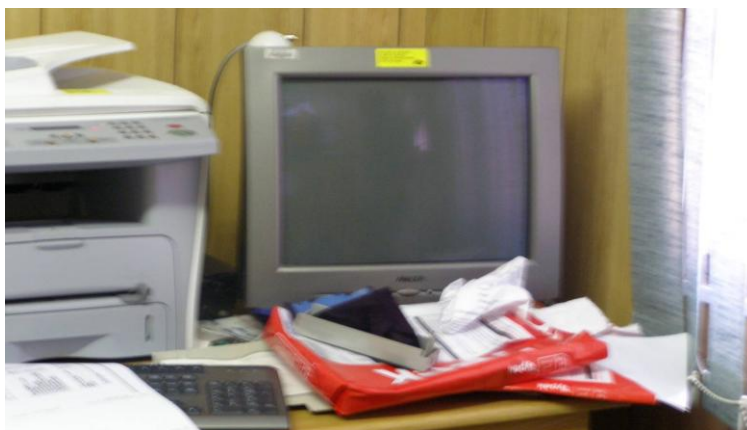
It is worth noting that the Service Provider is a private consultant hired by the Department of Health to deliver information technology support. The Service Provider is accountable to the Department of Health. The Facility Information Officers, the District Information Officer or the SuperUser do not have

any control over the activities of the Service Provider. Normally, the Service Provider is located in the city and whenever there is a hardware related problem, he/she is required to travel between 2-3, hours covering approximately 300kms on bad roads to the facility. Such a situation remains prevalent.

"At our clinic our computer was not working, the PHC manager was informed. It has been more than three months now and nobody has come to look at the computer." (PN, Clinic)

"In our clinic there is a problem with the computer and we were informed that the problem has to be fixed by the person who installed the computer. We don't have the contact of the person who installed the computer. It took between six or even ten months for that problem to be done. It will take a very long time." (PN, Clinic)

Long distances and the poor condition of the roads are major challenges in the provision of support to clinics and hospitals in rural areas. As a result thereof, computers not giving immediate attention might become mired in or buried under papers and are less likely ever to be used again. Such a situation was typical at clinics attached to Mseleni and Benedictine hospitals where it took the SP more than two months to attend to a PC that was not functioning properly. See Figure below.



This is a computer that has been buried by papers at the ARV clinic in Mseleni Hospital

Figure 5: A computer buried in papers

4.5 Access problems

In this study, access to computers was evident in different forms: location of the computer, nurses needing permission, the password to use the computer, and the lack of internet/intranet.

4.5.1 Location of computers

This is the position where the computer is located. Such a location is either not convenient or requires that permission be obtained before nurses and other categories of health professionals are allowed to use the computer(s) as compared to their medical doctor counterparts. The nurses interviewed indicated that the physical location of the computer hinders them from gaining access thereto.

In the nursing colleges, tutors do not possess computers. They share a common computer that is situated in the library. Unfortunately, the operating hours of the library are neither convenient nor conducive to acquiring skills. The library operates from 8:00 am to 16:00 pm. However, during this period, nurses are busy attending to patients and do not have the necessary time to use the computer in the library.

"We have only one computer that is used by 19 Tutors to practice. This computer is in the library. During working hours the library is over-crowded with students besides we are also busy so we cannot use the computer during working hours. The most convenient time for us to use the computer is after hours, unfortunately during the time, the library is close so we cannot use the computer." (Tutor Nursing College)

"In our hospital, the computer room is also used as the Doctors' meeting place. The computers are to be used by all staff members and not by doctors only. When we, the nurses, want to use the computer, the PA tells us we have to sign the log book for security purpose. At times after signing the log book, we get in the room, and just when we start to use the computer, we are asked to go out because the doctors want to have their meeting. Why should the hospitals' computer LAN be used as a meeting place for doctors?" (PN, Hospital-based)

The point relating to having a common computer room was raised and the nurses complained that if this is the case, whenever they wish to use the computer room, they will spend unnecessary time searching for its keys.

"Sometimes, I have to go everywhere looking for the keys of the computer room. When I ask my colleagues, they say Trevor was the last person from the computer room, you know. So I have to go round and round looking for the keys and at times it takes me more than 30 minutes looking for the keys. That is waste of time. We need computer in our offices." (PN, Hospital-based)

"In the college the computers are situated in the tutor's room. At times, I come early to prepare my plan before the start of the day. Instead, I spend time going up and down the stairs looking for the keys of the tutor's room where the computer are." (Tutor, Nursing College)

4.5.2 Password and permission before using the computer

Since computers are given to the management team, other staff members are required to ask for permission before using the computer. As the computers do not possess roving passwords, they are also required to ask for their password to enable them finally to use the computer. Ten of 40 Nurses interviewed reported the presence of computers in their wards/clinics but they cannot be used because they remain password protected and they have not been provided with password access.

"The other challenge is that in our clinic, there are people who have passwords and some do not have. If you are one of those without a password and want to use a computer, you have to ask from your colleague who has a password and they might not be willing to give you their password. (PN, Clinic-based)

"Still on the issue of password, if you ask for someone to give you her password, the person will look around and then say you mean my password, how? This is a polite way of refusing." (PN, Clinic-base)

Another situation arises when the computer is situated in the Matron's office or the sister-in-charge's office. The nurses interviewed complained that they will need to obtain permission before entering her office to use the equipment since she is always conducting meetings in her office.

"In the hospital, we have been told we can use the computer in the sister-in-charge's office. But we cannot go in her office without her permission. Whenever one wants to go there, she is either on the phone or having a meeting. We cannot use the computer but we have to use the computer." (PN, Hospital-Based)

The nurses also complained that, in some clinics, access remains restricted. Such a situation is common where the matron who is not herself computer literate refuses to allow her subordinates who are computer literate to make use thereof, for fear that the information technology equipment will be damaged.

"In my clinic I am computer literate but my matron will not allow me to use the computer. I don't know why. The computer is more of a tool to help us do our job but in our clinic, it is an accessory of decoration." (PN, Clinic-Based)

4.5.3 Geo-location

Nurses without computers at their clinics are allowed to use computers in the PHC supervisor's office situated far away from the clinic.

"I don't have a computer in my clinic and went to the hospital to use the computer but I was told that I can't use the computer in the hospital because I am from the clinic. I have to go to the PHC office. I have to cover about 65km to the PHC office because I wanted to use a computer. It is so frustrating for us in clinics without computers." (PN, Clinic-based)

4.6 Access to Intranet and/or internet

Electronic mail and intranet services are either not available or access is restricted to the hospital management team. Twenty-five nurses interviewed stated that they do not have access to the intranet. They also indicated that they desired to have access to the intranet in order to be able to access a patients' laboratory results such as his/her CD4 counts and viral load on the Albert Luthuli Community Hospital Website, to communicate with colleagues, to access protocols and guidelines on the Department of Health website, and, furthermore, to keep abreast of developments in their area of interest and expertise. However, these services are not available or provided to nurses.

"Another problem because of the lack of computer, and it's even worse with the intranet, which is something that is completely out of our reach: I don't know, because that is something that is very far-fetched for us. Because we do not have the computers, then for sure we have got no access to the intranet. If there is anything that we need from the internet we have got to run around in circles to the hospital." (Tutor, Nursing College)

"All clinics under our hospital do not have intranet. The computers that are there are just used for typing the reports, but no access to the intranet, no internet or intranet connection, they just came there left the computers without connection." (PN, Clinic-based)

"We can't access the type of information that we want, because now and then the intranet is nowhere to be found. So we struggle and we don't have intranet, so it's a challenging situation. Some of the new information and new developments that we should be acquiring, so that we should be able to teach effectively, we don't get access to it." (Tutor, Nursing College)

"At our nursing school we are using the old protocol on TB management to teach students. This is because we do not have access to the intranet to download the new protocol." (Tutor, Nursing College)

"About the intranet, sometimes you found that relevant course that we are supposed to be exposed to, like workshop and some courses. We can't attend because sometimes the intranet is not working. So having access of the...because I don't know whether it's the wind or what that makes our computers not to have access." (PN, Clinic-based)

At some hospitals where both internet and intranet access is available, access to these services is restricted to particular staff members only. The following remark was made.

“With the hospital it is different because there is internet access in the management and our computers here we cannot access this services.” (PN, Clinic-based)

4.7 Lack of relevant computer programme

These are computer programmes that would enable nurses to perform their tasks easily. The nurses interviewed complained that one of the reasons for not being able to use information technology after being trained is that the programme installed on the computers at their disposal is not relevant.

