Nurses' attitude toward health information systems in a private hospital

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Preface

There was a moment in my career where I had to evaluate myself using the what, where, and how. What is my niche` in nursing and what contribution can I bring to nursing as a profession? Where do I see myself professionally in the long term? How am I going to achieve whatever it is that I want personally and professionally? That is where my journey for a Masters' degree began, a vision was very clear and all that was left was for me to ensure that I achieve that.

The journey would not have been possible without the following people:

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"Commit to the Lord whatever you do, and your plans will succeed". Proverbs 16:3

Declaration

I hereby declare that this dissertation is my own work and has not been submitted to any institution before. I declare that this work has not been plagiarised, nor did I violate copyright restrictions. I declare that I gave due reference to all the sources used in the dissertation and that the sources are completely and accurately referenced in the list of references.

26/04/2016

Khumoetsile D. Shopo Date

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List of Abbreviations

ADM	Admissions module
AIDS	Acquired immunodeficiency syndrome
ANC	African National Congress
ARRA	American Recovery and Reinvestment Act
BAR	Billing and receivable module
COF	Certificate of fitness
CINAHL	Cumulative Index to Nursing and Allied Health Literature
DHIS	District Health Information System
DHMIS	District Health Management Information System
EC	Eastern Cape Province
EHRs	Electronic health records
EMR	Electronic medical record
EN	Enrolled nurse
ENA	Enrolled nurse auxiliary
EPR	Electronic patient record
HIS'	Health information systems
HISP	Health information system programme
HIV	Human immunodeficiency virus
HREC	Health Research Ethics Committee
ICT	Information communication technology
ITS	Imaging and therapeutic services
IT	Information technology
MRC	Medical Research Council
NDoH	National Department of Health
NEI	Nursing Education Institution
NHI	National Health Insurance
NHISSA	National Health Information Systems Committee of South Africa
NHP	National Health Plan
NUR	Nursing module
NWU	North-West University

OE	Order entry module
OHC	Occupational health centre
PATCH	Pretest for attitudes towards computers in healthcare
PEOU	Perceived ease of use
PHA	Pharmacy module
PHCIS	Primary Health Care Information System
PIMS	Pakistan Institute of Medial Science
PMI	Patient master index
PN	Professional nurse
PU	Perceived usefulness
RDP	Reconstruction and Development Programme
TAM	Technology acceptance model
TB	Tuberculosis
USA	United States of America
WHO	World Health Organisation

Abstract

Background: Health information systems (HIS') are necessary in South Africa. South Africa is a country which is crippled by a quadruple disease burden and on the verge of implementing National Health Insurance (NHI) systems. HIS' is a reality and was implemented over a decade ago as a response by the National Department of Health (NDoH) to obtain information for efficient managerial decision-making. However, South Africa is still faced with both public and private sector health systems that are not interoperable. HIS' on the international front are far more advanced with their data being fully comprehensive and integrated. The United States of America (USA) are using Electronic Health Records (EHRs) and is mandated for the universal adoption of EHRs within five years in each medical clinic and hospital. This mandate was due to the usefulness of health information technology and the huge investment done towards the much needed infrastructure.

Numerous studies have been documented from developed countries regarding nurses' attitudes from recent literature. The role of people as users of HIS' has been explored through various national and international studies; however, limited research is available on the attitudes of nurses towards HIS'. This research looks into the attitudes of nurses with regards to the use of HIS' in a private hospital.

Methods: This research followed a qualitative design using interpretive descriptive and contextual strategies. Semi-structured individual interviews were conducted (n=14) with nurses from all of the categories at a North West private hospital regarding their attitudes towards HIS'. The eligible participants were selected purposefully from the target population with a view that they would be able to inform research. Transcribed interviews underwent content analysis and a consensus discussion was conducted.

Results: The research yielded interesting results. Seven themes with several subthemes could be formulated. All the participants had positive attitudes and were generally interested in using HIS' in their nursing duties. Unique findings include realities that HIS' bring into the caring ethos of nursing and the interoperability of HIS'. The revised technology acceptance model (TAM2) which underpinned the framework proved not to be applicable in the context of this research.

Conclusion: The study confirmed that nurses have positive attitudes towards using HIS' and that several factors enable or enhance that. The findings are congruent with several studies done in both the public and private health sectors globally. The enablers included the support from colleagues, management and information technology (IT) personnel. Contrary to other studies, the age, previous experience or nurse category does not have an impact on the attitude of nurses or their inclination to use the system.

Key words: Nurses, attitudes, health information systems, private hospital, technology adoption.

(Word count: 439)

Opsomming

Agtergrond: Gesondheid-inligtingsisteme is noodsaaklik in Suid-Afrika. Suid-Afrika is ’n land wat gebuk gaan onder ’n viervoudige las van siektetoestande en op die rand om nasionale gesondheidsversekering-sisteme te implementeer. Gesondheid-inligtingsisteme is ’n realiteit en is ’n dekade terug geïmplementeer as ’n reaksie op die Nasionale Departement van Gesondheid se behoefte om inligting te bekom vir effektiewe bestuursbesluitneming. Suid-Afrika word egter nogsteeds gekonfronteer met beide die privaat en publieke gesondheidsisteme wat nie in korrelasie werk nie. Internasionale gesondheid-inligtingsisteme is baie meer gevorderd met omvattende en geïntegreerde data. Die Verenigde State van Amerika (VSA) maak gebruik van elektroniese gesondheidsrekords het ’n mandaat aanvaar dat elektroniese gesondheidsrekords binne vyf jaar in elke mediese kliniek en hospitaal universeel gebruik moet word. Hierdie mandaat was as gevolg van die bruikbaarheid van gesondheidsinligting-tegnologie en die enorme belegging wat gemaak is vir broodnodige opgradering van infrastruktuur.

Verskeie studies van ontwikkelde lande het in onlangse literatuur gerapporteer oor die gesindhede van verpleegsters heens gesondheid-inligtingsisteme. Dit is egter nie die geval in Suid-Afrika nie. Die rol van mense as gebruikers van gesondheid-inligtingsisteme is in verskeie nasionale en internasionale studies verken, maar beperkte navorsing oor die gesindhede van verpleegkundiges ten opsigte van gesondheid-inligtingsisteme in die privaat sektor is beskikbaar. Hierdie navorsing fokus op die gesindhede van verpleegkundiges ten opsigte van die gebruik van gesondheid-inligtingsisteme in ’n privaat hospitaal.

Metode: Die navorsing het ’n kwalitatiewe ontwerp gevolg en gebruik gemaak van vertolkende beskrywende en kontekstuele strategieë. Semi-gestruktureerde individuele onderhoude het plaasgevind (n=14) met alle kategorie verpleegkundiges by ’n Noordwes privaat hospitaal ten opsigte van hulle gesindheid teenoor gesondheid-inligtingsisteme. Die wenslike deelnemers is doelgerig gekies van die teikenpopulasie met die siening dat hulle to die navorsing sal kan bydra. Inhoud-analise is op die getranskribeerde onderhoude gedoen en ’n konsensus-bespreking het plaasgevind.

Resultate: Die navorsing het interessante resultate opgelewer. Sewe temas met verskeie subtemas is geformuleer. Al die deelnemers se gesindhede was positief en het in die algemeen daarin belanggestel om van gesondheid-inligtingsisteme gebruik te maak tydens hulle verpleeg-verantwoordelikhede. Unieke resultate sluit realiteite waarin gesondheid-inligtingsisteme tot die verpleegprofessie bydra, naamlik ’n nuwe dimensie in die deernisvolle teenwoordigheid van verpleegkundiges en die werkbaarheid van gesondheid-inligtingsisteme. Die hersiene tegnologie aanvaarbaarheidsmodel wat die fondasie van die teoretiese raamwerk vorm, is deur navorsing bewys as ontoepaslik vir die konteks vir hierdie navorsing.

Gevolgtrekking: Die navorsing het bevestig dat verpleegkundiges positiewe gesindhede het oor die gebruik van gesondheid-inligtingsisteme en dat verskeie faktore die gebruik daarvan verbeter of vergemaklik. Die bevinding stem ooreen met verskeie studies wat globaal in die privaat en publieke gesondheidsektor afgelê is. Faktore wat gebruik verbeter het, was ondersteuning van kollegas, bestuur en informasie tegnologie personeel. In teenstelling met ander studies, het ouderdom, vorige ondervinding nie ’n impak op die gesindhede van verpleegkundiges gehad nie en ook nie op hulle geneigdheid om die stelsel te gebruik nie.

Sleutelwoorde: verpleegkundiges, gesindhede, gesondheid-inligtingsisteme, privaat hospitaal, aanvaarding van tegnologie.

(Aantal woorde: 472)

SECTION 1

INTRODUCTION AND OVERVIEW OF THE RESEARCH

1.1 INTRODUCTION

This research focused on the attitudes of nurses towards health information systems (HIS') in the private health sector. This section conceptualises what a HIS' is and how these systems have evolved in South Africa. The gap identified is that although international literature has explored the attitudes of health professionals' towards HIS' in general, limited research is available in South Africa. Yet, with progressively more HIS' presented in health systems, understanding health professionals' attitudes can facilitate technology adoption. The public health sector information system titled the District Health Information System (DHIS) confirmed the reality of HIS' in South Africa and other developing African countries. In Section one a description of the research gap from national and international literature will be provided followed by the research question and objectives. The appropriate research methodology is motivated as well as strategies to enhance trustworthiness and the health research ethics that directed this research.

1.2 BACKGROUND

A HIS refers to "*...an integrated effort to collect, process, report and use health information and knowledge to influence policy-making, programme action and research in order to assess the health system's performance*....." (World Health Organisation [WHO], 2011:1) and this system is viewed as one of the six pillars of a well-functioning health system. HIS' have been one of the focus areas of South Africa's National Department of Health (NDoH) to meet and manage the growing health needs of the country. This is evident from the policies, guidelines and strategies that were introduced, but not limited to, the White Paper for the Transformation of Health System of 1997; the District Health Management Information Systems (DHMIS) policy of 2011 and the e-Health strategy of 2012. HIS' are especially necessary in South Africa which is crippled by a quadruple disease burden and implementing the National Health Insurance (NHI) system (Schaay *et al*., 2011:4; NDoH, 2012:21). The quadruple disease burden coined in 2011 by the minister of health, Dr Aaron Motsoaledi, refers to a disease profile compiled by HIV/AIDS and Tuberculosis (TB); maternal and child morbidity and mortality; prevalence of non-communicable diseases; and violence, injuries and trauma. This disease profile illustrates the complexity associated with health care in South Africa (NDoH, 2011:12). Yet, having functional HIS' in place might assist the NDoH to track and monitor these disease profiles and develop appropriate policies (NDoH, 2011:9).

The incorporation of timeous health information is needed from both the public and private health sector in order for the NDoH to get a full view of South Africa's health status (WHO, 2008:1). Timeous and accurate health information can be regulated more efficiently with the correct use of a HIS especially when the system is user-friendly and when the frameworks set out are correctly implemented (NDoH, 1997). The NDoH responded to the need for information for efficient managerial decision-making and by implementing the District Health Information Management System, the DHMIS (NDoH, 2011:13). South Africa also invested in the development and implementation of the National Health Information Management System (NHIMS). The White Paper for transformation in health systems (NDoH, 1997) prescribed already in 1997 a National Health Information Systems' Committee of South Africa (NHISSA). NHISSA had to be nationally coordinated to support the effective delivery of information services at all levels; establishing a comprehensive national health information system to encompass the management of information, surveillance of diseases, socio-demographic and health systems to assist the communities to assess their own problems and identify appropriate remedial actions.

To further support the realisation of a national HIS', the South African government signed off the National Health Act (Act no. 61 of 2003) (NDoH, 2011:13) whereby Chapter 9 of this Act referred to the coordination of HIS'. As HIS' gradually developed in South Africa, the DHMIS policy (NDoH, 2011) listed challenges experienced such as compromised data quality, data flow bottlenecks and insufficient use of data. These challenges led to the NDoH implementing the e-Health Strategy for South Africa 2012-2016 to bring direction (NDoH, 2012) to the HIS environment. e-Health refers to the electronic use of health information and communication technology to give the appropriate and necessary treatment, prevent and treat diseases and monitoring the public's health status (NDoH, 2012). The realities of a functional HIS' are also presented within the unique health system challenges of South Africa. These challenges are captured by a population of 51.8 million in 2011, of which 70.7% of the population consult the public health sector; 28% access the private sector, and the remainder consult other practitioners like traditional healers and homeopaths (Statistics SA, 2013).

The South African public health system is overburdened with a dire need for services and resources, coupled by lack of efficient systems. On the opposite, the private health sector has efficient systems accessible to a minority of the population (Statistics SA, 2013:108). This public-private health systems dichotomy is the case in most developing countries. Hence the South African Director General for health, Ms Matsoso, highlighted the need to integrate and coordinate e-health initiatives between the public and private health sectors (NDoH, 2012:6). When compared to developed countries, South Africa needs to accelerate progress in terms of HIS' management. The developed countries are far more advanced in information technology

(IT) (Wallis, 2012). According to Wallis (2012:16) individuals in the United Kingdom have access to their electronic health records and are involved in the decision-making processes regarding their care. Yet, most South African hospitals still use paper-based files and only a few has computerised processes (Cline & Luiz, 2013; Nkosi *et al.*, 2011).

HIS' are still in the process of being streamlined in South Africa. There is at present still no interoperability between HIS' and between the nine South African provinces. For example, Medicom Systems Limited, Meditech, CliniCom™ and Delta 9™ are examples of HIS' used in selected private health facilities in South Africa against HIS' in the public sector such as the DHIS. Routinely the following health information systems are utilised within the public health sector as listed by the NDoH: DHIS (used nationally to record routine information on facility level); the National Electronic Tuberculosis (TB) Register (monitors cohort groups of TB patients); the Western Cape Primary Health Care Information System (PHCIS) and the Patient Master Index (NDoH, 2012). These systems aren't necessarily interoperable as Health Minister Motsoaledi shared similar sentiments related to HIS' functioning in silos at the publication of the e-Health strategy in 2012 (NDoH, 2012:5).

The DHIS is open source software developed in South Africa around 1997/1998 to support data collection, aggregation and analysis at sub-district, district, provincial and national levels, (Jaducci *et al*., 2006:229; Khumalo, 2006:71; NDoH, 2011:10). The DHIS is also used by various countries (Lungo, 2008:39). Garrib *et al*. (2008) conducted research in rural KwaZulu-Natal to evaluate the implementation of DHIS in South Africa. This is one of a few studies regarding the DHIS in South Africa, concluding that the DHIS "...had strong district management support and was well integrated into the clinic routine*"* (Garrib *et al*., 2008:551). The negative finding was that the data quality was poor and not correctly utilized (Garrib *et al*., 2008). Poor data quality and incorrect data utilisation were also identified by the NDoH in South Africa (NDoH, 2011:12).

Despite the challenges of HIS', Khumalo (2006:75) placed emphasis on the fact that a HIS' is an important tool in modern health systems. HIS' is especially important for managers because when used correctly, it should provide the necessary information about health statuses and allow informed decisions regarding health resources allocation, policy formulation and health service performance. According to the DHMIS policy (NDoH, 2011:17), for HIS' to be managed efficiently the NDoH must ensure that a provincial team should consist of an information manager, data analyst with skills in health statistics, and a DHIS database developer/manager with information technology (IT) background. In a study conducted by Jaducci *et al*. (2006) in the Eastern Cape, (South Africa), they proved that for the successful implementation of the system, teamwork and cooperation among staff is critical. A manager in the hospital where

research was done commented "...*we try our best and we really work as a team. You can't do anything if you don't have support of others*….." (Jaducci *et al*., 2006:232). The multidisciplinary team is seen as responsible for the successful implementation and operation of HIS'. Rajkovic *et al*. (2013:1447) further specified that nurses and doctors are the main users of HIS'.

The role of people as users of HIS' has been explored and described through various national and international studies. Cline and Luiz (2013) explored the impact of the implementation of hospital information systems' on service delivery, user adoption and organisational culture within two tertiary public hospitals in South Africa. This study concluded that technology is as important as change management in the implementation of HIS'. A study on post-basic KwaZulu-Natal-based nurses' attitudes regarding HIS' by Nkosi *et al*. (2011) concluded that these student nurses were relatively positive. Yet, Nkosi *et al*. (2011:879) stated that although the student nurses presented with positive attitudes, challenges such as being overworked and hardware problems influenced student nurses' resistance to use computers. Jaducci *et al*. (2006) explored the sustainability of HIS' in the Eastern Cape (South Africa) and concluded that successful HIS implementation was subjective to the contextual needs of the specific health system rather than global needs. In Africa, Tanzania was the forerunner in the transition from a manual to a computerised HIS using the Health Information System Programme (HISP) which is based on the DHIS. Although the DHIS and HISP deemed reliable in Tanzania, usability was low, information was incomplete with a mismatch between the computerised data and manual forms and data quality was questionable (Lungo, 2008:43).