“Another thing is the computer that they bring for the clinics more especially, they only bring computers with operating software installed on them, but it does not have the other programmes like MS office. So now you want to practice typing, you do not have MS office, you do not have Word, you do not have Excel; you don’t have anything. So you have to ask them to come and reinstall the other programmes and it will take months for them to come. They don’t allow anyone else to install any programmes.” (PN, Clinic-based)

“Looking at the daily activities of a nurse there is very little space for us to sit and type a document using MS Word. We need programmes that will help us perform our tasks efficiently. ” (PN, Clinic-based)

“Even these courses we are taught are not assisting us. I can just say this out. They are useless. And you feel frustrated, very much frustrated. ” (PN, Hospital-based)

The nurses also mentioned that the programmes they were trained in are not installed in the computers at their disposal. They also indicated that they wish to use computers for such functions as typing monthly reports, preparing students’ exams questions, undertaking procurement (ordering drugs), preparing the monthly rosters and, most importantly, accessing lab results for patients. The nurses also reported that the ability to access a laboratory result timeously is something that would prove very helpful in fulfilling their daily activities as nurses.

“We spend most of our time running around looking for patients’ ARV and CD4 count results. Some come on appointment days and we haven’t received the results. If we have access to the intranet we will be able to access these result on NAL website and attend to patients quicker. This is what I’d like to do with the computer.” (PN, Clinic-based)

4.8 Attitude towards computers

Attitudes of nurses towards computers affect how nurses access and use the computer. Among the nurses interviewed, both positive and negative attitudes were identified. Those who displayed positive attitudes stated, as quoted *“I wish to express my sincere gratitude to the Department of Health for giving us the opportunity to be able to acquire computer skills, as computer literacy was not part of our Nursing Curricula.”* *“The computer training course was very useful and I did enjoy the course.”*

Of concern, there are those who expressed negative attitudes, and the cause thereof. From the results obtained, two major reasons were identified: the increase in workload as a result of the staff shortage and the deficiencies of the information technology training.

4.8.1 Increased workload as a result of staff shortage

The nurses interviewed reported that, due to the shortage of staff, their work load has increased significantly to an extent that they do not have time to practice because they spend the entire day attending to patients.

“Due to the shortage staff of the nursing personnel, the sister in-charge is responsible for every Admin work, and also for every clinical work for the patient. No time to use the computer.” (PN, Clinic-based)

“In the rural areas we are so short staff, besides; we are not typists or clerks to be working on a computer.” (PN, Clinic-based)

“Although I attended the IT courses and passed the exams, I cannot use the computer because I don’t have enough time. We don’t have much time, we nurses more especially. We are dealing with patients.” (PN, Hospital-based)

“Lack of time to practice is the major constraint, shortage of staff, you can’t do everything that you wish to do and have been told to do. I don’t have time for sure throughout the day I wish to remind myself about everything that I’ve being trained to do. But I can’t, I can’t. You see then you forget. It’s like a car if have a license and do not practice you totally forget the skills you have acquired or learnt. But you are having a license, but you can’t drive a car. It’s just a computer.” (PN, Clinic-based)

4.9 Deficiencies in information technology training

Information technology training sessions are organized by the Department of Health. The nurses complained that the composition of the groups and the group dynamics was unsatisfactory.

4.9.1 Group composition during training

A training session is comprised of public servants, including the nurses who are drawn from the government departments and units in the district to attend the training course. A session is composed of approximately 25 to 30 participants and the training is facilitated by one facilitator. Each level runs for three days.

“Those seeing using the computer for the first time are placed together with those who have previous experience in using computer.” (PN, Hospital-based)

“Being the first time computer user, I did not enjoy the training because those who are using computer for the 1st time and those who have diploma in computer were put together to attend the same computer literacy course without considering their previous computer exposure.” (PN, Clinic-based)

“During the training session we are put together with young and experienced computer expert. During the assessment when we have 20% and they obtain 100%, those young ones say we are “APGAR” person. This is annoying and frustrating.” (PN, Clinic-based)

4.9.2 Facilitation techniques

The nurses interviewed complained that the training sessions were not well organized as the environment was not conducive for learning purposes; the group was too big for a single facilitator to manage properly. People with previous experience were simply lumped together and offered the same training.

“In the training when facilitator says mouse, most of us don’t even know a mouse or this white elephant in front of us. Good people it was frustrating. When the facilitator says cut and paste, the young ones immediately do it [ban ban ban hitting on the table] and start sending SMS to their friends. I was so frustrated. My colleague and I were so frustrated. I told my colleague if learning computer was like this, after 5 days, I am just blank like a paper, we can’t. I developed a negative attitude. I must speak the truth. I developed a negative attitude towards computer. When we are going to write the test, its 45 minutes, Oh sheet. I was so frustrated, I was so frustrated.” (PN, Clinic-based)

“I heard my other colleagues complaining that during the training session there are no enough computers for all of the trainees to do practice at the same time, or they are given the chance to use the computer for practical.” (PN, Hospital- based)

“The courses are useless and frustrating because these who are seeing the computer for the 1st time tend to be intimidated by the young ones who are computer experts and use computer daily. So they don’t enjoy the course. How are they going to practice the computer when they did not even enjoy the course itself because they are put together among the people who know the computer.” (PN, Clinic-based)

4.9.3 *The duration in between training*

The nurses interviewed recounted that the time it takes for them to be invited after attending the first level is too long and, since some of them do not have computers to practice on, by the time they were invited to attend the next level they had forgotten what was taught at the previous session.

"I think the process is too long. It has been for almost one year since I attended the 1st level and I don't know when I will be invited to go for the 2nd level." (Tutor, Nursing College)

"I was introduced to computer six months ago. But it takes a long time for us to be invited to go for the next level. Usually it is those people that have already been exposed and have diplomas in computing who have been invited for the 2nd, 3rd and 4th change, whereas we have been invited only once." (Tutor, Nursing College)

4.9.4 *Recommendations to enable nurses to access and use information technology*

These recommendations will improve access to and use of IT efficiently after being trained.

➤ *Incorporate computer training into the Nursing Curricula*

The nurses interviewed agreed that computer literacy should be integrated into the existing nursing curricular. It should be provided to all categories of nurses and not limited to professional nurses as is the case now.

"We feel that it is important that computer training should be introduced, be incorporated in the training of nurses. For instance now, if a student completes the training, maybe apply to Albert Luthuli where they use computer, they may struggle to work in those areas. But being computer literate upon completion of his/her diploma s (he) will have a job anywhere, yes it is important." (Tutor, Nursing College)

"Computer course is supposed to be included to our curriculum in the colleges. That is really 100% good. I think that is really really good." (PN, Clinic-based)

"I can say it would be better if every category in the clinic settings should be trained on computer. It should not only be the Nurses." (PN, Clinic-based)

"So I think what they should do now, computer must be package for the nurses. They must have it at school as the package, but for us now because we are in the field I think we can close the gap in terms of, by attending (the courses)." (PN, Hospital-based)

"We recommend that the use of computer should be part of the orientation package whenever someone is employed so that they can be able to access other information. There are a lot of researches that are going around. With computer skills we will be able to understand many things." (Tutor, Nursing College)

➤ **The computer training programme should be relevant**

The nurses further mention that when IT is integrated to nursing curriculum, the courses should be developed to be relevant to their profession so that they will be able to apply such skills at their work place or in what they do.

"I think the thing that we are being trained with at the computer must be relevant with what we are doing at the clinic. Because I can learn something but something that I am not practicing at the clinic won't help me. I think it must be relevant to the work that I'm doing. So I think it will be better to go further in developing oneself, but it must be relevant. So the whole structure of the training programme, I think, needs to be reviewed." (PN, Clinic-based)

➤ **Organization of training**

Nurses suggested that, in order to improve access to and use of information technology by nurses after being trained, the training should be modified as follows:

➤ **Training should be decentralized**

The nurses interviewed agreed that training should be organized at sub-district level rather than at the district level. Such a change will enable more people to be trained and the distance to travel will be reduced.

"I think if training can be decentralized, it will be even easier for more candidates to attend, and getting access to travel will be easier." (PN, Clinic-based)

➤ **Trainees should be grouped**

The nurses unanimously agreed that, during the training sessions, instead of putting the entire group together, their previous computer background should be taken into consideration and trainees should be grouped based on their computer background.

"If they can just arrange the groups, for example all Admin Officers go together, the group of nurses, it can even make easier for the Service Provider to train people." (PN, Clinic-based)

"I am talking about restructuring of the computer training programme because as the Matron said we are often mixed with people who are having high level of computers." (PN, Clinic-based)

"I wanted to say if they can separate trainees because it tends to frustrate the 1st users of computer." (PN, Clinic-based)

"In the hospital, because there is a lot of staff in training, I think if they can be grouped - those who have previous knowledge of using the computer need to be together. It delays even the service provider to mix the people who have never touched the computer, mixing them with the people who have had some skills." (PN, Clinic-based)

➤ **Telemedicine (Videoconferencing equipment)**

Nurses from hospitals that have telemedicine equipment felt strongly that this equipment is used by doctors only and they want to understand more about it or become involved.

"I think they should involve nurses if they are in communication with other institutions using the telemedicine facility." (PN, Hospital-based)

"Only nurses who are working in the theatre have the opportunity to participate during videoconferencing. What about other nurses? If doctors can come in the ward and communicate with nurses how this thing is done. Because it is mostly the doctors who use this thing, nurses are left out." (PN, Hospital-based)

"All staff should be involved in telemedicine because other staff know that there is this telemedicine but they haven't seen how it is used." (PN, Hospital-based)

"We just go there sometimes if we have meetings; we just see this big machine of which we don't know even what it is. We heard that it is a telemedicine meeting. I think if it is used for every staff then the staff should know how to use it especially for professional they should know what it is." (PN, Hospital-based)

➤ **Provide more computer and internet access to nurses**

Nurses at all levels unanimously recommended that more computers should be provided to them.

"We all have got different needs for these computers so we should all get access to the computers. It should not be restricted to people from HR or Stores or Clerks. It should not only be restricted to people with ties." (All Nurses)

"In the hospital, I think all departments and wards need more computers so that everybody can get access to the computer." (PN, Clinic-based)

"We should have enough computers or enough points with computers at the clinic. It is not fair for someone to travel from one point of the hospital to the other point just to access a computer. Where ever there is work to be done there should be a computer point, at least one and the computer should have intranet access." (PN, Hospital-based)

In the absence of individual computers, they would like a common computer room for nurses where they can sit and work comfortably without any interruption.

"In every hospital, nurses should have a computer room where in our spare time we can go there and do some practicing. Because like the doctors they do have their computer room, but sometimes you feel like you

are not free to get there you know, because while you are busy they come in you see that.” (PN, Hospital-based)

“If we can have a place, a space where they are computers, then I don’t have to move around when I want to use the computer. If one has something to do with the computer, one just need to go to the computer room and access that thing than running around.” (PN, Nursing College).

“If we can have a computer room where everyone can access the computer, even our students can go there and access the computer.” (PN, Nursing College)

➤ Local Support

In order to improve access to and use of information technology by nurses after being trained, the Service Provider should be based locally, that is, someone based within the district to provide assistance whenever needed instead of relying on the Service Provider in Durban who is often difficult to contact.

“We need local support, local support. Someone we can turn to whenever we need assistance. The person who conducts training at Nongoma is from Durban and after training, that person is gone. When one needs support there is not one to assist but if we had someone locally, that will be helpful.” (PN Clinic-based)

“We need someone who will facilitate this at district level. The role of the person will be to provide assistance or answer questions and be part of training. Since the trainer comes from Durban, it would be good to have someone from the sub-district level. This will be less expensive and the person can be easily contacted in case of trouble.” (PN, Hospital-based)

“We need local assistance and the role of the person to provide assistance or answer questions and be part of training. Since the trainer comes from Durban, it would be good to have someone from the sub-district level. This will be less expensive and the person can be easily contacted in case of trouble. Whenever a decision has to be made about restriction, we should be contacted, because we know what we need most.” (PN, Clinic-based)

4.10 Summary of Chapter four

In this chapter, the results were presented. Data was collected through focus group discussions. Content analysis was used to analyze data. Challenges to accessing use of computers by nurses after being trained are lack of infrastructure, access problems and the lack of relevant computer software and programmes. The discussion will be presented in the next chapter.

CHAPTER FIVE: INTERPRETATION AND DISCUSSION OF RESULTS

5. Introduction

This chapter presents the discussion of the findings in relation to the objectives of the study. From the results that emerged from this study, the nurses in northern KwaZulu-Natal attend information technology training courses and, on their return to their healthcare facilities they are unable to apply the new skills acquired. The findings obtained show that access to, and use of information technologies by nurses at their healthcare facilities is hindered by the lack of computers, access problems, lack of relevant computer software programmes, deficiencies in training and negative attitudes towards computers.

5.1 Examining the computer literacy skills required by nurses

The nurses interviewed expressed an understanding about computers and what they would like to do with information technology. Nevertheless, they were able to also identify what computer literacy skills they needed.

Previous studies have shown that computer literacy in nurses is often limited to Microsoft Word (Gerrish et al. 2006:94). Considering the fact that Microsoft Word would be used nurses daily was incorrect. However, according to the nurses, Microsoft Word would be useful and could enhance the daily activities of nurses who perform administrative tasks (word processing). But for nurses who are hands-on with patient care, treatment and management, word processing although relevant would improve their daily activities. Therefore, the authors confirmed that computer literacy training for nurses should not be limited to word processing, and suggested that should also include the following:

- A range of information technology resources at the level of general users and file management.

- An understanding of the importance of passwords and the general security of equipment and access.
- The current health and safety legislation relating to the use of computers and personal information on computers, as set out in the data protection act.
- The concept of information and its electronic handling
- Personal and clinical use of computers and information technology such as the internet and intranet.

5.2 Identifying the obstacles faced in accessing and using information technology

The following sections highlight the factors that hinder nurses access to and use of computers after being trained.

5.2.1 The type of IT available

Healthcare facilities have a diverse range of equipment which could be used for the delivery of healthcare activities. But the types of information technology equipment available in the facilities interviewed are: computers and computer related accessories, including intranet access.

There is little in the literature as to what type of IT should be available to nurses. However, studies have emphasised the need for nurses to have a vast knowledge of IT as this will help them enhance the delivery of health services (Gerrish et al. 2006:96).

5.2.2 Lack of information technology

The lack of information technologies are compounded by the lack of computers and absence of support mechanisms in respect of both software and hardware.

After computer training, the nurses require computers in order to effectively practice their newly acquired skills. Such a factor applies to any type of training. But this study reported that after training, on the return of nurses to their offices or posts of work, the unavailability of the necessary equipment

results in a further inability to practice their skills. As a result of this factor, they tend to forget the computer skills acquired.

The deficiency in relation to the availability of computers has been identified as a major barrier to access to information technologies in most developing countries (Henderson & Deane 1995:256); Oak 2007) as a result, nurses endure serious delays and inconvenience in order to have access to a computer (Webster et al. 2003:144). However, the reason for the lack of computers for nurses was not mentioned.

The application of information technology in health is important as it increases efficiency, effectiveness, meets the needs of patients, staff and organizations involved in the delivery of healthcare service (Cardo 2000:1443). It can be argued that the use of computers is the basis of accessing IT knowledge. Although the importance of IT in health has been acknowledged, its integration into the delivery of health services in rural and remote healthcare facilities in developing countries is still very slow. Generally, the lack of information technologies has been attributed to cost factor. Although, some African countries have started manufacturing and assembling computers, the costs involved are too much. That is, costs involved in acquiring IT equipment (hardware and software), installation, connectivity and maintenance and in developing programmes are still exorbitant are often too prohibitive and beyond the budgets of health institutions in many developing countries (Edwards & Drury 2000:52, Kanamugire 1998:126). Alternatively, Ballantyne & Addison recommend that, if information technologies are properly installed, supported and managed, they could maximize scarce resources and provide access to reliable health information and other services and the latter will complement the scarce resources (Ballantyne & Addison 2000:20).

The literature has emphasized the need for proper integration. This occurs because, when an isolated individual computer is situated in a clinic or hospital and the secretary uses it for secretarial and administrative services, such facilities are often designated as having been automated. It is worth noting that information technologies integration involves more than the provision of computers to clinics and hospitals for administrative purposes.

Although IT integration into healthcare systems is expensive, investing in them is worthy because the benefits derived thereon are enormous and can assist in solving the many challenges healthcare facilities are encountering today: these are, inter alia, scarce resources and poor communication, poor monitoring, and poor access.