Within the international arena, the Pakistan Institute of Medical Science (PIMS) implemented a hospital information system successfully in a large public hospital (Malik & Khan, 2009:31). As the doctors, nurses and technical staff were reluctant to use the system at first, the hospital information system was implemented gradually from general hospital administration to documentation of clinical notes and billing until all processes were fully digitised. Malik and Khan (2009:31) emphasised the importance of keeping the layout in the system similar to paper-based forms to resolve conflict and enhance the adoption of an information system. The latter was also supported by Rajkovic *et al*. (2013:1449). Alquraini *et al*. (2007:379-380) concluded that nurses presented with positive attitudes regarding HIS' in public Kuwaiti hospitals. Aggelidis and Chatzoglou (2008:118) have also cited that adoption of a HIS by individuals depends on the adoption by the organisation. Factors assessed in the HIS were amongst others, age, gender, level of education, computer-use and computer utilisation experience. Nurses' positive attitude towards the use of HIS' in the workplace in Singapore was confirmed by Chan *et al*. (2010:24). However, factors such as training, computer accessibility and efficiency, compatibility of the technology, staff involvement, and nurse-patient relationship influenced nurses' attitude and perception towards HIS'. Contradicting results regarding nurses'

attitudes of HIS' surfaced from China (Chow *et al*., 2011). Nurses in a private hospital in Hong-Kong reported less favourable responses on attitudes regarding HIS'; with more positive responses on their satisfaction to use computerised HIS' (Chow *et al*., 2011:1692). These Hong-Kong nurses were more satisfied by the quality given by HIS' but were convinced that using the system impacted on their time to interact with patients when compared to manual processes.

Nurses (and doctors) are placed central to HIS' user adoption. It is a critical process to change from one system to the other and this moreover because nurses are the frontline providers and need to learn about use of computers for their daily work (Alquraini *et al*., 2007:381; Nkosi *et al*., 2011:881). A good lesson on success related to user adoption can be learnt from the study conducted by Malik and Khan (2009:33). The first barrier to adoption in their case was lack of interest from the staff to use computers; secondly the lack of infrastructure with only one computer in each department; there were no alternatives in affordable, customised software. Various studies revealed a lack of computer skills in the adoption of computers (Eley *et al*., 2008:1154; Nkosi *et al*., 2011:880; Rajkovic *et al*., 2013:1441). However, Eley *et al*. (2008:1157) concluded that a lack of computer knowledge and the age of the nurses were minimal barriers to HIS' adoption and recommended that barriers to the use of computers should be dealt with to also enforce positive attitudes. To ensure that adoption was a success, implementers at the PIMS had a champion (being the physician) and also used both paper-based and electronic systems parallel for some time until users were competent in using the electronic system alone (Malik & Khan, 2009:33). The same, however, cannot be said of other countries. In Serbia, doctors did not believe that using a HIS' would help them with their work. These doctors were then included in the project to facilitate adoption of the HIS', which improved their attitudes regarding the system (Rajkovic *et al*., 2013:1443). Chan *et al*. (2010:23) and de Veer and Francke (2009:853) also recommended that use of HIS' by nurses is possible if nurses are involved in the process of implementing it, and if they are aware of the benefits on quality and safety of patient care.

In South Africa, Nkosi *et al*. (2011) conducted a study in a public hospital on post-basic nursing student's access to and attitudes towards use of Information Technology (IT) and concluded that professional nurses in KwaZulu-Natal should be enabled to have access to computers as they had positive attitude and are willing to use it for improvement of patient care. Data analysis and interpretation was mentioned by Garrib *et al*. (2008:552) as another skill which nurses have to acquire in order for them to use data collected in the computer. Although Nkosi *et al*. (2011) conducted a study on nurses' attitudes; it was not representative of all nurse categories. It is important to highlight that no similar study has been conducted in a private facility in the country.

The researcher, who was a professional nurse in a private, global mining company's health services, (referred to as Hospital X) experienced contradicting responses from health professionals regarding the HIS' in this hospital. Hospital X is a wholly-owned subsidiary of a global mining company and renders health services to the employees and their dependants with the aim of achieving optimum health. In 1997, Hospital X started investigating medical information software to meet their business needs, especially because they were functioning on manual forms and the financial system was non-integrated. Software Z (name changed to protect identity of hospital) is medical information software used for clinical patient management, administration, billing, financials and reporting functions. During an interview with support personnel at Hospital X the few challenges they experienced regarding HIS' were revealed. These included among others user reluctance by some doctors; nurses not using the system effectively for record-keeping; incorrect patient identification, costs to maintain the system, lack of computer skills, and at times nurses complaining of shortage of computers in the wards (Tsehisi, 2014).

1.3 PROBLEM STATEMENT

The growing need for HIS' is a reality in South Africa, and is relied on to provide information to decision-makers in the format of statistics on disease profiles and delivery of health services. A HIS' is also a health system building block necessary to improve health outcomes (NDoH, 2011:10). The public health sector implemented the DHIS. The effective use of a HIS' is crucial to provide quality data. Nurses form the majority of the health workforce spending the most time with health care users and are therefore essential to capture real time data to a HIS' used. Various HIS' were implemented in South Africa. Yet, there is limited research on the attitude of nurses regarding HIS' in the private health sector in South Africa. Cline and Luiz (2013:11) explored these HIS' implementations and found that there is evidence for a need to improve the attitude of various health professionals regarding HIS'. The gap identified in this research is insufficient literature regarding nurses' attitudes towards HIS' in a private hospital in South Africa, especially were the hospital utilises a HIS'.

1.4 RESEARCH QUESTION

From the background provided and above-mentioned problem statement, the research question was: *What are the attitudes of nurses working in a private hospital towards a HIS'?*

1.5 AIM AND OBJECTIVE OF THE RESEARCH

The aim of this research was to enhance the ICT adoption of nurses' by means of optimal use of a HIS'. The objective of the study was to explore and describe the attitudes of nurses towards a HIS' in a private hospital.

1.6 SIGNIFICANCE OF THE RESEARCH

The significance of this research refers to the value that it might add to society, patients and families, healthcare and research field (Grove *et al*., 2013:73) related to health information systems in especially private hospitals. With the correct use of HIS' for decision-making regarding health problems, the outcomes for the society will be quality care. The researcher already alluded in the problem statement that there is limited research in South Africa regarding HIS'. Therefore this research will contribute to the scientific body of knowledge (Brynard *et al.*, 2014:15). As the field of health information systems (also sometimes referred to as health informatics) is relatively new in South Africa, researchers struggle to obtain relevant information applicable to the South African health systems context. In this research, recommendations will be given to the management of Hospital X which may benefit the development of policies and procedures related to HIS' and HIS' adoption. The recommendations might also prove to be useful to health professionals in the public sector who are in the process of implementing or already using the DHIS and various incompatible HIS'.

1.7 PARADIGMATIC PERSPECTIVE

A paradigm refers to *"*a philosophical framework on the way in which scientific knowledge is made*"* (Brink *et al.*, 2012:25). The philosophical stance of the researcher was based on **post-modernism**. Modernisation came about with changes whereby industrialisation and automation of processes took place in the workplace. Within the nursing field these changes can also be traced. Paper forms which were used to capture information have changed; disease profiles brought about by industrialisation have also contributed to changes taking place.

The researcher labels the twenty-first century era in nursing as post-modernistic because automation processes have also undergone changes. These changes are not only visible in equipments, such as new baumanometers, cardiac monitors, but also in the documentation of health care. Automation is defined as "*application of technology to the typical clerical and*

secretarial tasks such as communication, correspondence, documenting and filing" (Business dictionary, 2014). Nursing as a dynamic science has also evolved in respect of information and communication technology. The old way of keeping and managing the information of patients has changed for the better. Technology in health care is a reality, and so is the use of HIS'. Nurses also need to embrace this reality and accept the changes that have occurred in the field. The researcher therefore argues that every nurse might perceive and adapt differently to technology despite having similar training and practice experience and that these individual perceptions need to be explored.

1.8 THEORETICAL FRAMEWORK

The Technology Acceptance Model (TAM) underpinned the theoretical framework for this research. In 1985, this model was developed by Davis to explain the use of information systems (Davis, 1989:320) by employees in general. The two fundamental constructs in the TAM are Perceived Ease Of Use (PEOU) and Perceived Usefulness (PU). Applied to the health care industry, the TAM stipulates that if nurses perceive that technology will be beneficial to patients, it will impact their use thereof (Perceived Usefulness). For example, initially the TB suspects had to wait for long periods to get their sputum results from clinics and laboratories before treatment could be started, but now with the GeneXpert (diagnostic TB instrument) the turnaround time is dramatically reduced. However, the turnaround time will be dependent on whether the nurses experience the GeneXpert as easy to use and do not require a lot of effort and time. In-depth discussion on the TAM is done in Section 2.5.

1.8.1 Central theoretical statement

Nurses are critical role-players in the effective implementation and adoption of health information systems. Despite national and international initiatives to drive the implementation of health information systems in all types of health facilities, there is insufficient literature regarding nurses' perceptions of health information systems in especially a private hospital. Semi-structured, individual interviews from a qualitative, interpretive descriptive and contextual design can enable the researcher to gain more insight into nurses' attitudes regarding health information systems in their work environment, name a private mining hospital in South Africa. When the researcher has a better understanding of nurses' attitudes towards the health information systems, then the researcher will be able to formulate recommendations for nurse managers regarding the optimal use of health information systems ultimately towards improved quality nursing care.

1.9 DEFINITION OF KEY CONCEPTS

The following concepts were central to the research and are defined below:

Health Information Systems (HIS') are defined as "*an integrated effort to collect, process, report and use health information and knowledge to influence policy-making, programme action and research in order to assess the health system performance"* (WHO, 2011:1). HIS' in this research refer to computerised systems used in a health facility to capture the demographics, health status information (clinical data), diagnosis, treatment including laboratory and radiology data of patients.

Attitude is the propensity to respond (positively or negatively) towards a specific event, object, person or idea (Business dictionary, 2014). The following four components of an attitude give a clearer description. An attitude can be divided into four components and these components will be described: i) **affective** component, - referring to feelings and emotions; ii) **cognitive** component, - referring to one's consciously held opinions or beliefs; iii) **conative** component, - referring to an inclination to take action; and iv) **evaluative** component, - referring to the positive and/or negative responses towards a phenomenon. In this research, the nurses' attitude (their affective, cognitive, conative and evaluative attitudes) towards HIS' in the allocated hospital were explored.

Nurses are according to the Nursing Act (Act no.33 of 2005) described in different categories, namely:

- *Professional Nurse (PN)* is a person qualified and competent to practice comprehensive nursing independently in the manner and to the level prescribed and who is capable of assuming responsibility and accountability for such practice.
- *Enrolled Nurse (EN)* previously called staff nurse is a person educated to practice basic nursing in a manner and to the prescribed level.
- *Enrolled Nurse Auxiliary (ENA)* is a person educated to provide elementary nursing care in the manner and prescribed level.

In this research nurses include professional, enrolled and enrolled nurse auxiliaries using a computerised HIS' in a private mining hospital.

Adoption is to take and assume ownership of something (Collins English dictionary, 2015). Adoption in this study refers to the acceptance and use of the HIS.

Private health sector is according to the National Health Plan (NHP) an enormous business pertaining to different organisations, personnel and institutions, as well as private hospitals, the pharmaceutical industry, medical technology industry and other medical aspects associated with

rendering health care (ANC, 1994). In this research, Hospital X is the context where the research was conducted. Hospital X is a wholly-owned subsidiary of a global mining company. Within Hospital X health services are rendered to all employees and their dependants at a capped fee.

Private hospital is a hospital that functions for the purpose of profit (Medical dictionary, 2012) and the focus in this research is on the attitudes of nurses towards a HIS' in a private hospital.

1.10 RESEARCH METHODOLOGY

The research methodology as the research design and research method will now be discussed.

1.10.1 Design

This research followed a qualitative design using an interpretive descriptive (Thorne *et al*., 2004:2) and contextual strategies (Grove *et al*., 2013:57). Qualitative research design was selected as little was known (Botma *et al.,* 2010:182) about nurses' attitudes towards HIS' in a private hospital. This design produced data in the form of feelings, words, thoughts and behaviours. The researcher wanted to describe the phenomenon from the participants' point of view and the meaning that the participants attach to these perspectives (Brynard *et al.*, 2014:39; Grove *et al*., 2013:57). The design was interpretive because the researcher intended to get the subjective views of the participants and generate interpretive descriptions (Thorne *et al.*, 2004:2). Using an exploratory design assisted the researcher to gather or collect new in-depth information regarding nurses' attitudes towards a HIS' in a private hospital (Botma *et al.*, 2010:185). A contextual strategy enables views from a specific setting rather than generalising data and this research was conducted in a specific setting, namely a private mining hospital in the North West Province. The context of this research is described in 1.10.2.2.

1.10.2 Research method

The research method is described according to data collection, data analysis and the role of the researcher.

1.10.2.1 Data collection

Population, sampling, sampling, sample size

The researcher identified a private mining hospital (titled Hospital X, to maintain confidentiality) within the North West Province that was the context of this research. The target **population** (Botma *et al.,* 2010:124; Brynard *et al.*, 2014: 57; Grove *et al*., 2013:351) was the nurses employed at a private mining hospital who met the criteria for inclusion. This population was

isolated for this research because the hospital had an automated HIS' since 1997 and it is expected from all the nurses to use the system. The hospital employs enrolled nurse auxiliaries (ENA's), enrolled nurses (EN's), professional nurses (PN's) and agency nurses in certain units (N=132).

From the target population a **sample** was selected for the purpose of data collection and was a representative subset of the isolated population (Botma *et al*., 2010:124; Brynard *et al.*, 2014:56). A mediator, who has been working and identified by the nursing service manager at Hospital X was assisting the researcher in the process of identifying and recruiting the participants. The mediator was not in an authoritative position to the participants; this promoted the ethical guidelines in that participants are neither coerced nor intimidated. A poster (see annexure H) was also placed on the notice boards at Hospital X to ensure that prospective participants were informed about the research. Prospective participants were contacted by the mediator, invited to participate in research, contact details of the researcher were provided should interested participants have questions or required more information.

The process of selecting a portion of participants from the population is referred to as **sampling** (Botma *et al*., 2010:124) and the eligible participants were selected purposefully (Grove *et al*., 2013:365). The mediator was given the informed consent letter (see annexure D) when doing the initial recruitment. The mediator deliberately strived to include all categories of nurses to participate. The researcher was in close telephonic contact with the mediator, and granted prospective participants at least two days to read the informed consent letter and consult their own personal support systems. The participants were then consulted after two days by the mediator to find out if they were interested in being part of the research and then made appointments with those who declared their willingness. On the day of the scheduled data collection appointments, the mediator accompanied the participants to sign the informed consent. The mediator and the researcher co-signed as witnesses.

Purposeful selection of participants is used mostly in qualitative research where the researcher aims to get in-depth and new important information to answer research question (Thorne *et al*., 2004:6). In Hospital X different categories of nurses used the HIS' based on their scope of practice: ENA's only used the system to capture vital signs and notes on the care they rendered to patients. EN's used the HIS to order diagnostic blood tests and x-rays as prescribed by the doctor, wrote admission reports, nursing notes on daily care they render as well as discharges. The EN's had access to the HIS' to perform the duties of ENA's as well, as mentioned above. PN's had a broader scope of practice. In addition to the EN's duties, PN's were also using the system to write reports, do stock ordering and control, confidentiality reports of patients, etcetera.

Purposeful selection was guided by **inclusion criteria**, listed as follows:

- All three categories of nurses namely PN's, EN's and ENA's were included as these nurses were the main users of the HIS' and because they were directly involved in patient care. It also promoted the principle of justice (Grove *et al*., 2013:173) whereby all nurses were given a fair chance to participate.
- Nurses who were permanently employed for at least one year at Hospital X, who were trained on the HIS' and had access to the system.
- Both males and females were eligible to be included because the researcher was ethically bound not use gender or any form of discrimination. Grove *et al*. (2013:173) attest to this by highlighting the fact that selection of participants should be fair in all forms regarding social, racial, sexual and cultural and that this will enhance multiple views about the phenomena explored.
- Participants had to be willing to voluntarily consent for participation and to be digitally voice recorded during interviews.
- Ability to communicate in English as medium of instruction as it was the official language used at the hospital.

The only **exclusion criterion** identified was nurses working for Hospital X as agency staff and not permanently employed. Nurses who were working only once or twice in a week on contract basis such as agency nurses, were unable to fully inform the researcher as they were moving between computers and paper processes, might not have had the necessary HIS' training and might not be available during the data collection period.

The **sample size** was determined by data saturation when no additional new information was gathered from the collection process (Botma *et al.*, 2010:200; Bowling, 2009: 410). Thorne *et al*. (2004:5), when describing the interpretive description in terms of sample size emphasise that smaller sample sizes are used to enable the researcher to inform clinical understanding. Data saturation was declared after fourteen (n=14) interviews.

Method of data collection

The **method of data collection** was semi-structured individual interviews (Botma *et al*., 2010:208; Grove *et al*., 2013: 271), and were digitally voice recorded (Botma *et al*., 2010:214). The researcher obtained all the applicable permissions and informed consent before data collection was conducted. Semi-structured interviews were appropriate because all categories of nurses were interviewed, representing nurses' diverse backgrounds. The researcher conducted the interviews and underwent training by one study supervisor on interviewing techniques to enhance the researchers' competence before commencing with the project. The interviews entailed four stages as discussed below (Welman *et al.,* 2012:167-169):

Phase 1: Prepared for the interviews

In Phase 1 the researcher drafted the research interview schedule. The researcher followed the process of obtaining informed consent as discussed above before conducting interviews. A set of predetermined questions was used to guide the interview but didn't restrict the researcher to probe where a need arose. Botma *et al.* (2010:209) suggest that questions should be between three and six in number. The following questions were suggested to be included in the question set according to the four components of an attitude, namely i) affective [feelings and emotions]; ii) cognitive [opinions or beliefs held consciously]; iii) conative [an inclination to take action]; and iv) evaluative [positive and/or negative responses towards the phenomenon]. The interview schedule is indicated as follows:

- **Introductory question***: "Share with me your attitude towards the HIS' used in the hospital?"*
- **Probing questions** according to the four components of an attitude:
  - *Affective component: "What is your attitude about using the HIS' in your duties as a nurse?"*
  - *Cognitive component: "What is your attitude about the HIS' used in the hospital?"*
  - *Conative component: "Now that you have stated your attitude about the HIS' used in the hospital, what urges you to continue to use the HIS'?"*
  - *Evaluative component: "What are the enablers and/or barriers you experienced while using HIS' in the hospital?"*

During this phase it also entailed the recruitment of prospective participants and making appointments.

Phase 2: Pre-interview

During Phase 2, the following factors were considered to minimise bias for false information, namely: (Welman *et al.,* 2012:167-169):

- Avoid being associated by participants with any specific group or association known to the employees in their place of work but be presented as neutral as possible.
- Dressed in a similar fashion as the participants.
- Ensured sufficient scheduling of interviews that allowed enough traveling time.
- Was aware that the interviewer might have been experienced as an intruder amongst the participants.
- Checked the digital voice recorder(s) before each interviews.
- Practiced and rehearsed the interview and improved interview skills.

Phase 3: The interview

During the interview, the following structure was used to conduct each interview: (Welman *et al.,* 2012:167-169):

- Introduced the research and the purpose thereof to the participants and explained the interview process.
- Clarified that the participants understood the research questions.
- Used understandable English and tried not to use HIS-specific jargon or scientific terms that might have been difficult for participants to follow.
- Didn't ask the questions in a leading or a directing manner as pressurising participants might have caused a situation where the participants stated what they thought the interviewer wanted to hear.
- Managed time wisely and granted sufficient time to participants to answer questions, yet, remained sensitive when participants needed some control to bring them back to the questions on the table.

The following communication skills were used during the interviews (Mather, *et al*, 2002):

- Established a good rapport; remained friendly as you started the interview.
- Reassured to participants that participation was confidential and that participants' identity would not be revealed throughout any stage of the research process.
- Explained to the participants what would happen with the digital recording up to the research report.
- Started first with factual questions and then moved to more personal questions.
- Probed the participants gently when an answer to a question was unclear or incomplete.

- Didn't interrupt the participants' response unless when participants did not focus on the topic anymore. Rather, led participants to finish their thoughts as some answers have led to next questions.
- Avoided double questions or being too helpful, but focused rather to keep participants' trust and tried not to give personal opinions.
- Noted the difference between a qualitative interview and a supportive interview and don't show too much empathy.
- Remained aware of one's body language, ensuring comfortable seating. Remained relaxed and noted non-verbal cues from the participants.
- Some verbal communication skills used were summarizing, paraphrasing and minimal verbal response.

Phase 4: Post-interview

In the post-interview phase the researcher thanked the participant and discussed with the participant when and how the research results would be communicated. Immediately after the interviews were conducted, the researcher will download the interviews onto a password protected computer.

Throughout of data collection, the researcher completed **field notes** (see annexure G). Grove *et al.* (2013:269) describe field notes as the notes made by the researcher while conducting interviews and written during and/or after observing the participants. The researcher observed and recorded the non-verbal responses of the participants. However care was granted to ensure that genuine participant responses were observed and recorded and the researcher guarded against being biased as this might distort the truth of research findings. The type of notes kept was theoretical as the researcher documented what was observed, and making sense of what was observed (Botma *et al*., 2010:218). This type of field notes assisted the researcher to include more information about the participants especially because the research was interpretive descriptive in nature.

1.10.2.2 Research setting

Hospital X is a private mining hospital in the North-West Province; it is a wholly-owned subsidiary of a global mining company and renders health services to the employees and their dependants with the aim of achieving optimum health. In 1997, Hospital X started investigating HIS' to meet their business needs, especially because they were functioning on manual forms and the financial system was non-integrated. Information system software (name withheld to protect identity of the hospital) was implemented and is currently used for clinical management, administration, billing, financials and reporting functions. Hospital X has a capacity of 195 beds and one occupational health centre (OHC) off-site. The following departments are located within

the hospital - a laboratory on site, bulk store, pharmacy, radiology department, physiotherapy, occupational therapy and psychosocial department, numerous outpatient clinics including Tuberculosis and Wellness. The hospital renders service to the mine employees and mostly deals with occupational diseases like Tuberculosis (TB) and injuries. The occupancy rate currently for the hospital is 31.2%, with a total of (N=132) nurses. Speciality cases like maternity and neonatal care are referred to outside hospitals and speciality doctors have consultation days, e.g. ophthalmic, obstetrics & gynaecology. The interviews were held on the hospital premises for convenience of the participants. The researcher requested to have access to a quiet and accessible area where interviews would be conducted (Grove *et al*., 2013:271).

1.10.2.3 Data analysis

Data was transcribed from the digital voice recorder and written down for analysis while ensuring that it was not distorted in any way during transcription. This was done by the researcher immediately after the interviews with assistance of an experienced transcriber. Botma *et al*. (2010:220) attests that data analysis in qualitative research should be done concurrently with data collection. From an interpretive descriptive approach the researcher took cognisance of the four aspects of an attitude that were explored in the research. The data was stored on a computer in a confidential manner by allocating codes to the files. According to Grove *et al*. (2013:279) information stored electronically and containing information that could identify the participants had to be converted into codes before being handed to the transcriber. The interview data on digital audio tapes were then deleted once the transcriptions were done. Analysis of the data was done by coding to explore the phenomena in-depth and the following steps for data analysis by Creswell (cited by Botma *et al.*, 2010:224) as listed below:

- *Step 1 Organised and prepared data:* Transcribed interviews, typing up field notes.
- *Step 2 Developed a general sense:* Read through all the data, obtained a general sense of the information and reflected on the overall meaning. Started by writing notes in the margins as well as general thoughts about the data.
- *Step 3 Coded the data:* Activated a coding process by using emerging information from the participants.
- *Step 4 Described and identified themes:* Used the coding process to generate a description of the setting or people as well as themes from categories. Descriptions involved a detailed rendering of information about people, places, or events within the setting. Thereafter the researcher generated themes displaying the attitude from participants.
- *Step 5 Represented findings:* Findings were represented in a narrative way to convey the research findings. This included a detailed discussion of themes and the interconnected themes.
- *Step 6 Data interpretation:* Finally data were interpreted to get meaning from it.

Throughout this process the researcher monitored and ensured that ethical guidelines were adhered to.

The **role of the researcher** should be described in especially qualitative research because the researcher is actively involved unlike with quantitative research (Grove *et al*., 2013:268). Describing the role is also important as the research design chosen requires for the researcher to be involved and declare the involvement thus in the process clearing bias issues. The researcher was responsible to complete an approved research protocol; obtain ethical clearance from the Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University; got the necessary permission from Hospital X; requested and worked with a mediator at the hospital; gave participants information about the research as needed and facilitated the process of obtaining voluntary informed consent. Furthermore the researcher linked with the mediator to make appointments with the participants; obtained training on how to conduct research-related interviews; conducted the interviews, analysed the data and wrote the report and adhered to health research ethics throughout the research process. The researcher also declared to communicate the research results and recommendations back to the participants and the executive management of Hospital X.

1.11 MEASURES TO ENSURE TRUSTWORTHINESS

According to Lincoln and Guba (*cited by* Botma *et al*, 2010:233) rigour in qualitative research refers to trustworthiness. Trustworthiness is characterised by openness, demonstration of methodological congruence, scrupulous adherence to a philosophical perspective, thoroughness in collecting data, consideration of all the data in the analysis process, as well as self-understanding from the researcher (Grove et al., 2013:58). These include proposed strategies or standards which are credibility, applicability, consistency, neutrality and authenticity. The researcher aimed to adhere to these strategies to enhance trustworthiness as formulated in Table 1.1 (page 19).

As part of monitoring and evaluation, the researcher had to report any changes in the realisation of the research opposing the proposed plan, to the Human Research Ethics Committee, as discussed in point 1.12 hereafter.

1.12 ETHICAL CONSIDERATIONS

Ethical considerations can be described when health research ethics are outlined, followed by international and national guidelines, principles in health research ethics and the specific research policy provided by the North-West University (NWU).

1.12.1 Ethics in health research defined

Ethics in health research are, according to South African Medical Research Council (MRC) (2007), provided to determine the values and norms that guide researchers to undertake research with honesty and integrity. Ethics should be promoted from conceptualisation of the research until communication of the research results takes place (Grove *et al*., 2013:159).

1.12.2 International and national ethics guidelines adhered to in this study

The researcher adhered to various international and national health research ethics guidelines. The international and national guidelines for ethics in health research and the core summary of each are summarised in Table 1.2 on page 20.

Table 1.1: Strategies to enhance trustworthiness in qualitative research based on Guba and Lincoln (*cited by* Botma *et al*., 2010:233)

Criteria for trustworthiness	Strategies to enhance trustworthiness	Strategies to enhance trustworthiness applied to this research
Truth value is determined whether the researcher established confidence in the truth of the research findings.	**Credibility**, providing authentic representations of the participants or their perceptions.	The researcher engaged with participants for at least 30 minutes and probed with follow-up questions for more in-depth explanations during interviews. A voice recorder was used to capture data when the participants were interviewed. The researcher adhered to the ethical criteria of honesty and integrity throughout the study.
Applicability is the degree to which a study can be generalised.	**Transferability**, which suggests that the same study be done in a similar context and research setting.	Data collection was done until no more new information emerged. Participants were purposefully selected who are knowledgeable about HIS' to inform research. A rich and thick description of research methodology was provided to assist other researchers who might want to conduct similar research studies.
Consistency refers to the yielding of the same results if another study is done in a similar context.	**Dependability** refers to the audit trail that the researcher provided of the research methodology followed.	The research methodology used was described and followed to ensure consistency. The researcher made use of clear and identifiable sources and listed these sources in reference lists. The researcher obtained assistance of a co-coder as an experienced senior researcher, in the analysis of data with a consensus discussion afterwards.
Neutrality refers to the researcher being objective.	**Confirmability**, meaning that the researcher remained unbiased and objective during the research.	Objectivity was ensured during the data collection process by keeping field notes. Research limitations were noted and ethical considerations were adhered to by the researcher. The views of the participants were honestly portrayed by having the supervisor verify transcriptions and gave transcriptions also to participants to read and verify.
Authenticity* refers to the extent that the researcher describes the feelings or views of the participants.	**Fairness**, implying that the research results portray fairness or authenticity	The researcher conducted the research process while observing the principle of fairness from sampling until the report was disseminated. Interview responses were verified with the participants by allowing them to read transcripts and confirm results as true reflection of their views and feelings.

* Authenticity wasn't reported by Guba and Lincoln, but is the fifth strategy listed by Botma *et al.* (2010).

Table 1.2: International and national health research ethics adhered to in this research

Guideline	Core summary adhered to
International ethics guidelines	
Nuremburg Trials (Grove *et al*., 2013:160).	The participants provided voluntary informed consent to be part of the research and the research did not bring unnecessary mental or physical harm to the participants.
Declaration of Helsinki (Grove *et al*., 2013:160).	The wellbeing of the participants took precedence over all interests.
National ethics guidelines	
South African Constitution and the Bill of Human Rights (SA Constitution, 1996).	All the participants and role-players were treated with dignity and respect and their human rights were respected throughout the research.
Medical Research Council (MRC, 2007).	The confidentiality of participants was respected, a sound and appropriate research proposal was ensured as blue print for the research process and a researcher with sufficient and correct expertise was utilised during the research process.

1.12.3 Research ethics criteria considered in this research

In addition to an outline of the specific national and international research guidelines adhered to, the researcher listed the specific health research ethics considerations appropriate to this research. Please refer to Table 1.3 for these considerations:

1.13 DISSERTATION OUTLINE

The following outline was proposed and later conducted in the dissertation:

- Section 1: Introduction and overview.
- Section 2: An overview of a HIS' in the public and private health sector: a literature review.
- Section 3: Manuscript titled *Nursing the system or nursing the patient? A health information system in a private, South African hospital was* sent for peer review and planned to be submitted to the ***Journal of Nursing Management.***
- Section 4: Evaluation, limitations and recommendations.

Table 1.3 Research ethics considerations adhered to (combined with the criteria stipulated by Botma *et al*., 2010; Medical Research Council, 2007; South African Constitution, 1996 and the NWU, 2013:9)

Criteria	Criteria described	Criteria applied to this research
Acknowledge of human rights	Research should be approached from a perspective that there will be a deliberate awareness and respect for the human rights of all role players.	• All the participants were respected as individuals, as well as their rights to self-determination. • Information about the research was given to the participants by the mediator and further explanation was afterwards provided in writing/via e-mail or telephonically when needed. Participants made an informed choice to participate in the study. • There was no feedback loop between the participants and their managers regarding their participation or refusal to participate in the research. • An advertisement with regard to the research was placed in the hospital to ensure that all of the prospective participants had sufficient opportunity to be informed of the research and to participate if they matched the inclusion criteria.
Autonomy	All participants should be viewed as persons and they should be respected for their autonomy and freedom of choice.	• Matching the inclusion criteria was not sufficient reason for participation and the nurses were not just viewed as ideal participants for data collection. Rather, the participants had to provide voluntarily and informed consent to be part of the research. • The participants were recruited by a mediator and each received a brochure of information about the research. The participants were allowed sufficient time to consider their participation. • The participants had the right to withdraw from the research at any time and for any reason, and their withdrawal would have been respected. No participant withdrew from the study. • The organisational hierarchy was not used to force nurses to participate by requesting unit – and operational managers to force nurses to participate as part of their delegated tasks.
Maintain justice, fairness, objectivity	Treat all role players involved in the research with dignity.	• The participants were treated fairly and equally, no favouritism or coercion took place. All of the participants identified and recruited by the mediator were granted an opportunity to decide their participation by themselves. • All of the participants who were willing to participate had the opportunity to be included in the sampling process and the role of data saturation in the sample size was described clearly in the research information.