Interestingly, the results from this study diverge from the observations of Ballantyne & Addison that the lack of IT is not due to unavailability of funds but related to the issue of prioritizing services and functions (Ballantyne & Addison 2000:20). Results show that the services of nurses are not viewed as constituting a priority, as IT access is given to those staff whose functions are considered to merit greater importance. The prioritized activities are administration, procurement, laboratories and human resource management. Since the clinical activities of nurses are deemed to be of 'lower priority' providing access to computers for nurses remains either neglected or limited (Mthumbu 2007).

The lack of IT support constitutes a major obstacle to the access to and the use of computer. This finding concurs with that of other studies. According to the literature, rural areas are mostly hit as far as lack of human and financial resources are concerned. This is because in the rural areas, it is difficult to attract and retain qualified staff (Centre for Rural Health 2007), and professionals would prefer to work with private organizations due to better working conditions and better salary packages.

Lack of support after training was another problem identified in the study. Normally, in any training, support is usually of the training package. According to the literature, for an institution to use IT properly, there is the need for a support system to ensure continuity. Such a support system can aid in identifying resources, and also assist novice users. It should be a part of the vision of the institution. The author recommends the creation of a resource centre as an in-house support system (Yaghamaie & Jayasuriya 2004:164).

5.2.3 Lack of relevant computer activities/tasks

Lack of relevant computer activities was also identified as a problem. This result concurs with previous studies on the lack of relevant programmes (Alpay et al. 2000:6). The literature has also alluded to the lack of relevant information technology training being offered to nurses. The lack of relevant computer activities has been attributed to the type of training offered and also to the non-integration of IT in nursing curriculum. However, studies have emphasised that IT training for nurses should not be limited to word processing, spreadsheets, file management and graphics. It should also be noted that if IT is integrated into the nursing curricula might it would lead to positive attitudes, more exposure, and ultimately nurses will feel more confident (Garish et al. 2006:96). Sinclair & Gardner further added that when IT is integrated into the nursing curricula, the content of the course will determine the type of training to be offered, and will ensure that the necessary skills are developed (Sinclair & Gardner 1999: 1443).

Another reason attributed to the lack of relevant computer software is the lack of clarity as to what IT training for nurses should comprise. Again, it has been reiterated that if IT is integrated into the existing nursing curricula, it will give relevance to what will be taught. However, this is the responsibility of both the nursing council and nursing educators to define the objectives of IT in healthcare and to nursing in particular (Alpay 2002:137). Hence, accredited courses for nurses will be developed and such course(s)

will be designed to meet the needs of IT in nursing. It will also provide the link between technology and healthcare delivery, and its importance in healthcare delivery something which is lacking in the training they are presently receiving (Alpay 2000:6; Alpay 2002:137). Until these issues are clearly outlined, the content of IT for nurses will remain a major concern. However, at KZN the situation is even worse because at the nursing colleges access to computers are also limited to the principal and secretary thus, the educators do not have access and are also not computer literate. Therefore, nursing educators need greater encouragement to begin using IT as well (Mthumbu 2007).

5.2.4 Attitudes towards computers

Attitudes toward the use of information technology were identified as major obstacles. This finding confirms with earlier studies on the use of information technology by nurses (Roberts & Peels 1997:826). Nonetheless, the literature reports that over the years attitudes have changed and nurses are interested in using information technology more than before (Garish et al. 2006:95). However, in this study, the nurses interviewed expressed both positive and negative attitudes towards the access to and use of information technology. These findings are similar to those of some studies (Gerrish et al. 2006; Alquraini et al. 2006; Iliyasu 2005). Those who manifested negative attitudes remain of considerable concern.

From the literature, different factors have been identified to influence negative attitudes: nurse work experience and cultural differences. Although these aforementioned factors were not discussed in the present study, the nurses interviewed confirmed that at the beginning of the training they were excited and eager to study but during the course of the training, their attitude changed to negative. These negative attitudes arose because they were not comfortable using computers. However, as they continued to use computers, they became more familiar and confident. However, factors that influenced negative attitudes as indicated by the nurses interviewed are:

➤ **Increased workload**

Increased workload was identified in this study. The literature has emphasized that lack of support, inadequate referral systems, and absence of appropriate skills, nurses are over-stretched and do not have sufficient time to use computers, as their attention to patients takes priority. The authors warn that, as long as understaffing and heavy workloads prevail in clinical settings, they inhibit nurses from leaving the clinic to attend computer literacy training courses. It has been further stressed that increased workloads also act as a restraint to nurses from finding time to apply the skills in their daily activities or to practice them after being trained (Lee *et al* 2005:171).

➤ **Deficiencies in training**

Training deficiencies were a major issue in this study. Training deficiencies increase stress and frustration. This finding concurs with other studies. However, the literature on adult teaching has emphasized the need for facilitators to respect the principles of teaching when teaching adult learners. The literature further states that when these principles are applied when training during adults issues such as group composition and group dynamics, facilitation techniques, arrangement during lecture, venues, administration of the course, assessment and evaluation and how to handle pressure from class-mates and how to address the adult learners, etc, will all be addressed before the commencement of the training (Alpay *et al.* 2000:6).

➤ **Access problems**

Factors that hinder access to IT was a major concern in this study. In this study, however, access referred to the location of the computer, password and permission, and intranet access.

In this study, the nurses interviewed reported that the location of the computer was problematic and, in some cases, the nurses required passwords and permission in order to be able to acquire use thereof. However, (Gerrish *et al.* 2006:93) emphasizes that the location of the technology should be easily accessible and should be placed in a safe location, secured and comfortable environment.

Furthermore, access should be provided to all those who have been trained and not to the managerial team only.

5.2.5 Limitations of the study

The phrase information technology is an umbrella term used to describe complex electronic hardware and software, linked by a vast array of technical protocols. Although IT is a broad term as already defined above, in this study, the equipments referred to as information technology were computers and computer accessories such as the printer, and intranet and/or internet. This is because this is all that is available in the healthcare facilities of those who participated in the study. Information technology is relevant in all areas of healthcare delivery but this study was confined to nurses who had undergone computer literacy training and who are working in government healthcare facilities in northern KwaZulu-Natal.

Time constraint: Data for this study was collected during the period when there was a nationwide civil servant strike; it was difficult to remove nurses from their work stations to participate in the focus group discussions for an hour without being called for an emergency arising in the ward. Also, due to the nationwide civil servant strike, it was difficult for the researcher to travel back to health facilities to verify data collected through follow-up focus group discussions.

Had sufficient resources and time been available, the researcher would have interviewed information technology facilitators on the issue of access and policy. The results obtained from the facilitators would have provided for a broader and more diverse perspective of the research questions. Further studies might focus on this.

Initially, the researcher had intended to utilize four nurses per facility per level but due to the fact that not many nurses have been trained on how to use a computer, the nurses from the hospital and from

the nursing colleges were merged to form a single group. In order to avoid confusion and for analysis purposes, the nurses were granted code names such as NT1 (Nurse Tutor) and HPN (Hospital-based Professional Nurse) and they were advised to identify themselves by these particular code names when speaking.

5.2.6 The person of the researcher

Such a characteristic refers to the sensitivity towards the means whereby both the researcher and research processes have shaped the collected data as influenced by the former's bias. The researcher works at the Centre for Rural Health as a researcher and facilitator. During her past profession as systems operator at Healthnet Network in Cameroon and facilitator of health information, she experienced a lack of access to and skills in accessing IT by healthcare professionals. Therefore, it is apparent that researcher bias might be introduced. To reduce this unwanted phenomenon, the researcher attempted to become aware of her own biases, and to maintain an ethical standard.

Other possible biases lie in the current professional status of the researcher. The fact that the researcher is not a nurse by profession and originates from another institution might possibly have introduced researcher bias. In an attempt to reduce this bias, the interview guide was pre-tested before it was administered. The nurses interviewed came from three levels; hospital, nursing college and clinic levels. Such a factor has allowed a broad perspective of the research problem to be provided. Finally, the data was analyzed by the researcher and a senior researcher independently in order to triangulate the analysis.

5.2.7 Assumptions underlying the study

At the beginning of the study, the researcher held the following underlying assumptions:

- a) That nurses, as the largest sector of healthcare professionals and frontline healthcare providers

do not possess adequate knowledge and skills to access and use IT compared to doctors and other healthcare professionals.