Ensure competence of the research team	All members of research teams should be professionally and personally qualified and experienced for the realisation of the research methodology.	• The research team consisted of the researcher as a Master's degree-candidate under supervision of an experienced Doctoral degree qualified research supervisor. • The researcher relied on the feedback provided by the mediator at the hospital for participant recruitment. • All voice recorded interviews were declared to the supervisor as these interviews were completed for in-service training of the researcher. • The supervisor ensured that the researcher attended a workshop on individual interview skills and conducted a role-play first before the actual interviews took place.
People should be handled with sensitivity	Scientific interest should always be balanced with human dignity when role-players involved.	• The risk and benefit ratio was declared to the participants in the information brochure. • The risks to the participants were that they were already exhausted and overworked in an overburdened hospital and will have to excuse themselves form their responsibilities and take time to participate. • There was no anticipated emotional discomfort associated with participation and the possibility existed that participation might even have been a therapeutic opportunity for participants to vent their positive and negative experiences regarding the HIS' used in their workplace. • Should any of the participants experienced emotional discomfort, these participants would have been referred for counselling free of charge. • The benefits of participation were that participants played an active role to assist the researcher to gain a better understanding of their attitudes towards the HIS' and recommendations were provided to management regarding the optimal adoption to the HIS' from a bottom-up approach. In addition, as indicated above, participation could be viewed as an opportunity for participants to share their experiences.
Role clarification of all significant role-players	There should be a mutual understanding of research team and participants' interests and roles in the research.	• The researcher ensured that the participants understood their roles by including a complete explanation regarding the study in the information brochure. • The researcher was supervised throughout the study and the supervisor guided and played a significant role to ensure that the researcher adhered to the ethical guidelines. • The researcher had to declare and acknowledge the authorship of the research when the results were published and this was also done to ensure that the study was free from plagiarism.

Confidentiality throughout the research process	The identity of all role-players should be safeguarded throughout the research including documentation	• The confidentiality of the participants was safeguarded by the researcher. Confidentiality was maintained throughout the study commencing with sampling. • The participants were not identified by their names or surnames. Numbers were allocated instead and these numbers could not be linked to any detail of the participants. • The data were coded and stored in a password-protected computer which can only be accessed by the researcher.
Communication of all the aspects of the research	Factual data with sufficient referencing should be provided with consideration of cultural and emotional values.	• The research was conducted in English as the medium of instruction, explanations were provided to the participants in an understandable language when needed – as a consideration of cultural values • The researcher ensured that there was clear and understandable verbal and written communication with the participants and the research community at large which was achieved through efficient scientific writing. • The dissemination of research results was presented to the study participants and to the management of Hospital X.

1.14 SUMMARY

Health Information Systems is a reality globally and there is evidence of successful implementation in developing countries including South Africa (Cline & Luiz, 2013; Jaducci *et al.,* 2006; Malik & Khan, 2009). Nurses form a major part of health workers hence their perception of the system plays a significant role in using a HIS'. Available literature on the attitudes of nurses towards the use of a HIS' tells us that in fact some nurses have positive attitudes (Alquraini *et al.,* 2007:379; Chan *et al*., 2010:24; Nkosi *et al.,* 2011:880). The findings were accompanied by factors that had an effect on their attitudes. A study done by Chow *et al*. (2011) in China was an exception when nurses gave less favourable responses on attitude but provided positive responses with regard to satisfaction on system use.

The private and public health sectors are both responsible for providing health care to the majority of the population in South Africa. With limited research available on the attitudes of nurses on the use of HIS', the researcher is of the opinion that by conducting this research in the private health sector, the findings will add to the body of knowledge and also benefit other entities in the private (and public) sector should they intend to implement a HIS' completely. The approach that assisted the researcher in obtaining the desired results was by making use of qualitative design using an interpretive descriptive (Thorne *et al*., 2004:2) and contextual strategies (Grove *et al*., 2013:57). This approach was chosen as it provided the researcher with more in-depth experiences of the participants, which in turn answered the stated research question: *What are the attitudes of nurses working in a private hospital towards a HIS'?*

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Table of Contents

SECTION 2

RESEARCH REGARDING HIS' IN THE PUBLIC AND PRIVATE HEALTH SECTOR: A LITERATURE REVIEW

2.1 INTRODUCTION

Section One outlined why the researcher deemed it necessary to conduct this research and included the proposed methodology. This section focuses on the search strategies and conceptual framework for the research including, but not limited to the literature review on studies conducted regarding the attitudes of nurses towards HIS' both nationally and internationally. The Technology Acceptance Model (TAM) which was developed to predict or measure the use of information systems is explained. This section is concluded by describing the context of this research.

2.2 SEARCH STRATEGY

A literature review is a critical aspect of research as it guides the researcher on the relevance of the chosen research topic. It is described as a formal and organised presentation of the findings of researchers after reading about the topic of interest (Grove *et al*., 2013:97). Literature, according to Grove *et al*. (2013:100), includes all the written sources relevant to the chosen topic ranging from conference papers, newspapers, books, academic thesis and dissertations, as well as clinical journals. One can ask why it is important to conduct a literature review. Different authors share a similar answer to this question, namely that researcher must gain knowledge and a general understanding about concepts related to their research and theories attached to the topic of interest (Botma *et al*., 2010:64; Gray, 2010:54; Grove *et al*., 2013:98). Another important reason is added by Gray (2010:46), namely that literature enlightens researchers on the significance of problems. The researcher conducted the literature review as a foundation to formulate the background and followed similar search strategies as indicated by the above-mentioned authors and these strategies are explained further in the next paragraph.

Although the research problem was identified by the researcher in practice, a literature review was carried out to justify the need for a literature gap in the chosen topic and to identify what is already known. The literature search was conducted from March 2013 intermittently until October 2015 on current published literature ranging from 2008 to 2015.The researcher found limited literature on the attitudes of nurses towards HIS' in private hospitals. Botma *et al*. (2010:64) suggest that an analysis of the research title should be done to guide the researcher in identifying keywords. The assistance of a librarian was sought in order for different sources to be identified. The keywords used during literature searches included nurses, attitudes, health

information system, private hospital and technology adoption. Different search engines and databases were accessed for the search including Ebsco-Host, Medline, Science Direct, SA E-publications, Scopus, CINAHL (Cumulative Index to Nursing and Allied Health Literature), government websites and Google Scholar. The types of literature reviewed included peer reviewed journal manuscripts, books, government policies and guidelines. In the following paragraphs a critical and analytical synthesis of the literature follows according to a conceptual framework.

2.3 CONCEPTUAL FRAMEWORK

A conceptual framework directed the literature review (*see* Figure 2.1 below). This framework presents four aspects regarding the context of this research, namely the challenges within the public and private health sectors; the attitudes of nurses (as the major workforce in the health sectors) towards HIS'; and also the characteristics of the health sector within the mining industry. The researcher has conceptualised the study from the view that a HIS at Hospital X has been used from 1997 to date, whereas in the public sector different systems are used and there is no interoperability. The latter was confirmed by Health Minister Motsoaledi (NDoH, 2012:5). The public health sector can therefore also learn from Hospital X's success story on the sustainability of a HIS'.

The incorporation of timeous health information is needed from both the public and private health sectors in order for the NDoH to obtain a full view of South Africa's health status (WHO, 2008:1). The following diagram illustrates the conceptual framework.

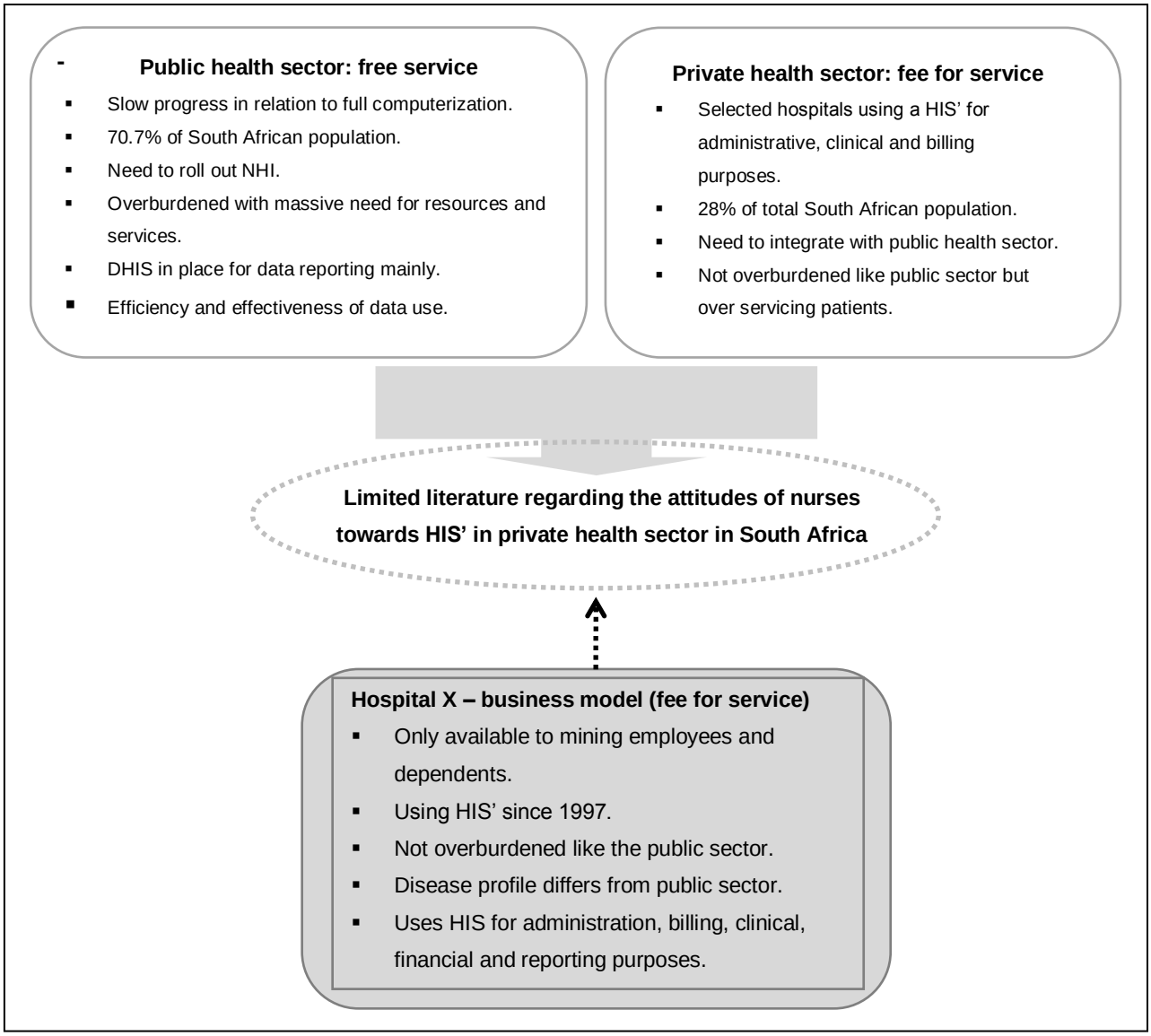

Figure 2.1: Conceptual framework

2.4 HEALTH INFORMATION SYSTEMS DEFINED

As formulated in section one, HIS' are defined as "*an integrated effort to collect, process, report and use health information and knowledge to influence policy-making, programme action and research in order to assess the health system performance*....." (WHO, 2011:1). HIS' will, first be described from a public health sector perspective. The HIS' implemented by the National Department of Health (NDoH) is called the DHIS (District Health Information System) (NDoH, 2011a:11). The components of such health systems are identified and categorised into three aspects, namely inputs, processes and outputs. As listed by the NDoH (2011b:3), these components are depicted in Table 2.1 below:-

Table 2.1: Components of a health information system within the context of the public health sector (*adapted from* NDoH, 2011:3)

COMPONENTS OF A HEALTH INFORMATION SYSTEM		
INPUTS	1. HIS Resources	Personnel, financing, logistic support, IT and communication, legislative, regulatory and planning framework.
PROCESSES	2. Indicators	Measurable sets of data that reflect change over time.
	3. Data sources	Population or institution-based.
	4. Data management	Collection, storage, quality assurance, processing, compilation and analysis.
OUTPUTS	5. Information products	Data transformed into information that can be used by decision-makers to improve health care.
	6. Dissemination and use	Accessibility of information by decision-makers and providing incentives for information use.

Based on these components, HIS' in South Africa can be characterised in terms of how health information is gathered and finally used. The initial process is of critical importance where data are collected, captured, stored, analysed and reporting takes place (NDoH, 2011a:10). Data are collected at facilities level such as primary health centres and hospital units and sent to a sub-district - or district level for entry into the DHIS. If this process is carried out as planned, it will ultimately ensure that information is used correctly for decision-making by health care managers. The NDoH developed health indicators and data sets and is responsible for monitoring these, with the Director-General having the overall authority (NDoH, 2011a:19-20). An indicator is defined "as a core element of data analysis*"* and there is a set formula used to calculate for entry in the DHIS (Anon, 2014). Examples of indicators are antenatal cases booked after 20 weeks, fully immunised <1year coverage and the maternal mortality rate.

2.5 TECHNOLOGY ACCEPTANCE MODEL

Davis (1989) proposed the TAM in 1985 when he realised a need to measure in order to predict or explain the use of information systems. The theoretical constructs used were Perceived Usefulness (PU) and Perceived Ease Of Use (PEOU). Davis (1989:320) defined these two constructs as follows: **Perceived Usefulness** is *"*the degree to which a person believes that using a particular system will enhance his/her work performance" while **Perceived Ease Of Use** as "the degree to which a person believes that using a system will be free of effort*"*. The relationship between the two constructs would indicate that if users perceive a system to be

useful – then they are likely to use it; but it would also depend on how easy it is to use a particular system.

In 1993, Davis, presented a revised model including the characteristics that could influence the attitude of system users (Chuttur, 2009:9). The latest TAM model was designed in 2000 by Venkatesh and Davis (*cited by* Chuttur, 2009:14) called the TAM2. TAM2 was designed due to the limitations identified within the original TAM that did not explain the reasons for users who perceived the system as useful. TAM2 is illustrated below:

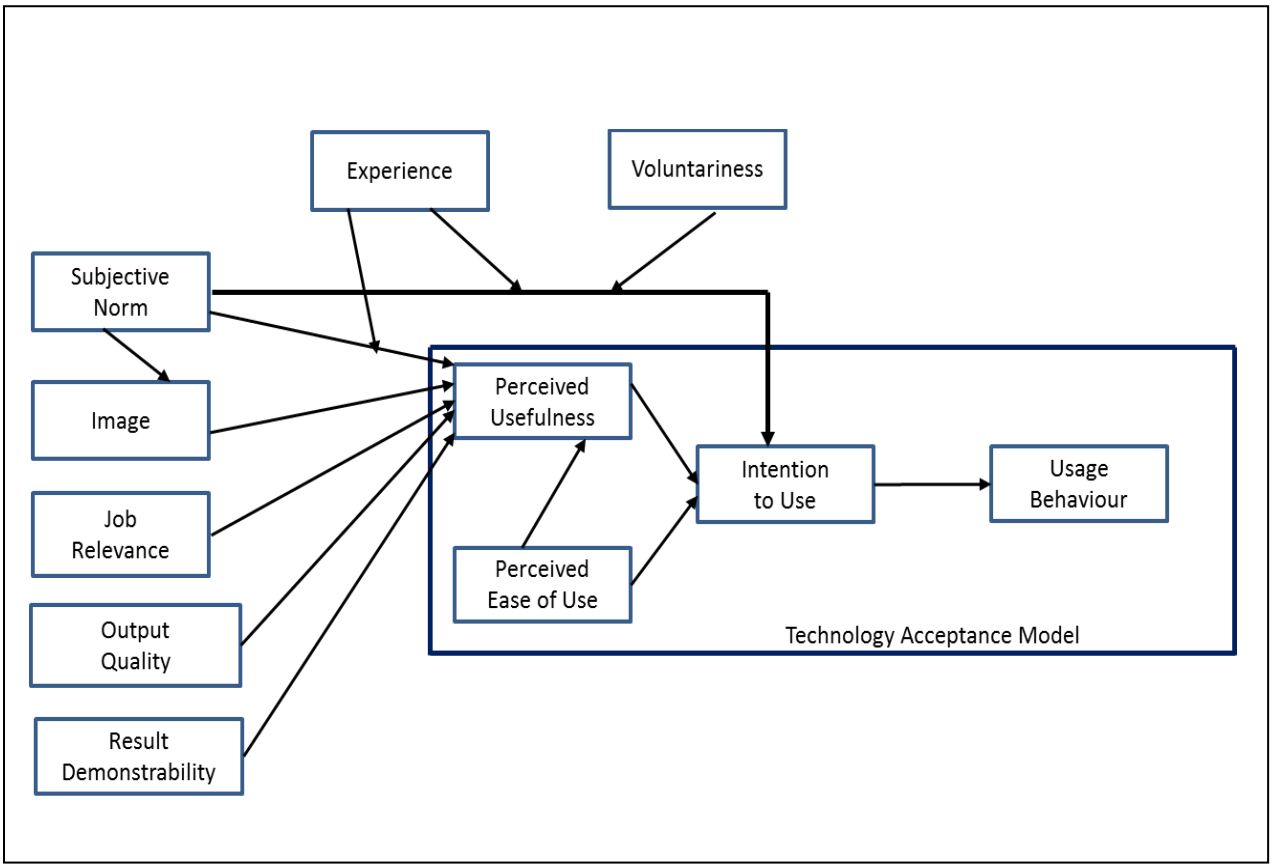

Figure 2.2: TAM 2 by Venkatesh and Davis (*cited by* Chuttur, 2009)

Because the TAM2 was constructed years ago, very few of the reviewed studies based their research on this extended version of TAM which includes other characteristics such as system quality, service quality, training and demographic characteristics (Aggelidis & Chatzoglou, 2008:123; Chow *et al.*, 2011:1687; de Veer & Francke, 2009:849; Pai & Huang, 2010:657). Contradicting findings were found in reviewed literature, for example, Chow *et al.* (2011:1687) used the original TAM to illustrate that PU and PEOU had a desirable effect on the attitudes of nurses. Similar findings surfaced by Aggelidis and Chatzoglou (2008:124) and Pai and Huang (2010:658) whereby the modified TAM concluded that when the attitudes of users in general towards the quality of information are positive, they are more likely to use the system. De Veer

and Francke (2009:853) also modified TAM and concluded that the model was more valid if more aspects are considered which could explain Perceived Usefulness. In this research both the original TAM and the TAM2 version are adhered to when considering technology adoption.

2.6 RESEARCH RELATED TO HIS' IN DEVELOPED COUNTRIES

In addition to comprehension of what health information systems and technology adoption are, this review will lead the reader through the realities of HIS' in developed countries. HIS' are in the international arena more advanced regarding comprehensiveness and integration. The United States of America (USA) use electronic health records (EHR). The universal adoption of EHRs within five years in each medical clinic and hospital was mandated by the USA President, Mr Obama (Flanders, 2010:1329). This mandate realised from the usefulness of health information technology and the huge investment done towards infrastructure. Of significant importance is that the EHR capture the demographic data and clinical data, other medical personnel can access the health history as data are integrated and can be exchanged electronically. The USA is not only moving towards giving incentives to practitioners for using EHR but also for proving that they can demonstrate the "meaningful use"-criteria by improving efficiency, quality, safety and other aspects of care as set out by the federal government (Jha *et al*., 2010:1951).

A recent study on nurses' attitudes on using the EHR in the USA focussed on the perioperative nurses only (Yontz *et al*., 2015). Interesting findings were similar to most studies namely that the participants' attitudes were positive and they voiced that the EHR "is beneficial to the nurse, does not add to their workload nor does it take them away from their patients and that it will not eliminate the nurses' position in patient care" (Yontz *et al*., 2015:31). Hong Kong (although part of the greater China, Hong Kong's economy is listed as being a developed country) is using computerised HIS' for more than 30 years. Chow *et al*. (2011) conducted a Hong Kong-based study on the attitudes of nurses towards computerisation in a private hospital. Their study concluded that although a computerised HIS' was used for decades, challenges related to users still surfaced. In addition the attitudes of nurses can have a major impact on the efficiency, use and acceptance of HIS' (Ward *et al*., 2008:93).

Asiri *et al*. (2014) contributed with research on nurses' attitude, acceptance and use of EHRs; in Saudi Arabia (a partially developing country). The Aldosari's modified TAM was used with added human components, professional factors and organisational change components. The findings were consistent with Yontz *et al* (2015:31). There was a positive link that HIS' don't interfere with clinical work but were perceived as being useful. The nurses were confident in their ability to use the HIS' (Asiri *et al*., 2014:73). Research in the Netherlands used the extended version of the TAM to obtain more insight into the attitudes of nurses regarding EHRs

(De Veer & Francke, 2009). Quality of care, cost effectiveness and work circumstances were added as domains to the TAM. It was concluded that nurses associate EHRs with an improvement in several aspects of care, especially quality and safe care (De Veer & Francke, 2009:852). In addition nurses presented a less positive attitude towards adopting EHRs. These studies emphasised the reality of advanced HIS' in the developed countries.

2.7 RESEARCH RELATED TO HIS' IN DEVELOPING COUNTRIES

Vital Wave Consulting (2009) undertook a global project to analyse HIS' in developing countries using a multifaceted approach and emphasised the need for these countries to strengthen their information systems. Primary research was conducted in India, Brazil and Zambia (Vital Wave Consulting, 2009:5). Secondary research was conducted in Asia (Bangladesh, China, India, Indonesia and Vietnam), Sub-Saharan Africa (Ethiopia, Ghana, Kenya, Mozambique, Rwanda, Sierra Leone, South Africa, Uganda and Zambia) and Latin America and the Caribbean (Belize, Brazil, Haiti, Mexico and Peru). The analysis aimed to describe all the HIS-initiatives, assessment tools by the Health Metrics Network (HMN), the WHO-based initiative to strengthen HIS' globally, were adhere to. There seems to be a global dynamic for developing countries towards a health systems reform whereby HIS' are an integrated factor (Vital Wave Consulting, 2009:24) moving from a first generation to a second generation HIS' environment. A summary of developing countries' efforts from paper-based HIS' towards a fully electronic version is presented in Table 2.2. South Africa can fit into the third stage of efforts.

A cross-sectional descriptive study in Kenya by Kipturo *et al*. (2014) was between a public and private hospital nurses. The use of computers in hospitals was not widespread in the public hospitals, hence they compared attitudes of nurses who used computers and those still using paper-based system (Kipturo *et al*., 2014:2). The attitude score of nurses using computers was significantly lower than that of non-users (those using paper-based system). Garrib *et al*. (2008) evaluated HIS' in rural clinics of Kwa-Zulu Natal (KZN), South Africa. The study was part of the foundation of the policies developed by the NDoH to overcome problems experienced after the implementation of the DHIS in South Africa. Positive findings were that there was management support at district level and the DHIS was well-integrated into the clinic routine. Yet, poor data quality and inefficient data use were also reported (Garrib *et al*., 2008:551). A rather significant outcome was that although computerisation could reduce problems with data collation, analysis and access thereof, data utilisation could not improve unless the skills of nurses regarding analysis, interpretation and understanding of how and why data should be used are enhanced. This entailed that nurses or HIS' users needed to be trained on the above-mentioned skills.

Cline and Luiz (2013) undertook a study in two public hospitals in Kwa-Zulu Natal investigating how access to public hospitals by a large population can be improved through efficient

healthcare resource management by investing in HIS'. Inkosi Albert Luthuli Central Hospital (IALCH) implemented a complete HIS' in 2001 and has since implemented the following systems: Electronic Medical Record, Picture Archiving and Communication System, Radiological Information System, Laboratory Information System, Pharmacy Information System, Critical Care System, Human Resource Management System and Administration and Financial Systems (Cline & Luiz, 2013:7). Another public hospital that implemented a HIS' is Sebokeng Hospital in Gauteng in 2008, seven years after IALCH. This study provided insight on the perceptions of HIS users in both hospitals which as nurses, doctors and administrators voiced that these HIS' were perceived as useful (Cline & Luiz, 2013:9).

Furthermore O'Mahony *et al*. (2014) explored the knowledge and attitudes of nurses regarding EHRs in clinics where paper-based HIS' were used in Mtatha's King Sabata Dalyindyebo local municipality. The researcher concluded that user perceptions were positive; nurses at the clinics appreciated and highlighted the potential benefits that could be obtained when an electronic system is used. Examples of benefits were fewer errors, faster work rate, prevention of data loss, reduced workload regarding DHIS statistics, remote access to patient data, access to knowledge (NDoH information, policies, etc.), ensuring confidentiality and patient follow-ups, cost saving on storage and stationery and an improved continuity of care (O'Mahony *et al*., 2014:3).

Table 2.2 Summary of 16 developing countries' efforts presented in five stages to strengthen HIS' (adapted from Vital Wave Consulting, 2009:24)

South Africa fits into the 3rd stage of efforts.

Process	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Data flow and collection	Data collection based on manual tallies from activity registers. Multiple redundant forms. Data collection external to routine operations and time consuming.	Data collection based on manual tallies from activity registers. Focus on existing systems to collect an optimised and smaller set of data quality, relevance. Collection burden reduced; more rapid availability possible.	Data collection based on manual tallies from activity registers. District data collection converted to electronic storage and reporting. No change to basic process of compiled reports passed up institutional chain.	Data captured in course of routine transactions rather than collected. No manual tabulation from registers. Heavy reliance on electronic data storage (some paper-based data collection may remain). Operational systems (e.g. patient, scheduling, lab management, pharmaceutical modules) as data source.	Data captured electronically from routine business ops (clinical and administrative). Integration of data from multiple information systems at all levels of the health system. Data collection provides decision support for clinicians.

Data utilization and integration	Disorganised and ineffective district reporting. Data quality poor, long delays in reporting. No integration of separate information systems. Peer data from other facilities or geographies rarely available.	District data collection normalised, simplified. More rapid data availability. Improved management decisions possible with quality data. No integration with other information systems.	Formal electronic communication, storage and automated reporting of collected data. Increased analytics. Aggregated data not tied to individual electronic medical records. Data from other facilities geographies can be obtained for peer comparison.	Enabled individual IDs, EMR, appointment, scheduling and reminders, facility operations capabilities (lab, pharmacy, etc.). Systematic business process analysis required. Access to information from all levels of service delivery network possible and encouraged. Public health data not integrated. Complex reporting.	Full personal health records for all individuals. Complex reporting. Evidence-based decision making and data-driven management. Integrates all significant health – related data from all component systems. Explicit national policies on data standards and interoperability.
Resources and capacity	Little or no computer literacy at local level. Capacity for data analysis limited confined to central MoH.	Little or no computer literacy at local level. Basic capacity for data analysis at local levels. Monitoring and evaluation capacity at central level.	Limited computer literacy required for data entry at local level. Increased analytical capabilities.	Moderate to significant computer literacy required for larger number of users. Substantial technical skills required on an on-going basis. Often local push for national adoption, but no sustained national commitment or funding.	Managers at all levels strongly inclined to using data to support decision making. Strong culture of data driven management. Strong consistent leadership and support. National commitment to on-going support.

Scope	Scope: Modest – captures only district indicators	Same as stage 1	Same as stage 1	Greatly expanded with inclusion of patient –level data from health systems transactions (EMR) and resource data (personnel, medical supplies)	Maximised, with stage 4 data integrated with public health data
Scale	Can be country-wide depending on compliance and follow-through (which is often spotty)	Same as stage 1	Projects often begin with one or two districts, but aim for nationwide deployment	Sub-national because of increased resource and capability requirements	National, entire population included

Contrary to the findings by Garrib *et al*. (2008), an evaluative study was conducted by Krishnan *et al.* (2010) in the rural Primary Health Care (PHC) clinics in India who found that data are used effectively and workers receive feedback of their performance in previous months and problems and possible solutions could then be discussed with supervisors. This data flow process indicates commitment and understanding of potential benefits from the health-care team and contributes to the sustainability of the system in India (Krishnan *et al.*, 2010: 6).

Kaya (2010) also conducted a study in two hospitals in Turkey and used an instrument called Pretest for Attitudes toward Computers in Healthcare (PATCH) Assessment Scale version 2. The study revealed that Turkish nurses also have a positive attitude toward use of computers in health care and that nurses who had an opportunity to use computers both at work and at home had higher scores of attitude (Kaya, 2010: 126-127).

2.8 RESEARCH RELATED TO HIS' IN PRIVATE HOSPITALS

In the literature that was searched and reviewed, no study was conducted nationally in any private hospitals on the use of HIS'. However, researchers in Hong Kong (Chow *et al*., 2011) explored the perceptions and attitudes of nurses towards computerisation. Because of the type of service provided at private hospitals which values customer satisfaction, the researchers modified the TAM to include the level of satisfaction (Chow *et al*., 2011:1687). An interesting finding was that the nurses provided less favourable responses on attitude and much better responses on satisfaction to use the system. The researchers concluded that staff satisfaction and acceptance of the system would provide a positive impact on the attitudes of nurses (Chow *et al*., 2011:1694). Their findings corroborate the findings of O'Mahony *et al.* (2014) who found that the perceptions of nurses of improved accessibility of patient information as well as impact on workflow and quality of patient care facilitates the use and acceptance of HIS'.

2.9 RESEARCH RELATED TO OTHER HEALTH PROFESSIONALS USING HIS'

The researcher will now highlight studies which emphasise other users in the health care sector. Lammintakanen *et al*. (2010) focused on the nursing managers' use of electronic systems in Finland. Their study revealed that nurse managers were challenged when an electronic system was introduced and felt that computers took them away from their day-to-day management tasks they were used to. They had to manage change in their daily work and were frustrated by these changes (Lammintakanen *et al*., 2010:328). Regarding information use, Lammintakanen *et al.* (2010:328) experienced challenges related to access which for them was complex and not ready for use. In spite of all the negative aspects they accepted the use of an electronic system as it was part of the strategic plans of their organisation; hence they had to be role-models for their subordinates on acceptance and use of an electronic information system. Lammintakanen

et al. (2010:329) highlighted the fact that not only nurses at operational level find it difficult to use HIS', and that the workflow, skills and competencies of users must be taken into consideration when planning to implement HIS' in the workplace.

In Serbia physicians did not believe that using a HIS' would assist them in their work at the first implementation of HIS'. Physicians were then deliberately included in a project to facilitate adoption of a HIS which at the end improved their attitude about HIS' (Rajkovic *et al.*, 2013:1443). The inclusion of physicians in the implementation was positive as they were able to highlight important aspects in their workflow and make decisions related to access to confidential information of patients, and to keep the HIS' similar to paper documents already used (Rajkovic *et al.*, 2013:1439). Similar findings were reported by the Pakistan Institute of Medical Science (PMIS) where HIS' was successfully implemented and doctors, nurses and technical staff were reluctant to use the system at first (Malik & Khan, 2009:31). A counter action was to implement the HIS' gradually from general hospital administration to the documentation of clinical notes and billing until all processes were fully digitised. Malik and Khan (2009:31) emphasised the importance of keeping the layout in the system similar to paper-based forms to resolve conflict and enhance the adoption of the HIS'. These recommendations are supported by Rajkovic *et al.* (2013:1449).

A literature review by Ward *et al*. (2008:88) offered contradicting findings regarding physicians' adoption of HIS'. The junior doctors were less enthusiastic towards the implementation of HIS' than the nurses, with the workload being cited as a hindrance. Yet, the attitudes of health care professionals in general played a significant role in the acceptance and efficient use of information systems (Ward *et al*., 2008:93). In South Africa, Nkosi *et al.* (2011) conducted a study in a public hospital on access to and attitudes of post-basic nursing students towards use of information technology. The study found that the attitudes of student nurses were positive although these nurses faced challenges such as being overworked and having hardware problems which in return influenced their resistance to computers. Geiler (2014:75) explored how to enhance the use of ICT by nurses in distance education and found that they viewed technology as integral and important in the health environment, their studies and their workplace. Nurses were positive about technology in practice as they perceived it to provide more time for them to spend with patients.

2.10 CONTEXT OF THE HIS' IN THIS RESEARCH

The following diagrammatic presentation (see Figure 2.3) outlines the typical workflow in Hospital X, using a fully computerised documentation HIS' for patients in a private mining hospital. Hospital X uses selected software for various activities related to patient care. The HIS' has different modules which include patient administration, systems administration and security,

clinical, reporting and finance. The mine employees, their dependents and the hospital employees on a specific position grading also use these health services. Patients can indicate on their medical aid plan that they wish to use the services of their employer (e.g. Key Care plans at Discovery).