- b) Although nurses are trained in information technology, access to and use of such technologies as tools to facilitate healthcare delivery is still practiced rudimentarily.
- c) Nurses do not have access to information technology.

5.2.8 Summary of Chapter five

The chapter discusses the results in light of other studies relating to the research question. The limitation of the study was also discussed. The conclusions and recommendations will be presented in the next chapter.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6. Introduction

The purpose of this study was to explore and identify why professional nurses are unable to apply ITs skills in their daily activities in healthcare facilities after being trained. The main purpose behind the study lay in the fact that only 7% of professional nurses are computer literate after undergoing computer literacy courses, compared to 90% of therapists and 78% of managers.

The chapter will discuss the summary of conclusions and recommendations that emanated from the results and the literature maintaining the objectives of the study.

6.1 Conclusions

The following sections summarise the findings of the study based upon the research questions of the study.

Objective One

To examine the computer literacy training needs of professional nurses in healthcare facilities in northern KwaZulu-Natal.

What are the computer training needs of a professional nurse?

The nurses interviewed were able to identify the computer training needs, they however expressed an understanding of what they would like to do therewith and how computers could help them in their daily activities.

The computer training needed by nurses is broad. Thereby, nurses should be able to have a good understanding of computers and its software so that they will be able to use them confidently and

comfortably. Computer training for nurses should enable them to use a wide range of computer programmes and to be able to perform a wide range of tasks or activities with the computer and should not be limited to Microsoft Office Suite, a factor that was also confirmed in the literature.

What do professional nurses use computers for?

They would like to use computers to be able to capture and analyze data, prepare their work plans, document procedures and guidelines, and to prepare students' lectures, etc. There was a broad variety of activities they would like to use a computer for.

Objective Two

Identify the obstacles that professional nurses face to access and use IT in rural healthcare facilities in northern KwaZulu-Natal.

What IT are available to professional nurses in rural healthcare facilities?

The types of IT available are computers, printers, scanner, intranet and the internet, and in some hospitals there are video-conferencing sets. Although there are these equipments, one of the major issues identified was access. Challenges to access were experienced at varies levels as highlighted below:

The nurses do not often have access to IT (computer, internet and intranet) because the services of nurses are not viewed as constituting a priority. Access to IT is given to those whose functions are considered to merit greater importance. Since clinical activities of nurses seemed to be regarded as that of lower priority activities, providing access to IT remains either neglected or limited.

What challenges do professional nurses face to access IT in rural healthcare facilities?

The accessibility problem is exacerbated by their location as they are either in the medical managers office, the nurse manager's or the supervisor's office. To be allowed to use the machine, permission is needed to enter the office and then ask for another permission for login and password in order to use the computer. In most cases this is difficult as meetings are often held in these offices and the supervisor's office is a long distance from the clinic.

What factors hinder access to and use of IT by professional nurses in rural healthcare facilities?

Lack of computers and lack of relevant computer software are factors that hinder access to and use of IT. For those with access to computers, the software installed is irrelevant. As a result, they cannot use the computers comfortably. In addition, since they are in the rural area with bad roads and poor means of communication, a support system is either limited or not available.

Nurses negative attitude towards the use of IT highlighted as another barrier. Attitude towards the use of computers is partly as a result of the aforementioned factors and also due to deficiencies in training.

In regard to the training, the process of selection of nurses to attend the training is unclear. The composition of the group is not adequate and, as a result thereof, the nurses tend to develop a negative attitude towards the use of computers and tend to forget the skills acquired, through lack of use.

6.2 Recommendations

➤ *The lack of information technology infrastructure*

It is clear that information technology can play an important and crucial role in enhancing healthcare delivery, particularly in the rural areas where resources are scarce. Information technology can be used to complement the lack of resources. Therefore, more information technologies (access to computers, internet and intranet services) should be provided to nurses. KwaZulu-Natal Department of Health

should review its policies (if any) on computer procurement to district hospital, clinics and nursing colleges. The policy should also look at access to intranet/internet, allocation and providing access to computers and intranet for the delivery of healthcare services in the rural district healthcare. By so doing, the KZN Department of Health have a responsibility in overcoming the digital divide and also in ensuring as wide an access as possible to its services.

➤ ***The lack support***

In the rural areas, government departments should develop a policy whereby the same IT specialist (service provider) is contracting. The service provider will provide support, and maintain information technology systems to all the government departments in a single rural district. This will provide more jobs to the service provider and will encourage him/her to reside in the rural area rather than in the city. Alternatively, the post of an IT technician is created at the district or hospital level who will provide such services and support.

➤ ***Introducing alternative technologies***

In addition, the element of introducing alternative technology such as the PDAs (Personal Digital Assistant) arises. Although PDAs are small in size, they have the same features as computers. They are able to retrieve information from databases. PDAs are good because of their flexibility; i.e. they can be used as a cell phone and will enable the user to also type and print. When connected on the internet they can be used to access information via the web and nurses will find answers in their palms and not at the nurses' work station. Due to the size of PDAs they will always have it on them and will enable nurses to have current and reliable and routine updates. It should be noted that, presently KZN-DOH provides cell phones and airtime to clinics in rural KZN. Instead of providing ordinary cell phones, they should give PDAs instead.

➤ ***Training***

- Reduce the time nurses have to wait before being invited to attend the next level of the training. Computer literacy should be introduced to nurses as continuing professional education.
- The IT training should be organized at sub-district level so that participants will not have to travel long distances.
- Those who are already computer literate should not be grouped with those who have never used computers and use local service providers who could be easily located when need be.

➤ ***Lack of relevant computer software***

Information technology should be integrated into the nursing curricula. If integrated, the course should be designed to suit the IT needs of nurses. In addition, the course will clearly outline the importance of IT in healthcare delivery and the content will be relevant to the functions of nurses.

➤ ***Attitudes towards computers***

When IT is integrated into the nursing curricula, nurses will gain more exposure and assistance thereto. Thus, nurses will become more confident when using computers. More exposure will lead to less negative attitudes.

➤ ***Access issues***

KwaZulu-Natal Department of Health should review its policy on the allocation of IT to district healthcare facilities and also to look at the possibilities of providing nurses with a roving login and password to access their computers. This will enable nurses to log into any computer that is available.

In addition, computers should be located in an environment where they can be conducive and easily accessible by all staff members. If the safest place to keep a computer is in the library, the institution

should provide afterhours access so that nurses and other healthcare providers would be able to access the technology if need be. Unrestricted but monitored intranet access should be provided.

In KwaZulu-Natal, the Department of Health, in partnership with SITA offers information technology training to civil servants from various units of the department. The trainees enter into such a learning process with diverse backgrounds, which is a factor not taken into consideration when training. The KwaZulu-Natal Information Technology Department of Health staff independently decide on the type of training, structure, and content. Nursing college educators are not computers literate thus no access to computer. Those clinics without computers, thereby, access to the intranet remains an impossibility and support is seldom available when needed.

Nurse educators should be included in the process in developing IT content for nurses and it should not be left to SITA facilitators alone and nurse educators should be trained as well.

Finally, instead of asking nurses why have they not been able to apply the IT skills in their work environment after training, the KZN Department of Health should be asking itself whether they are prepared to prioritize the use of and access to IT in health care delivery and, particularly, for the nurses. Such a question is important because access to and use of IT by nurses involves more than just providing computers and sending nurses on training courses. Policies and a support system should be available, and, most importantly, a 'visionary' person is needed to champion the entire process. Information technologies are powerful tools to enhance efficiency, accessible and affordable means of delivering of health services. Therefore, the training of nurses should be geared towards achieving that goal and information technology skills will accelerate the process.