The patients are registered on a mine human resource system "*Software Y*" [1] (name changed to protect identity of the mine) and they have an allocated ***company number***. For them to be employed by the mine they have to be medically fit. In order to obtain a Certificate Of Fitness (COF), employees have to undergo various tests at an Occupational Health Centre (OHC). Upon registration at an OHC they are allocated another number, a ***hospital or unit number***. These numbers are linked to the patient on the system and are used for identification purposes. The third number allocated to each patient is an ***account number*** which is created by the system every time the patient is registered for consultations or follow-ups. It is important to note that there is an interface between *software Y and software Z*, therefore, when patients are discharged or given sick leave at the hospital or clinics, the Human Resources at the mine are notified. This means that patients who consult doctors or nurses on the mine hospital or clinics do not need to be given a sick note in paper format.

There is a department responsible for training the employees (e.g. nurses) at the hospital on how to use the system. The team working in the information systems department is also responsible for conducting audits on certain modules thus ensuring that security/confidentiality is not jeopardised. Each nurse employed by Hospital X goes for training on the system and only after being found competent to work on the system, they are given access. Access is according to the scope of practice of each employee, meaning that the access level of a professional nurse is different from that of lower categories nurses. The administrative personnel do not have access to the medical history of patients especially laboratory results. Management is able to draw various reports from the system, if the report is not available the information systems department have an employee who is able to write reports according to the management's specifications.

In figure 2.3 the reader can view the workflow of Software Z [2]applied to the outpatient department of Hospital X. The HIS' is based on processes whereby one step is when an employee is first employed by the mine after being deemed fit to work through tests at OHC. The employee then gets the first two unique identifying numbers (Company number/Hospital number), these are linked to the hospital Patient Master Index file.

[1]Software Y : Software used by the mine human resources
[2] Software Z:: Software used by Hospital X

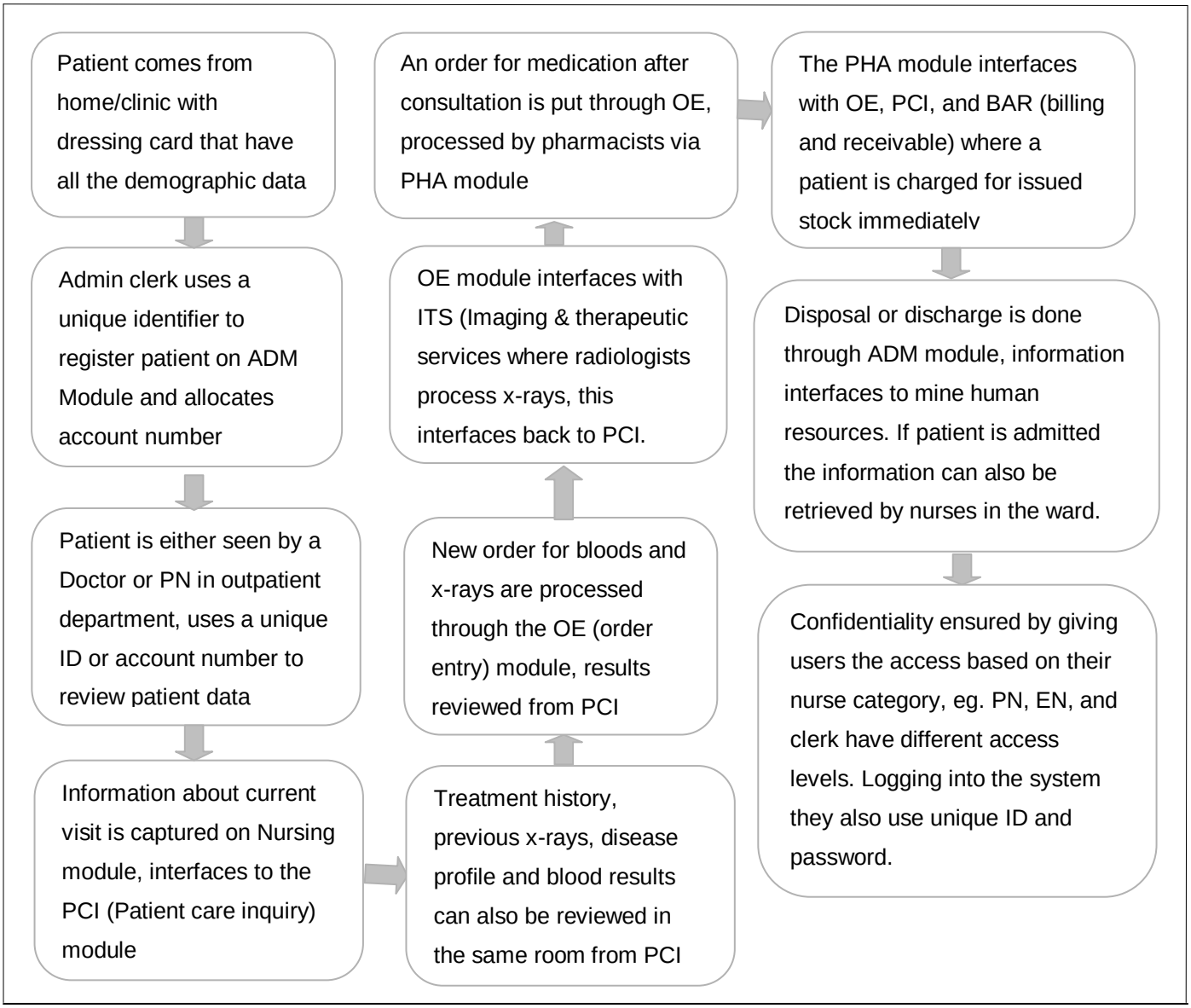

Figure 2.3: A typical HIS' workflow in an Outpatient department of Hospital X

2.11 CONCLUDING STATEMENTS

From the literature it can be concluded:

- There is a global shift towards HIS' as a reality which cannot be ignored in both developed and developing countries.
- The TAM and variations thereof, remains an appropriate model to understand technology adoption in general.
- There is a growing need to use electronic systems to capture information (clinical and administrative) within public health facilities.
- There are policies and standard operating procedures available in South Africa for the DHIS.
- Developed countries are more advanced in HIS' than developing countries although various developing countries' have governmental buy-in to improve HIS'.
- Nurses, as the frontline providers, are critical role players in the implementation, operationalisation and sustainability of HIS'.
- When nurses perceive HIS' as useful, nurses will have greater acceptance thereof.
- Nurses need computer skills training to use computers in their daily work.
- In general, nurses do have a positive attitude towards HIS' when perceived that it will not influence time spend on patient care and that it will safe time.

2.12 SUMMARY

Different researchers have conducted various studies on the attitudes of nurses towards the use of HIS' and the implementation of these systems in some organisations. In this section the researcher highlighted the limited research about HIS' used in private hospitals. TAM, which is a model used to evaluate the users' perception and intentions to use the system (Davis, 1989) was explored. Conflicting responses were found on studies conducted by other researchers using the modified TAM to explore the attitudes of nurses. Overall the attitudes of nurses were found to be favourable towards the use of HIS' (Chow *et al*., 2011:1694; O'Mahony *et al*, 2014:5), with insufficient research about nurses' attitude of HIS' in the private, South African context.

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Table of Contents

SECTION 3

MANUSCRIPT

3.1 MANUSCRIPT WRITING DECLARATION

This manuscript was planned and written by two researchers from the School of Nursing Science at the North-West University (Potchefstroom Campus). The contribution of each researcher is outlined below:

Mrs K.D. Shopo	Planning of the article, selection of journal, conducted data collection and analysis, wrote methodology, results and discussion, finalised manuscript for submission.
Dr P. Bester	Planning of the manuscript, selection of journal, co-coding in data analysis and organising themes in results, supervised the written manuscript, wrote the background and problem statement.
Dr IM Kruger	Worked through manuscript and commented.

The following is a declaration by the author and co-authors of this manuscript to confirm their roles in writing the manuscript.

A declaration:

We hereby declare that we have written the manuscript and that our contribution to this manuscript is indeed as stated above.

Mrs K.D. Shopo	Dr P. Bester	Dr IM Kruger
Author	Co-author	Co-author

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Dear Editor

REQUEST SUBMISSION OF MANUSCRIPT FOR PUBLICATION IN JOURNAL OF NURSING MANAGEMENT

This letter serves as a request to publish the manuscript titled "*Nursing the system or nursing the patient? A Health information system in a private South African hospital*". The manuscript is derived from research conducted in a dissertation for a Masters' degree in Health Science Education titled *Nurses' attitude toward health information systems in a private hospital*. Literature indicated an increased implementation of health information systems in all levels of health facilities in developed and developing countries, such as South Africa. Health information systems are critical for nurse managers to make informed decisions. Furthermore, nurses are frontline members of the workforce whose perceptions of perceived usefulness might impact on these nurses' adoption of the health information systems. In the absence of sufficient literature regarding nurses' attitudes towards health information systems in a private hospital in South Africa, the above research was conducted.

The objective of this study was to explore and describe nurses' attitudes towards HIS' in a private hospital. This manuscript was planned and written by Khumoetsile D. Shopo (masters' student), Dr Petra Bester (study supervisor) and Dr Lanthé Kruger (co-supervisor) from the North-West University (Potchefstroom Campus).

A qualitative design using an interpretive descriptive and contextual strategy was followed. In-depth individual interviews were conducted (n=14) with nurses who had experience using health information systems, all categories of nurses were represented. Seven main themes and four themes were categorised into the four components of an attitude, namely affective (feelings and emotions), cognitive (opinions or beliefs held consciously), conative (inclination to take action) and evaluative (positive and/or negative responses). Themes were also formulated which relates to health information systems versus a caring ethos, health information systems as a new dimension infiltrating the caring presence of nursing

and the lack of interoperability of health information systems. Recommendations were formulated for nurse managers to facilitate all categories of nurses' favourable attitude towards health information systems and the caring ethos of nursing.

The manuscript consists of the original work and is not under consideration by any other journal. Thank you for receiving our manuscript and considering it for review, it is appreciated and we look forward to your response.

Kind regards,

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K. D. Shopo

TITLE PAGE

Nursing the system or nursing the patient? A health information system in a private South African hospital

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Conflict of interest and source of funding

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Abstract

Aims: The research aims to enhance information communication and technology (ICT) adoption by means of optimal use of the health information systems (HIS'). The objectives were to explore and describe nurses' attitudes towards HIS' in a private hospital.

Background: HIS' are necessary in South Africa, a country which is crippled by a quadruple disease burden. The role of people as HIS' users has been explored; however there is limited research on the attitudes of nurses towards HIS'. Nurses play a vital role in patient care and in providing information to NDoH.

Methodology: This research followed a qualitative design using interpretive, descriptive and contextual strategies. Purposive sampling was done (n=14) and semi-structured individual interviews conducted, thematic analysis was done.

Results: The research yielded interesting results. The participants had a positive attitude towards HIS'. Unique findings include realities that HIS' brings into the nursing profession, namely the caring ethos, the new dimension in the caring presence of nursing and interoperability of HIS'.

Conclusion: The study confirmed that nurses have positive attitudes to HIS'.

Implications for Nursing Management: Support, training and balancing the workflow processes with practice.

Key words: Nurses, attitudes, health information systems, private hospital, technology adoption.

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Aims

The research aims to enhance information communication and technology (ICT) adoption of nurses' by means of optimal use of the hospitals' health information systems (HIS'). The objectives were to explore and describe nurses' attitudes towards HIS' in a private hospital.

Background

South Africa presents an intricate healthcare landscape. A landscape sculpted by a quadruple burden of disease, referring to HIV/AIDS and Tuberculosis (TB); maternal and child morbidity and mortality; prevalence of non-communicable diseases; and violence, injuries and trauma (NDoH, 2011:1). Within this landscape beacons the National Health Insurance (NHI) system (Schaay *et al*., 2011:4; NDoH, 2012:21) aimed to improve healthcare quality, accessibility and affordability. Another beacon is the dichotomy between the public and private health sectors. The public health system is overburdened coupled by lack of efficient systems. The private health sector has efficient systems accessible to a minority of the population (Statistics SA, 2013:108). Through this contradiction the National Department of Health (NDoH) cannot have a comprehensive view of its citizens' health status (WHO, 2008:1). The Department acknowledged the need for health information systems for efficient decision-making and responded by implementing the District Health Information Management System (NDoH, 2011:13). Already two decades ago (1997) the White Paper for Transformation in Health Systems (NDoH, 1997) prescribed the National Health Information Systems' Committee of South Africa (NHISSA) to coordinate support for the effective delivery of information services at all levels; establishing a comprehensive national health information system to encompass the management of information, surveillance of diseases, socio-demographic and health systems to assist the communities to assess their own problems and identify appropriate remedial actions.

As health information systems (HIS') developed over time in South Africa, typical HIS' challenges arose. The DHMIS policy (NDoH, 2011) listed challenges as compromised data quality, data flow bottlenecks and insufficient use of data. These challenges led to e-health Strategy for South Africa 2012-2016, aimed to bring direction (NDoH, 2012) to the HIS' environment. The realities of a functional HIS' are also presented within the health systems landscape of South Africa. Within a population of 51.8 million in 2011, of which 70.7% of the population consulted public health systems, 28% accessed private systems, and the remainder consulted other practitioners such as traditional healers (Statistics SA, 2013). The Director General for health stressed the need to integrate and coordinate e-health initiatives between the public and private health systems (NDoH, 2012:6). Within the international arena, South Africa needs to accelerate with HIS' management as developed countries utilise more advanced information technology (IT) (Wallis, 2012). In the United Kingdom patients have access to their

e-health records and are involved in their care-related decision-making processes (Wallis, 2012:16). Yet, most South African hospitals are paper-based and only a few computerised (Cline & Luiz, 2013; Nkosi *et al.*, 2011). HIS' are therefore progressive rather than absent in South Africa and there lacks interoperability between HIS' within facilities, let alone between provinces.

Tanzania was the forerunner to change from a manual to a computerised HIS' using the Health Information System Programme (HISP) which is based on the DHIS. Yet, the HIS' usability was low, information incomplete and data quality questionable (Lungo, 2008). The Pakistan Institute of Medical Science (PIMS) implemented a hospital-based HIS' successfully in a large public hospital (Malik & Khan, 2009:31). Due to user reluctance the HIS followed a gradual and successful implementation. Nurses presented with positive attitudes towards HIS' in public Kuwaiti hospitals (Alquraini *et al*., 2007:379-380) and HIS' adoption on individual level is dependent on organisational adoption (Aggelidis & Chatzoglou, 2009:118), and Singapore (Chan *et al*., 2010:23). In Hong Kong nurses were sceptical that HIS' might impact on hands-on patient care time (Chow *et al*., 2011). In South Africa, Nkosi *et al*. (2011) concluded that public healthcare-based nurses in KwaZulu-Natal were positive about HIS'.

It's advantageous that HIS' should acknowledge nurses. Chan *et al*. (2010:23), de Veer and Francke (2009:853) recommend that nurses become involved in HIS' implementation and aware of the benefits thereof for quality care and patient outcomes. Nurses need competence analysing and interpreting data from HIS' (Garrib *et al*., 2008:552). Nurses should therefore be viewed as HIS' users rather than data collectors.

The progressive nature of HIS' in South African health systems is a reality. Nurses' adoption to HIS' implementation and operationalisation are directly associated with the successful use thereof. The gap identified in this research was an absence of significant research related to HIS' adoption by nurses in South African private healthcare facilities. The research question asked was: *What are the attitudes of nurses working in a private hospital towards HIS'?*

Methodology

This research followed a qualitative design using interpretive, descriptive (Thorne *et al*., 2004) and contextual strategies (Grove *et al*., 2013). The target population (N132) was all categories permanently employed nurses working in a private mining hospital in the North West Province in South Africa who met the inclusion criteria. The selected hospital use a computerised HIS' since 1997 and it is a hospital standard for all nurses to use this system. After purposive sampling assisted by a mediator and according to inclusion and exclusion criteria, semi-structured individual interviews were conducted on the hospital's premises. The mediator scheduled the

interview appointments and supervised that informed consent was signed, voluntary by interested participants. The mediator targeted all nursing categories into the sample. The interview questions were designed according to four components of an attitude: affective (feelings and emotions), cognitive (consciously held opinions or beliefs), conative (an inclination to take action) and evaluative (the positive and/or negative responses). Field notes (Grove *et al.,* 2013:269) included personal, observational and methodological notes and were collected throughout the interviews. Data were transcribed from the digital recordings. Data were stored on a password-protected computer in a confidential manner and no information contained in the transcripts could identify participants. Thematic analysis followed according to the steps of Tesch (*in* Botma *et al.*, 2010:224). A consensus discussion followed whereafter the results were declared. Ethical clearance was obtained from the Health Research Ethics Committee of the North-West University (certificate NWU-0009-15-S1). Guba and Lincoln's (*in* Botma *et al*., 2010:233) strategies to promote trustworthiness were followed.

Results

The demographic information specified the majority (78.5%) of participants was female and 42.8% aged between 30-39 years. These statistics are congruent with the South African Nursing Council (SANC) profile of nursing being a female-dominant profession (SANC, 2015) with the mean age being 40. All of the nursing categories were included. More than half of the participants (57.1%) had one to five years working experience with a HIS', followed by 21.4% having 11-15 years' exposure.

(Insert Table 1 about here)

Results were ordered into three categories and six main themes, namely four components of nurses attitudes towards HIS' (category 1), nursing-specific themes related to HIS' (category 2) and acquired computer skills (category 3). These categories and themes are summarised in Table 2 1.

(Insert Table 2 about here)

1st Category: Four components of nurses' attitudes

Affective

Participants experienced fairly positive to very positive feelings about using the HIS' and some were even enthusiastic. None of the participants voiced negative emotions regarding the HIS' while carrying out their duties. The responses varied from *"I find it very attractive...*" to "*Yeah I, I eh feel great...*"

Cognitive

Participants' cognitive attitude was that the HIS' is a meaningful system compared to paper-based, manual systems. A HIS' is meaningful because it is time-efficient and enables nurses to structure a patient-to-system workflow. The HIS' was perceived as being safe to use, data always retrievable and a paperless environment cost-efficient. The HIS' is user-friendly and interesting and thought-provoking, stimulating nurses to discover more scopes thereof, expanding borders and triggered a necessity to have more access. "*I could undergo other training like having other access modules in the computers like the one PN's use is not the same as us*".

Conative

The first inclination was receiving adequate training prior to using the system. Initial acquaintance of the HIS' was perceived as deficient and demanding. With continued use nurses' skills improved towards independent users. "*We are sent to the, eh, eh training but it's only for a day or two and there are lot of things that we have to do*." The second inclination was teamwork and support especially in units with high patient turnover. Support, available 24-hours a day, seven days a week, provided by information technology support personnel and support from management and fellow colleagues combined with a culture of tolerance. *"... call somebody on another unit .... Okay I'm busy with 1, 2, 3, 4 but I'm stuck come and help me".* The third inclination was the system's easy-to-follow structure. The HIS' presents a logic schema that permits nurses with inadequate computer skills to use it. "*It's easy for me to know uhm the system because even though I'm not too fast in it ...they are understanding in the ward what kind of person I am*..."

The fourth inclination was that nurses studiously wanted to learn to use the HIS'. Participants voiced an internal motivation to absorb more about the HIS' and improving their computer skills. It was encouraging knowing that fellow nurses in other hospitals have only access to paper-based, manual systems. The fifth inclination was following specific work routine. This routine permitted nurses to use the HIS' parallel with nursing care actions, where patient care is not interfered with. "*So I have to prioritise first thing, work with the patient and then later computer...*"

The realities of technology as inevitable in healthcare and as a hospital standard are the sixth inclination. "*HIS' ... makes us clever*". The desire to keep up-to-date with technology was voiced by participants. "*....you can just go with ease its technology, it's beautiful*". Technology is used all the time – even cellphones included – but the importance of nursing care while using technology should not be underestimated The HIS' is a hospital standard, the use thereof is

compulsory, and non-negotiable: "*When you are in this hospital you cannot do your work without the system*".

Evaluative

Positive, negative and contradictory aspects surfaced. The first positive aspect is that participants felt able to structure their routine, giving them a sense of being in control of their time and not spending too much time away from direct patient care. Participants perceive the HIS' as useful and easy to use. Emphasis was placed on using the system despite having poor computer skills or being a slow typist. "*Once you have been trained on it, it is easy to use it because you, you are using what you've been taught ne*." The HIS' enabled nurses to document all applicable information ranging from admissions, diagnoses, care plans, the laboratory orders to wound care. Support from the IT personnel was confirmed.

The first negative aspect was that nurses were frustrated having limited access to the HIS'. Access is related to nurses' scope of practice and therefore lower category nurses don't have similar access to professional nurses. In second place a high workload or staff shortages risked retrospective recording with possible less accurate information recorded in the system. Thirdly nurses complained about the double work caused with system downtime due to maintenance. Although limited, downtime is perceived as negative. Fourthly, nurses complained that stock ordering is a comprehensive process, even if only one item is ordered. "*...here's the blank page on the computer put what you want to order; I don't think that there will be a mistake."* The fifth negative aspect is that doctors don't use the HIS' effectively, they continue to write in patient files and nurses have to capture doctors' clinical notes and prescriptions into the system after the ward rounds are completed. Besides being an additional task for nurses, doctors cannot view the correctness of captured notes on the system. In sixth's place, participants acknowledged that nurses don't use the HIS' to its full potential. Some nurses still do not know certain functions, especially when completing a nursing care plan. *"..I was looking at the nursing care plan it was done by another sister showing another sister who have been working here for 12 years..."*

There was also a contradictory result. Professional nurses blamed the HIS' for "stealing" patient time..." yet lower categories voiced the opposite. Where an enrolled nurse category will just document vital signs of patients in the unit/ward, which normally take 30 minutes, professional nurses were expected to design a care plan, write admission reports and order stock on the computer – all of these processes require more time and concentration. This does not condone that some nurses admitted that they neglected patient care to nurse the system. *"....Especially PNs' ne they are not so in contact with our patients.....people become so lazy to an extent where they like computers more than their job*."

2nd Category: Nursing-specific themes regarding the HIS'

HIS' challenges the caring ethos of nursing

Nursing as a caring profession is challenged by the HIS'. The system risked patient confidentiality. Participants acknowledged that patient confidentiality is important and that confidentiality exceeded the boundaries of the hospital into nurses' personal lives. Confidentiality is at risk when patient information is available to all system users with appropriate access. "*So if the patient is a staff member it's unfair because there's, the information is not confidential*". Honesty and professional integrity can be compromised. Some participants claimed that nurses lied about information on the HIS', *"...lie to the system..."* Nurses can declare nursing interventions done when in actual fact, these weren't all conducted. *"...there is a form that you call assessment form, it's done by these low categories what will the sister do, the sister will just go take that form and put it on the system, he doesn't, he or she doesn't know the patient.*" The majority of participants stated that nurses liked spending more time working on the HIS' than being with patients. "*Uhm Information System I think yeah it's, its good and... Let us not forget that we don't have to nurse the system, let's nurse our patients, that's the bottom line yes".*

HIS infiltrates the caring presence in nursing

HIS' (and technology) were seen as a new and significant dimension that infiltrates the caring presence of nurses. A caring presence refers the intentional nursing activity of being fully present with a patient. Nurses acknowledged that the HIS' "*makes nurses lazy thinker*(s)..." Within this particular HIS', certain modules are designed that nurses can only fill in the applicable information, such as the nursing care plan and discharge summary. The system prevents nurses from thinking about the comprehensive profile of each patient. By just filling in the gaps, nurses miss out on opportunities to learn about the patient care. "*People no longer think, we don't use our brains, for example when you do the care plan you just do look-up (F9) and then you just click and choose*." Nurses' caring presence can be influenced by having a reductionist view of patients rather than a holistic view. The HIS' software is designed that nurses are able to move from one screen to the next when entering patient information but does not provide nurses with a holistic view of total patient care. "*We no longer go back to the patient and do the assessment like the way we are taught people would just use the Doctors' notes and write*." Nurses urged to be also consciously present when using the HIS' to prevent costly mistakes. For example the wrong patient could be discharged or the wrong stock ordered. The HIS has a default action concerning stock that the various wards/units need as maximum stock levels and despite an increased need in a ward, a professional nurse will not be able to overwrite the pre-set stock levels. "*Let the system not direct me*..."

3rd Category: Acquired computer skills

Participants entered the hospital with minimal computer skills. Yet, with training and continuously using the HIS', nurses progressively improved their computer skills and became more computer literate. They acquired computer skills after being trained on the HIS' and developed interest in information and communication technology (ICT). "*I find it very attractive because of where I was before there were no such things. So since I was here I got attracted and then I am even willing to go further ....*"

Discussion

Regarding the demographic data, Chan *et al*. (2010) and Kipturgo *et al*. (2014) associate nurses' age with HIS' adoption yet age wasn't an identified theme (Yontz *et al*., 2015) in this research. Neither the nurses' gender, years of exposure or qualifications surfaced as factors that impacted their attitudes towards the HIS'. Literature confirms nurses' fairly positive attitude towards the HIS. This result is congruent with several studies conducted in both the public and private facilities worldwide (Alquraini *et al*., 2007; Asiri *et al*., 2014; Chan *et al.,* 2010; Cline & Luiz, 2013; Kipturgo *et al*., 2014; Nkosi *et al*., 2011; O'Mahony *et al*., 2014; Yontz *et al*. 2015). Participants perceived the HIS as user-friendly and easy to use. This is aligned with the constructs of Perceived Usefulness and Perceived Ease of Use in the TAM and confirmed by Chow *et al.* (2011).

Asiri *et al*. (2014:73) identified the importance of confidence in using a HIS' among the nurses in Saudi Arabia. Yet, confidence wasn't a theme in this research. Nurses' perceptions that the HIS' makes their work faster and improves patient outcomes were confirmed by Kipturgo *et al*. (2014:6) in Kenya. Although Alquraini *et al*. (2007:380) suggest that longer exposure to computer technology could improve HIS' adoption; this research revealed that nurses without any computer skills could access and use the HIS'. Support from management, colleagues and IT personnel as well as training on a HIS' were identified as enablers for the nurses to continue using the system. These results are confirmed by Alquraini *et al*. (2007); Asiri *et al*. (2014) and Jaducci *et al*. (2006). Krishnan *et al.* (2010) listed benefits in HIS' as perceived by nurses in India as easy data retrieval, time saved in record-keeping and report generation. Asiri *et al*. (2014) stated that doctors are labelled as poor HIS' users, which correspond with the research finding that doctors remain using paper-based documents whilst nurses have to work on the HIS'. Nurses' need to have more access to the system irrespective of their scope of practice was a new finding and not confirmed in literature.

High workload is cited a hindering factor to access IT among post-basic nursing students by Nkosi *et al*. (2011:879). This aligned partially with the research finding that although high

workloads impacted on the time available to use the HIS', nurses were able to work in a team and allocate one staff member responsible to work with the HIS' only. System downtime was identified as a hindering factor that leads to nurses recording events retrospectively. Chan *et al*. (2010:23) identified downtime or system failure in Singapore as a "*major technical problem*" for nurses.

Confidentiality of patient records is very important in the health sector. Contradicting findings were, however, identified. The nurses mostly felt that the HIS' at Hospital X is safe and measures are put in place to audit nurses. Cline and Luiz (2013) had similar recommendations in their study that confidentiality must be ensured for the records of patients. However, some of the nurses felt that if you are a health employee (a nurse consulting in hospital) and not a mine employee then your information does not remain confidential. One of the unique findings of this research was that confidentiality was perceived as an ethical aspect that exceeds a HIS'. Confidentiality also exceeds the boundaries of the hospital into the nurses' personal lives. This finding, coupled with the indication by some of the participants that some nurses are capable of "*lying to the system*" was not confirmed in literature. It is expected of nurses by virtue of the profession to show commitment to personal integrity (SANC, 2004). The above-stated findings were not identified in any literature except an emphasis on confidentiality by Cline and Luiz (2013).

Nurses spending more time in front of a computer screen than patient care were confirmed in literature (Asiri *et al*., 2014:75; Chan *et al.,* 2010:23; Cline & Luiz, 2013:4). Conflicting results emerged from literature. On the one hand literature stated that HIS' should improve quality patient care (Chan *et al.,* 2010; De Veer & Francke, 2009). And Yontz *et al.* (2015) emphasised that a HIS' doesn't take nurses away from the patients. Technology's impact on the nursing care relationship are confirmed by Greger (2012:1-31).

Conclusion

In general nurses voiced their favourable attitude towards the HIS' irrespective of age, experience or nursing category. Technology adoption seemed seamless in a culture of training, tolerance and a logical scheme within the system's architecture. HIS' is perceived as a meaningful tool in nursing duties. There are perceived positive and negative aspects associated with the HIS', yet, challenges to the caring ethos of nursing and the infiltration of the caring presence of nurses are reported.

Implications for nursing management

Nurses are placed central to HIS' implementation and specific considerations taken can improve the adoption of a HIS'. Nurse Managers should be aware that HIS' can threaten the caring presence between nurse and patient and challenge the caring ethos of nursing. Training, support, tolerant environment and a specific health information software structure will improve HIS' adoption. Managers can demarcate the boundaries that technology remains a tool and that nursing is always about the patient first. From the criteria for healthy work environments (American Association of Critical-care Nurses, 2005:1-44) nurses should be skilled in the use of technology for efficient communication; should be involved with technology selection, adoption and evaluation; and organisations should ensure that technology increases nursing care efficiency. Don't assume that nurses know how to care for patients in a technological environment. Greger (2014:1) suggested that simulation, reflection and confluent education be used to facilitate caring behaviour of nurses. The technological competency as caring in nursing model (Locsin, 2005) places intentional knowing of the patient central to the use of technology towards a caring presence.

Table 3.1: Demographic information of participants (n=14)

Characteristics	n	%
Gender		
Male	3	21.4 %
Female	11	78.5%
Age of participants (years)		
20 – 29	2	14.5%
30 – 39	6	42.8%
40 – 49	3	21.4%
50 – 59	2	14.2%
60 and above	1	7.1%
Nurse category		
Enrolled Nurse Auxiliary	4	28.5%
Enrolled Nurse	4	28.5%
Professional Nurse	5	35.7%
Unit Manager	1	7.1%
No. of years HIS' experience		
1 to 5 yrs.	8	57.1%
6 to 10 yrs.	2	14.2%
11 to 15 yrs.	3	21.4%
16 to 20 yrs.	1	7.1%

Table 3.2: Categories and themes

1ST CATEGORY **Four components of nurses' attitudes**	**Theme 1:** Affective attitude	• Positive feelings.
	Theme 2: Cognitive attitude	• Meaningful to use. • Useful. • Interesting.
	Theme 3: Conative attitude	• Teamwork and support. • Training. • Logic scheme. • Studious to learn. • HIS part of work routine. • A hospital standard.
	Theme 4: Evaluative attitude	• Positive. • Negative. • Contradictory.
2ND CATEGORY **Nursing-specific**	**Theme 5:** HIS' challenges caring ethos of nursing.	• Confidentiality. • Honesty and integrity. • Spending less time with patients.
	Theme 6: HIS' infiltrates caring presence of nursing.	• Lazy thinkers. • Reductionist not holistic view. • Conscious awareness.
3RD CATEGORY **Acquired computer skills**	Using HIS' improved computer skills.	

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SECTION 4

EVALUATION, LIMITATIONS AND RECOMMENDATIONS

4.1 INTRODUCTION

This section concludes the research with the evaluation of the research gap, the central theoretical statement, revisiting the research aim and objectives and an overview to the research results. The appropriateness of the research methodology is evaluated including the trustworthiness strategies followed. Limitations experienced in the realisation of the research are declared followed by recommendations for practice, education and further research.

4.2 EVALUATION

In Section One the researcher declared in the problem statement that limited literature regarding nurses' attitudes of HIS' in private hospitals in South Africa was a reality. The researcher conducted a literature search from March 2013 intermittently until October 2015 and confirmed the stated problem statement. Most of the literature was found was internationally published. This research will contribute to closing the gap concerning the nurses' attitudes towards health information systems in literature available in South Africa.

The researcher did obtain the set-out quest as stipulated in the central theoretical argument in 1.8.1 in Section One.

The aim of this research was to enhance ICT adoption of nurses' by means of optimally using a specific hospital's HIS. The objectives were to explore and describe the attitudes of nurses towards a HIS' in a private hospital by using the four components of an attitude, namely the affective, emotive, conative and evaluative. These components were used to formulate the four themes presented in the research results (see Table 2 in Section Three). The objectives were reached and exceeded as the researcher identify three more unique themes, namely HIS versus the caring ethos of nursing; HIS infiltrating the caring presence and the acquired computer skills obtained by using the HIS. It was concluded that nurses held a fairly positive attitude towards the HIS in the selected hospital and that technology adoption didn't seem to lack.