7. REFERENCES

- Addo H.** 2001. Utilizing Information and Communication Technologies for Education and Development: Issues and challenges for Developing countries. *IFLA Journal* 27(2001)3. Available at <<http://www.ifla.org/V/iflaj/abs2703.pdf>> [10th Nov 2008]
- AED-SATELLIFE Bulletin.** 2005. The Global health information networks: ICT Health Available at <<http://www.healthnet.org/icthealth.php>> [10th Dec. 2008].
- Ahmed M. & Berlin A.** 1997. Information technology in general practice: current use and views of future development. *Journal of Informatics in Primary Care* 1997(Nov.): 5-8. Available at <<http://www.primis.nottingham.ac.uk/informatics/nov97/nov3.htm>> [27th August 2007]
- Alpay L, Gill N & Murray P.** 2000. The potential of information technology for Nurses in primary care: a review of issues and trends. *Primary Health Care Research and Development*, (1)5-13.
- Alpay L & Russell A.** 2002. Information Technology Training in Primary Care: The Nurses' voice *Computers Informatics Nursing*. Vol. 20(4), 136-142.
- Alquraini H, Alhashem A, Shah M, Chowdhury R.** 2006. Factors influencing nurses' attitudes towards the use of computerized health information systems in Kuwaiti hospitals. *Journal of Advanced Nursing* 57(4), 357
- Amanda, K.** 2002. Online learning: enhancing nurse education? *Journal of Advanced Nursing*, 38(2):127-135
- American Library Association,** 2000. The digital divide. Available at <<http://www.ala.org/ala/aboutala/missionhistory/plan/digitaldivide.cfm>> [20th Nov. 2008]
- Babbie E.** 1992. *The practice of social research*. Belmont: Wadsworth
- Ball M.** 2000. *Overview: Emerging trends in nursing informatics*. In Ball, MJ, Hannah KJ, Newbold SK and Douglas JV (eds.) *Nursing Informatics: where caring and technology meets* 3rd ed. Springer New York. Pp. 3001- 304.
- Ballantyne P & Addison C.** 2000. Cooperation on the web: trends and practice in development sector. *Information development* 16(1):15-23.
- Barry P, Jones S, Jacobs G.** 2007. Retention and application of information technology skills among nursing and midwifery students. *Innovation in Education and Teaching International* 44(2) May 2007, 199-210.
- Bello, I., F. Arogundade, A. Sanusi, I. Ezeoma, E. Abioye-Kuteyi, A. Akinsola.** 2004. Knowledge and utilisation of information technology among healthcare professionals and students in Ile-Ife, Nigeria: A case study of a university teaching hospital. *J. Med Internet Res* 2004;6(4):e45
- Bracey B.** 2000. Bridging the Digital Divide. Available at <<http://teachers.net/gazette/SEPO/bracey.html>> [5th Jan. 2009].

Bouma J. 1999. The experience of nurses learning computers in the workplace. Master thesis. Alberta: Calgary. Available at <<http://dspace.ucalgary.ca/handle/1880/25270>> [20th August 2008]

Bridges.com. [**]. Provincial Government of the Western Cape: Cape Gateway project. Available at <http://www.bridges.org/publications/63?from=10&comments_per_page=10> [11th Nov 2009]

Bridges.com [***]. South Africa Telecommunication overview, commentary, and statistics. Available at <<http://bridges.org/publications/123>> [12 Nov 2009].

Brink P. & Wood M. 1998. *Advance design in nursing research*. Thousand Oaks: Sage.

Brookfield 2005. Adult education: the power of critical theory for adult learning and teaching. Open University Press. Available at <http://en.wikipedia.org/wiki/adult_education> [5th Jan. 2009].

Burns N. & Grove S. 2001. *The Practice of Nursing Research: conduct, critique, and utilization*. 5th ed. Elsevier Saunders.

Bryson D. 1991. The computer-literate nurses. *Computer Nurs.* 9(1991) 100-107.

Cardno, E. 2000. Managing the “fit” of information and communication technology in community health: a framework for decision making. *Journal of Telemedicine and Telecare* vol.6;6-8

Centre for Rural Health. 2007. Situational analysis on learning needs and opportunities of health professionals in northern KwaZulu-Natal, University of KwaZulu-Natal, Centre for Rural Health, Durban (Unpublished).

Chanda, K. 2004. ICTs to enhance delivery of health services. 14online March 2004.

Chetty M, Tucker W, Blake E. [**]. Telemedicine in the Eastern Cape using VoIP combined with a Store and Forward Approach. Available at <<http://pubs.cs.uct.ac.za/archive/00000202/01/Chetty.pdf>> [7th Nov. 2009].

Chisenga J. 2002. Facing the digital divide; ensuring access to digital information in sub-Saharan Africa [21(4): 179-187. [Electronic version]

Coffman J. 2000. Applying adult education principles to computer education. *Journal of Nursing Development* 12(5):260-263.

Couper I, Malate N, Hugo J. 2000. The role of the visiting doctors in primary healthcare clinics: a research report. Available at <<http://www.hst.org.za>> [8th Nov. 2008]

Davenport, B. 2003. What Nurses need to know about PDAs. Available at <http://eaa-knowledge.com/ojni/ni/8_3davenport.htm> [24th June 2008]

De Vos, Strydom H, Fouche B, Delpport C. 2005. Research at grass root: for the social sciences and human service profession, 3rd ed. VanSchaik Publishers.

Dubow, J. 2006. Improving health, connecting people: the role of ICTs in the health sector of Developing countries: A framework paper. *InfoDev program* Grant no. 1254

Ernberg, 1998. Universal Access for Rural Development: from actions to strategies. 1st International Conference on Rural Communication. Washington. 30 Nov. – 2 Dec. 1998. Available at <http://www.itu.int/ITU-D/univ_access/> [20th Nov. 2008]

European Space Agency. [***]. Satellite-enhanced health and telemedicine for the whole of Sub-Saharan Africa, demonstration project. Available at <<http://iap.esa.int/Tenders/subsaharan-africa>> [11th Nov. 2009]

Ewards A & Drury M. 2000. Using computers in basic nursing education, continuing education, and patient education. In Ball, MJ, Hannah KJ, Newbold SK and Douglas JV (eds.) *Nursing Informatics: where caring and technology meets* 3rd ed. Springer New York. Pp. 49-69.

Frantz K. 2001. Evaluating technology for success in home care. *Caring* 20(9) 10-12

Galblum, A. 2002. Handheld computers for health workers in Africa. *International Network for the Availability of Scientific Publications (INASP) Newsletter* 2 Oct. 2002. Available at <<http://www.inasp.info/uploaded/documents/21-oct02-INASPNews21.pdf>> [1st August 2008]

Ganapathy, K. 2008. Without India there is no mHealth (mobileactive). Available at <http://tech.groups.yahoo.com/group/bytesforall_readers/message/12405> [24th August 2008]

Gaumer G, Koeniger-Donohue R, Friel C. 2005. Use of information technology by Advanced Practice Nurses. *Comput Inform Nurs*. 2007. Nov-Dev;25(6):344-52

Geissbuhler A., Ly, Lovis, L'haire. 2003. Telemedicine in Western Africa: Lesson learned From pilot project in Mali, perspectives and recommendations. *AMIA Annu Symp Proc* 2003; 2003: 249-253. Available at <<http://www.pubmedcentral.nih.gov>> [10th Dec. 2008].

Gerster, R & S. Zimmerman. 2003. Information and Communication Technologies (ICTs) and poverty reduction in sub-Saharan Africa: A Learning study (Synthesis). Available at <http://www.deza.admin.ch/ressources/resource_en_24708.pdf> [7th Jan 2009].

Godlee F, Neil Pakenham-Walsh, Ncayiyana D, Babara C, Abel P. [***]. Can we achieve health information for all by 2015? Available at <<http://image.thelancet.com/extras/04art6112web.pdf>> [11th 2009]

Gerrish, K., A. Morgan, I. Mabbortt, S. Debbage, B. Entwistle, M. Ireland, C. Taylor, C. Warnock. 2006. Factors influencing use of information technology by nurses and midwives. *Practice Development in Health Care* 5(2): 92-101

Health KwaZulu-Natal. [***]. Telemedicine. Available at <<http://www.kznhealth.gov.za/telemedicine.htm>> [11th Nov 2009]

Henderson R & Deane F. 1995. Assessment of satisfaction with computer training in healthcare setting. *Journal of Nursing Staff Development* 11(5): 255-260

Hsu H, Hou Y, Cheng I, Yen D. 2008. Factors influencing computer literacy of Taiwan and South Korea Nurses. *Journal of Medical Systems*. [Electronic Version].

ICT for Africa. 2007. ICTs in Africa: ecommerce in Africa. Available at <http://ictinafrica.com/sector/ecommerce.htm> [5th Jan 2009].

Iliyasu Z, Abubakar I, Kabir M, Abbas M. 2005. Computing Knowledge, attitudes and skills among healthcare professionals in Aminu Kano teaching hospital, Nigeria. *Nigerian Journal of Medicine* (14)2, April- June 2005.

InfoDev. 2007. ICT in Health: the role of ICTs in the health sector in developing countries. Available at <http://www.infodiv.org/en/Project.38.html> [5th Dec. 2008]

InfoDev. 2007. Governance: <http://www.infodiv.org/en/Topic.html> [20th Dec. 2008].

Information Access Institute. Public Internet access. Available at World Wide Web: Available at <http://information.org/public.html> > [10th June 2008]

International Development Research Centre (IDRC). [***]. Telecentres in South Africa. Available at http://www.idrc.ca/en/ev-56553-201-1-DO_TOPIC.html > [11th Nov. 2009]

International Telecommunication Unions. 2003. Universal Access to Internet services. Available at <http://www.itu.int> > [3rd Dec 2008].

Internet Usage Statistics for Africa. [***]. Africa Internet Usage and population stats. Available at <http://www.internetworldstats.com/stats1.htm> > [12 Nov 2009]

Jayasuriya, R., & R. Chapman. 1997. Computerized information systems in community nursing: factors related to computer skills and computing training. *Informatics in healthcare.* Australia 6(5): 191-196.

Jensen M. 2004. Participating in the telecom policy dialogue. ICT Update No. 15, 2004. Available at http://ictupdate.cta.int/en/regulars/g_a_participating_in_the_telecom_policy-dialogue > [7th Jan 2009]

Jensen M. 2005. ICT in Africa: A status report. Available at <http://www3.sn.apc.org/africa/afstat.htm> > [20th Nov. 2008].

Kanamugire A. 1998. Implementing information technology projects. In Kent (ed.) *Encyclopaedia of Library and Information Science* 63:125-171

Kanana C. 2006. Personal communication, Ekomba Hospital, September 2006

KENT ICT. Available at <http://www/kented.org.org.uk/ngfl/ict/definition.htm> > [11th Nov. 2009]

Klecun-Dabrouska E, & Cornford T. 2000. Telehealth acquires meanings: information and communication technologies within health policy. *Information System Journal* 10:41-63

Knowles M. 1984. The adult learner: A neglected species (3rd ed.) Houston, TX: Gulf Publishing Company

Jiang W, Chen W, Chen. 2004. Important computer competencies for the nursing profession. *J. Nurs Research.* 12(2004) 213-2250). [Electronic version]

Lafond A, Brown L & Macintyre K. 2002. Mapping capacity in the health sector: a conceptual framework. *International Journal of Health Planning and Management* 2002; 17: 3-22.

Lieb, S. 1991. Principles of Adult Learning. Available at <<http://honolulu.hawaii.edu/intranet>> [7th Jan. 2009].

Lee T, Lee T, Lin K. & Chang P. 2005. Factors affecting the use of nursing information systems in Taiwan. *Journal of Advanced Nursing* 50(2), 170-178.

Mabaso, 2006. Personal communication, Benedictine Hospital, Sept. 2007.

Mack N, Woodsong C, MacQueen K, Guest G, Namey E. 2005. Qualitative research methods: a data collector's field guide. Available at http://www.fhi.org/en/rh/pubs/booksreports/htm_detacoll.htm [9th Oct. 2008]

Marasovic C, Kenney C, Elliot D & Sindhusake D. 1997. Attitudes of Australian nurses towards the implementation of a clinical information systems. *Computers in Nursing* 15, 91-98.

Mayanja M. 2009. Networking Telecentres in Africa. Available at <<http://www.telecentremagazine.net/articles/article-details.asp?Title=Networking-Telecentres-in-Africa&articleid=248&typ=Features>> [11th Nov 2009]

McNeil B, Elfrink S, Beyea S, Pierce S, Bickford C. 2006. Computer literacy study: Report of qualitative findings. *Journal of Professional Nursing*, Vol. 22, No.1 (Jan – Feb) 2006: pp 52-59.

Miller J, Piper L, Tucker D. 1997. Strategies for getting students on the information superhighway. *Nurse Educator*, 22(5), p. 40-43

Mills A, & McQueen J. 1997. Developing User Sophistication in the Prganization: an empirical investigation. *Proceedings of the Pacific Asia Conference on Information Systems, PACIS'97*, 1-5 April 1997, Brisbane, Queensland, Australia.

Miranda D, Fields W & Lund K. 2001. Lessons learned during 15 years of clinical information system experiences. *Computers in Nursing* 19(4) 147-151.

Morris-Docker S., A Tod, M. Harrison, D. Wolstenholme, R. Black. 2004. Nurse' use of the Internet in clinical setting. *Journal of Advanced Nursing*, 48(2), 157-166.

Mthembu C. 2008. Personal communication, Nkuzana Clinic, October 2008.

Mthumbu L. 2007. Personal communication, Pietermaritzburg, September 2007.

Mtshiya Z. 2009. Crisis at KZN hospital crisis at KZN hospital. *The Daily News*. 6 February 2009. Available at <<http://www.bhfglobal.com/crisis-kzn-hospital-6-february-2009>> [11th Nov. 2009]

Nagelkerk L., Ritola P & Vandort P. 1998. Nursing informatics: the trend of the future. *Primary Health Care Research and Development* 2000;1: 5-13

- Neuman, L.** 2000. *Social research methods: qualitative and quantitative approaches*, 4th ed. Boston: Allyn & Bacon.
- Nkosi P.** 2008. *The role of PHC supervisors in Area 3*. Poster presentation at the PHSA conference
- Ntuli A. [**]** Provincial findings in preparation for the South African Human Rights Commission Public Enquiry into the rights to have access to health care services. Synthesis Report. Available at <<http://sahrc.org.za/sahrc.../Provincial%20Synthesis%2Report.doc>> [11th Nov 2009]
- Oak M.** 2007. A review of barriers to implementing health informatics in developing countries *Journal of Health Informatics in developing countries*, 1(1), 19-22 Available at <<http://www.jhidc.org/index.php/jhidc/article/view/3>> [24 June 2008]
- Ojo T.** 2006. Communication networking: ICT and health information in Africa. *Information Development. SAGE Publication*. Vol. 22(2) pp 94-101.
- Omolewa M.** 2004. International Literacy Day. Cape Town, South Africa. Available at <http://portal.unesco.org/en/files/15785/11020842821int_lit_day_eng.pdf/int_day_eng.pdf> [11th Nov. 2009]
- Patton M.** 2002. *Qualitative research and evaluation methods*. 3rd ed. Newbury, Park CA: Sage Publication, Inc.
- Pope C, & Z Sue and N. Mays.** 2000. Qualitative research in healthcare: analyzing qualitative data. *BJM* 2000;320:114-6.
- Rahedi B.** 2000. Wireless in LDC's: a solution to the telecommunication industry. Available at <<http://asgard.kent.edu/collabwork/Spring2002/wireless.in.LDCs.ppt>> [7th Jan 2009]
- Rajeev R.** 2006. Personal Communication, Medical Research Council, Cape Town, December 2007
- Republic of South Africa.** 2006. Government Gazette. 491 29 May No. 28883. Available at <<http://www.info.gov.za/view/DownloadFileAction?id=6788>> [7th Oct. 2008]
- Roberts, J. & V. Peel.** 1997. Getting IT into shape – external factors affecting the potential benefits from health informatics. In Pappas, C et al., editors. *Proceedings for Medical Informatics Europe (MIE '97)*. Amsterdam: IOS Press, 825-28
- Romano A.** 1990. Diffusion of technology innovation. *Adv Nurs Sci* 3(2):11-21.
- Saba K.** 2001. Nursing informatics: yesterday, today and tomorrow. *International Nursing Review*, 48, 177 – 187.
- Saranto K.** 1998. Outcomes of education in information technology at nursing polytechnics. *Health Information Journal* 4, 84-91.
- Saranto K & Leino-Kilpi H.** 1997. Computer literacy in nursing: developing the information Technology syllabus in nursing education. *Journal of Advanced Nursing* . 25: 377-385

- Shamases R.** 2007. Personal communication, Zululand, September 2007.
- Shafika I.** 2007. Survey of ICT and education in Africa: South Africa Country Report South Africa – 1. Available at <<http://www.infodev.org/en/Publication.429.html>> [11th Nov. 2009]
- Simpson G, Kendrick M.** 1997. Nurses' attitudes towards computerization in clinical practice in a Britain General Hospital. *CompuNurs* 15(1): 37-42.
- Skyscape** 2000. Nursing procedures. Available at <<http://www.skyscape.com/estore/ProductDetail.aspx?Product=1069>> [10th July 2008]
- South African Health Review.** 2005 Health Systems situation analysis report. Available at <<http://www.doh.gov.za/facts/ensites/umzinyathi01b.pdf>> [7th Nov 2008]
- SONA REPRO** 2007: Health: a health sector perspective on the 2007 state of the nation address. Available at <http://www.parliament.gov.za/content/11_Chapter%2010.pdf> [7th Nov. 2008]
- Subedar H.** 2005. The nursing profession: production of nurses and proposed scope of practice. In Ijumba P, Barron P. eds. South African Health Review 2005. Durban: Health Systems Trust; 2005. Available at <<http://www.hst.org.za>> [7th Nov. 2008]
- Sinclair M & Gardner J.** 1999. Planning for information technology key skills in nursing education. *Journal of Advanced Nursing* 30(6) 1441-1450.
- Sliverman D.** 2006. *Interpreting qualitative data: methods for analyzing talk, text and interaction*. 3rd ed. London: Sage Publications, Ltd.
- Sultana N.** 1990. Nurses' attitudes towards computerization in clinical practice. *Journal of Advanced Nursing* 15, 696-702.
- The Horn of Africa Bulletin** 1995. The Horn. Available at <http://222.sas.upenn.edu/Africa_studies/Newsletters/HB91095_HOR.html> [7th Jan 2009]
- Trucano M.** 2007. ICTs for education in Africa. Available at <<http://ictinafrica.com/sector/ducation.htm>> [5th Jan 2009]
- UNESCO.** 2006. Multipurpose community telecentres. Available at <http://portal.unesco.org/ci/en/ev.php-URL_ID=5341&URL_DO=DO_TOPIC&URL_SECTION=201.html> [7th Jan 2009]
- United Nations Economic Commission for Africa.** 1999. The Africa development forum "99:post ADF summit on information and communication technology for health sector, Available at <<http://www.uneca.org/adf99/adf99health.htm>> [4th Jan. 2009].
- van Manen M.** 1997. From meaning to method. *Qualitative Health Research* 7(3) 345-369.
- Weber P.** 1990. *Basic Content Analysis*. 2nd ed. Newbury, CA.
- Webster J., Davis J, Holt V, Stallan G, New K, Yegdich T.** 2003. Australian nurses' and midwives' knowledge of computers and their attitudes to using their in their

practice. *Journal of Advanced Nursing* 41(2), 140-146

Willmer M. 2005. Promoting practical clinical management learning: the current situation about Information and communication technology capability development in student nurses. *Journal of Nursing Management*, 13: 467-476

Wireless Webopedia. 2005. Available at <<http://www.webopedia.com>> [6th Jan. 2009].

Westerveld R, & Maitland F. 2002. Technical and policy advances in rural telecommunications. Available at <<http://link.wits.ac.za/journal/j0301-westerveldt-fin.pdf>> [10th Nov. 2008].

What is information technology? <http://wiki.answers.com/Q/What_is_information_technology> [11th Nov 2009].

Wikipedia. Computer literacy 2009. Available at <http://en.wikipedia.org/wiki/Computer_literacy> [11th Nov 2009]

Wilson P, Bulato T & Rascati K. 2000. Satisfaction with a computerized practitioner order entry system at two military health care facilities. *American Journal of Health system Pharmacy* 57, 2188-2194.

Xego W. 2006. Professional nurses' experience of working in a rural hospital in the Eastern Cape Province. Master thesis. University of South Africa, Pretoria. [Electron version]

Yaghamaie F & R Jayasuriya. 2004. The roles of subjective computer training and management support in the use of computers in community health centres. *Informatics in Primary Care* 12:163-70

Zabani M. 2007. Personal communication. Benedictine Nursing College. Nogoma 2007

Zulu N. 2008. Personal communication, Hlengimpilo Clinic. Oct. 2008.

8. Appendix

8.1 Structured Interview Guide

- Can you share your experiences about your computer training in your institution?
 - How the training was organized
 - The facilitator
 - How the sessions were run
- Can you share your experiences in applying your computer skills in your work place after the computer training you had?
- What are some of the computer needs of professional nurses in your institutions?
- As a professional nurse what would you like to use Information technology for?
- What is your experience in accessing and using IT (computers, internet, intranet, telemedicine unit) in your institution?
- What are some of the challenges you face in using IT in your institution after being trained?

8.2 Postgraduate Ethic Approval



29 October 2007

Professor S Reid
Centre for Rural Health
Nelson R Mandela School of Medicine

Dear Professor Reid

PROTOCOL: Challenges of access to Information and Communication technologies (ICTSs) faced by Professional Nurses in Area 3 of northern KwaZulu, Natal, South Africa. F. Asah VRH MPH student 200220132

The Postgraduate Education Committee considered the abovementioned application and raised various queries. These have been addressed and the protocol is given provisional approval for an MPH degree.

This decision will be ratified at a full sitting of the Committee to be held on 13 November 2007.

Please note that the study may not begin without ethics approval.

May I take this opportunity to wish you every success with your study.

Many thanks
Yours sincerely

Dr. A Voce
Deputy Dean Postgraduate Education Committee
cc Flora Asah

Postgraduate Education Administration, Medical School Campus

Postal Address: Private Bag 7, Congella, 4013, South Africa

Telephone: +27 (0)31 260 4416

Facsimile: +27 (0)31 260 4723

Email: sibatos@ukzn.ac.za

Website: www.ukzn.ac.za

Founding Campuses: ■ Edgewood ■ Howard College ■ Medical School ■ Pietermaritzburg ■ Westville

8.3 Biomedical Ethics Committee



19 March 2008

Ms Flora N Asah
Centre for Rural Health
Department of Public Health
Nelson R Mandela School of Medicine
University of KwaZulu-Natal

PROTOCOL: Challenges of access to Information Technologies faced by Professional Nurses in Area 3 of northern KwaZulu-Natal. Ms F N Asah, Centre for Rural Health. Ref: BE029/08

EXPEDITED APPLICATION

Dear Ms Asah

The Chair of the Biomedical Research Ethics Committee has considered and noted your application received on 13 February 2008.

You are requested to seek permission for the use of the data for degree purposes from the School that you are registered in, as the research, Ethics Reference Number (E119/06 was approved on 7 May 2007.

Yours sincerely



PROFESSOR D WASSENAAR
Chair: Biomedical Research Ethics Committee

8.4 Approval for KZN-Health

FROM

(MON) JUN 11 2007 10:26/ST. 10:27/No. 7500000890 P 3



HEALTH
KwaZulu-Natal

Health Research & Knowledge Management Unit
10 – 103 Natalia Building,
330 Langalibalele Street
Private Bag x9051
Pietermaritzburg
3200
Tel: 033 – 395 3070,
Fax: 033 – 394 3782
Email: Scelo.dlamini@kznhealth.gov.za
www.kznhealth.gov.za

Reference : HRKM003/07
Enquiries : Mr. S.S. Dlamini
Telephone : 033 – 395 3070

27 March 2007

Dear Ms. Nah

Subject: Learning Complex projects

1. The research proposal entitled **The challenges of access to Information and Community Technology (ICT) faced by Professional Nurses in rural Areas** was reviewed by the KwaZulu-Natal Department of Health. The proposal is hereby **approved** for research to be undertaken in Area 3 hospitals identified in your proposal – namely Benedictine, Itshelejuba, Mbongolwane, St. Mary's (KwaMagwaza), Ngwelezane, Lower Umfolozi War Memorial and Vryheid Hospitals.
2. You are requested to undertake the following:
 - a. Meet with Mr. S.S. Dlamini before the research commences to discuss and agree on the project plan including the assignment of a Researcher from the Department of Health to work with you on the research project:
 - Date: 5th of April 2007
 - Time: 12h00
 - Venue: Natalia Building, South Tower, 10th Floor, Office: 103
 - b. Make the necessary arrangement with the identified hospitals before commencing with your research project.
 - c. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.
3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to scelo.dlamini@kznhealth.gov.za.

uMnyango Wezempilo . Departement van Gesondheid

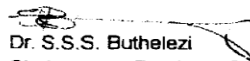
Fighting Disease, Fighting Poverty, Giving Hope

FROM

(MON) JUN 11 2007 13:26/ST. 13:27/No. 7500000690 P 4

For any additional information please contact Mr. S.S. Dlamini on 033-395 3070.

Yours Sincerely


Dr. S.S.S. Buthelezi
Chairperson: Provincial Research Committee
KwaZulu-Natal Department of Health

• KINDLY RETURN ALL DOCUMENTATION WHEN REPLYING