The qualitative design made use of interpretive descriptive (Thorne *et al*., 2004) and contextual strategies (Grove *et al*., 2013). The methodology was appropriate. The sample which was purposefully selected was sufficient (n=14) as participants were able to inform the researcher from different nursing categories until data saturation was reached. A mediator's assistance ensured that different nurse categories were included and no challenges arose in the signing of

the informed consent letters. Rich results were obtained from conducting individual semi-structured interviews and the researcher is of the opinion that this would not have been possible with focus groups or self-reporting questionnaires. The researcher had ample opportunity during interviews to clarify participants' contributions.

Strategies to enhance trustworthiness were adhered to. In some instances the researcher struggled to stretch relative short interviews after all the necessary probing was done. In retrospect the researcher agrees that participants' would have benefited to use their own mother tongue during data collection. A digital voice recorder was used and the data transcribed verbatim. The transcribed data were verified by the researcher and the study supervisor. The methodology explained and followed in this research enables fellow researchers to be able to replicate the research in other contexts. Identifiable literature was used and the reference lists at the end of each section were completed according to Harvard referencing style. The researcher was objective and fair from sampling to data collection and analysis, field notes were kept to ensure objectivity. The researcher had discussions relating to data analysis and consensus was reached regarding the research results.

Ethical considerations were observed from the conceptualisation of the study, up until the research results were published. The research study was approved by the North-West University Potchefstroom Campus (NWU) Health Research Ethics Committee, and the researcher only started with data collection after receiving ethical clearance. Permission was granted by the senior management of Hospital X. The researcher acknowledged the human rights of the participants; not one of the participants was forced to take part in the study. Assistance of a mediator at Hospital X was sought and the participants voluntarily agreed and signed the informed consent forms before interviews commenced. Participants were well-informed before signing the consent forms, and research advertisements were posted in different areas around the Hospital X. Ethical criteria adhered to include justice, autonomy and the competence of the research team. Confidentiality was maintained, the mediator and transcriber both signed confidentiality agreements and these agreements are attached as annexures (see annexure F). The participants were neither identified by their names nor the name of the hospital. The interviews were held in a secluded room and recorded data were deleted on the voice recorder according to the stipulated data storage and archiving protocol.

4.3 LIMITATIONS

No research can be conducted smoothly without experiencing limitations, whether the research was done qualitatively or quantitatively. The initial ethics application to NWU was submitted in May 2015 with approval being granted at the end of August 2015 (three months later). This

delay in the process of obtaining ethical clearance from the HREC (Health Research Ethics Committee) left the researcher demotivated.

The second limitation was the use of English during the interviews. Very few of the participants were fluent in English. The researcher had to re-phrase some of the sentences in the questionnaire like “Enablers and barriers for using a HIS”. The researcher managed to obtain all three categories of nurses and only one nurse manager for the interviews. The intention was to include more managers. A third limitation was, therefore, that a desired number of nurse managers could not be interviewed. This research was contextualised to a private mining hospital; therefore, the results cannot be generalised to all of the nurses working in the private sector or in the country for that matter.

Finally, a manuscript was written according to the author guidelines for the Journal of Nursing Management and will be submitted to the journal after a peer review.

4.4 RECOMMENDATIONS

The following recommendations were formulated from the findings of this research with regard to practice; education; research and technology acceptance model.

4.4.1 Nursing Practice

The results of this study indicate that HIS’ introduces a new era to the nursing practice. The ethics of nursing need to take the confidentiality and security aspects of computerised health information into consideration. Nurse Managers need to include confidentiality measures as part of their standards and ensure that these standards are adhered to. This can be achieved by regular in-service training and an audit trail of users (nurses using the system) as well as having mechanisms in place to correct deficiencies. Making a HIS’ a standard in health organisations will also enhance adoption as everyone will have to use the system.

The caring presence of nurses will have to be reinforced. This can be achieved by installing more computers in each unit and ideally at each point of care. This will ensure that more time is spent with patients. Nurses will not have to sit at the nursing stations and justify that as “having to record information” on the computer. Additionally, managers will have to support the implementation of a HIS’ at their institutions and will have to use the system effectively for decision-making purposes.

Empower nurses to be active participants in the selection, implementation, adoption and evaluation of HIS’.

4.4.2 Nursing Education

In South Africa not many NEIs' (Nursing Education Institutions) have the ICT included in their curricula at the moment. A few studies recommend that ICT should become part of the nursing curricula (Geiler, 2014:94; Nkosi *et al*., 2010:881) and the same recommendations are made by the researcher. The participants in this research study had no previous computer skills, basic computer skills during the training of nurses should, therefore, be included. A second recommendation would be – to sensitise nurses so that they get familiar with how to use the computers and learn to type faster. The nursing ethics modules need to be revised to include caring aspect of nurses using a HIS' and the professional integrity that goes with using HIS'. Training to nurses about their caring presence and caring behaviours amidst a technological environment is advisable.

4.4.3 Nursing Research

From this research a few more studies could be conducted. Further research could be done on the relation between HIS' and ethics of nursing as a profession including the caring presence of nurses especially in the public health sector. It would be interesting to see how nurses in the public health sector perceive HIS' and the implication of using a HIS on their caring role. The researcher is highlighting this because the nurse-patient ratio in the private sector is far less than in the public sector. Additional research could be done on the interoperability of HIS', what the National Department of Health (NDoH) is doing to ensure that interoperability is achieved in the country, and lastly the hindering factors with regards to interoperability could be identified. There are a lot of different health information systems used at the moment as indicated in the literature review, why is that the case? Nurses are the frontline users of electronic systems and are viewed as first patient contact and yet the people who are recording information on the District Health Information System (DHIS) are data capturers? When will nurses in the public health sector going to be responsible for this very important task in execution of their duties? The decision-making skills and capabilities of nurse managers using HIS' could also be explored further.

4.4.4 Technology Acceptance Model

The TAM underpinned the theoretical framework for this research and this was elaborated on in section 2. However, from the research it was evident that the modified (TAM2) model was not appropriate. The original TAM (Davis, 1989) stated the basic constructs "Perceived Usefulness" and "Perceived Ease of Use" as contributing towards the positive attitudes of nurses. It was evident from this research that the additional constructs of TAM2 such as "*subjective norm, image, job relevance and output quality*" were not contributing to the positive attitudes of nurses.

The participants did not elaborate on the above-mentioned constructs included in the TAM2. The original TAM therefore proved to be more appropriate in contributing to their positive attitudes.

4.5 SUMMARY

This section evaluated the research findings. The researcher proved that the research gap has been addressed; the objectives were obtained and even exceeded as additional unique themes were formulated. The methodology was evaluated including the trustworthiness measures and ethical considerations. Limitations experienced during the research were also evaluated; recommendations were provided with regard to nursing practice, education as well as future research. The section concluded with the contributions made by the Technology Acceptance Model that underpinned the theoretical framework. It was evident from the research that the original TAM is more appropriate and also that the nurses at Hospital X have adopted the HIS' being used there.

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Annexure A: Ethical Approval of the NWU: Potchefstroom Campus

NORTH-WEST UNIVERSITY
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NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: (018) 299-4900
Faks: (018) 299-4910
Web: http://www.nwu.ac.za

Institutional Research Ethics Regulatory Committee
Tel +27 18 299 4849
Email Ethics@nwu.ac.za

ETHICS APPROVAL CERTIFICATE OF PROJECT

Based on approval by **Health Research Ethics Committee (HREC)**, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby approves your project as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: NURSES' ATTITUDES TOWARDS HEALTH INFORMATION SYSTEMS IN A PRIVATE HOSPITAL

Project Leader: Dr P Bester

Ethics number: NWU-00095-15-A1

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Approval date: 2015-08-27 **Expiry date:** 2015-11-30 **Category** N/A

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-RERC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-IRERC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-IRERC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC for any further enquiries or requests for assistance.

Yours sincerely

Linda du Plessis

Digitally signed by Linda du Plessis
DN: cn=Linda du Plessis, o=NWU, ou=Vaal Triangle Campus, email=linda.duplessis@nwu.ac.za, c=ZA
Date: 2015.09.03 14:36:28 +02'00'

Prof Linda du Plessis
Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

Annexure B: Ethical approval letter from Hospital X

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

Private Bag X05, Noordbrug
South Africa 2520

Tel: 018 299-2000
Fax: 018 299-2999
Web: http://www.nwu.ac.za

School of Nursing Science
Tel: 018 299 2189
Fax: 018 299 1827
Email: 16470087@nwu.ac.za

The Hospital Manager

[redacted]

Dear Mrs Veronica van Ede

REQUEST TO CONDUCT RESEARCH AT [redacted]

As a registered Masters' degree student in Health Science Education at the North-West University (Potchefstroom Campus), I have to conduct a research project. The project that I am conducting is titled *Nurses' attitudes towards health information systems in a private hospital,* and I wish to conduct this research at [redacted] Hospital. The objectives of this project are to explore and describe all categories of nurses' attitudes towards health information systems (HIS) in [redacted] Hospital in order to compile recommendations to enhance nurses' adoption of the HIS used in West Vaal Hospital to ultimately enhance the quality of data.

Participation is voluntary and the participants will sign informed consent (*attached*) before data collection commences. The Health Research Ethics Committee of the Faculty of Health Sciences, North-West University (Potchefstroom Campus) granted ethical clearance (certificate number...., *see attached).* Data will be collected through individual, semi-structured interviews that will last between 45-60 minutes per interview. Interviews will be conducted by myself, the researcher, under the supervision of Dr Petra Bester (a PhD qualified researcher at INSINQ, the research focus area of the School of Nursing Science). Interviews will be digitally voice recorded and will be conducted on the hospital's premises. The identities of the hospital and participants will be kept confidential and will be replaced with code names. This will be maintained through the research process, the collection and analysis of the data, publication of the results. The data will be stored in a password protected computer and hard copies within a lockable office of the researcher.

In addition to request permission to conduct this research, [redacted] Hospital's management is also requested to indicate a mediator. The role of the mediator will be to assist the researcher to identify prospective participants, to distribute the informed consent letter to prospective participants, to place informative posters (*attached*) on notice boards and to provide the list of participants with their contact details in order for the researcher to schedule appointments. The mediator will also be requested to sign a confidentiality agreement. Please don't hesitate to contact me or my supervisor for more information regarding the research: Mrs Khumo Shopo at 018-299 2189 (office), 16470087@nwu.ac.za; Dr Petra Bester at 018-299 2094 (office), petra.bester@nwu.ac.za.

Thanking you in anticipation

Mrs KD Shopo (BCur Ed et Adm)
Researcher

Dr P Bester (PhD)
Supervisor

PERMISSION BY HOSPITAL MANAGER FOR NURSES TO PARTICIPATE IN RESEARCH

Research title: *Nurses' attitudes towards health information systems in a private hospital*

V. VA[redacted]DE

I *(name)*.....[redacted]..hereby give my permission that the research study "Nurses' attitudes towards health information systems in a private hospital" may be conducted at West Vaal Hospital".

Name, surname and contact number of the mediator: ISHMAEL TSEHISI (018-476 3706)

Manager's signature:.....

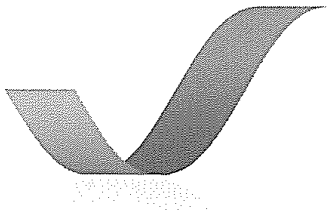
Date: 27/08/2015

Witness' signature: .....

Isaac Lebone
Nursing Manager
Nursing Hospital
[redacted]

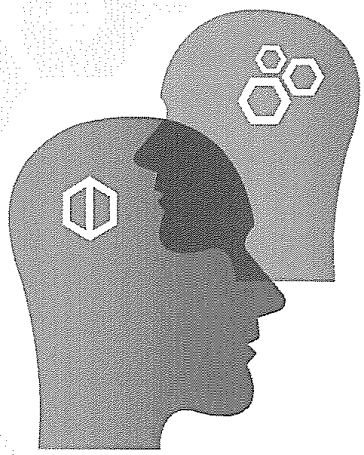
Date: 27/08/2015

Annexure C: Research advertisement poster

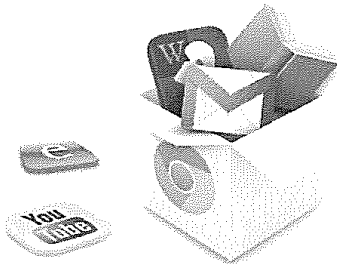


Participate in research

Nurses' attitudes towards health information systems in a private hospital



This research aims to have a better understanding into nurses' attitudes towards health information systems. All categories of nurses trained in the Hospital's HIS, are invited to participate in this research. Prospective participants should be permanently employed for at least one year; be able to participate in business English; and give written informed consent.



"Help us understand nurses' attitudes towards health information systems and make recommendations to improve nurses' adoption thereof."

Researcher: Mrs Khumo Shopo (Master's degree student from the North-West University (Potchefstroom Campus)
018-299 1838 / 16470087@nwu.ac.za

DATA COLLECTION
Individual interviews will be conducted by the researcher on the Hospital's premises. Interviews will last 45-60 minutes and will be voice recorded

DATE
Data will be conducted during September 2015. The venue will be confirmed when appointments are scheduled.

CONTACT PERSON
Hospital contact:
Ishmael Tsehisi at Information Systems Department at 018-4783706.

CONSENT
Ethics clearance was granted by the Health Research Ethics Committee of the North-West University and consent granted by the CEO of the Hospital.

Health information | Computers | Attitude of nurses | Technology adoption | Private hospital

HEALTH INFORMATION SYSTEMS IN A PRIVATE HOSPITAL...

NORTH-WEST UNIVERSITY
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NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

Health Research Ethics Committee
Faculty of Health Sciences
NORTH-WEST University
(Potchefstroom Campus)
2015 -08- 27

HREC Stamp

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR RESEARCH TO PARTICIPATE IN INDIVIDUAL INTERVIEWS

Research title: Nurses' attitude towards health information systems in a private hospital

REFERENCE NUMBERS: NWU-0009-15-S1

RESEARCHER: Mrs Khumo Shopo

School of Nursing Science, Office G26, Building F7, North-West University (Potchefstroom Campus)

CONTACT NUMBER: 083 239 5017

You are being invited to take part in a research project that forms part of my study for a Masters' degree in Nursing with the specialisation in Health Science Education. Please take some time to read the information presented here, which will explain the details of this project. Please ask the mediator and/or researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU) (certificate number NWU-0009-15-S1) and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records.

What is this research study all about?

- This study will be conducted on the premises of the hospital and will involve individual, semi-structured interviews done by the researchers trained in research interview skills and knowledgeable about health information systems.
- The objective of this research is to explore and describe nurses' attitudes toward health information systems (HIS) in a private hospital.

Why have you been invited to participate?

- You have been invited to participate because you are experienced in using a HIS for patient care documentation and it is believed that you will be able to inform the researcher with rich information.
- You have also complied with the following inclusion criteria:
    - You are a permanent employee; you have been trained on HIS and have access to the system.
    - You have been employed for at least one year and belong to one of the three categories of nurses (PN's, EN's and ENA's), nurse managers included.
    - You are male or female and willing to voluntarily consent to taking part in the study and agree for the interview to be recorded in an audio digital tape recorder.
    - You are able to communicate in English as medium of instruction.
- You will be excluded if you are a session worker and moonlight only.

What will your responsibilities be?

You will be expected to take part in the semi-structured interview which will be conducted by the researcher, and answer questions relating to your attitudes regarding the HIS used in the hospital. The duration of the interview is expected to be between 45 – 60 minutes. The interviews will be held during working hours for your convenience.

Will you benefit from taking part in this research?

- There are no direct benefits for you as a participant.
- The indirect benefit will be that participants will be assisting the researcher to gain a better understanding of their attitudes toward HIS and to formulate recommendations to management regarding optimal adoption to the HIS from a bottom-up approach.

Are there risks involved in your taking part in this research?

- The risks in this study are limited, yet emotional discomfort might be experienced during the interview. Should this happen the participants will be referred for counselling on the premises, free of charge.
- The benefits outweigh the risk.

Who will have access to the data?

Anonymity will be safeguarded by the researcher throughout the research process commencing with sampling. Confidentiality will be ensured by not identifying participants by their names, instead numbers will be allocated and these will not be linked to the names or place of work. Reporting of findings will be anonymous by blinding the name of the hospital and any aspect that could be linked to the participants. Only the researcher and supervisor will have access to the data. There will be a transcriber that will listen to the recordings and type the discussions

word by word in addition to a co-coder, but both these role players signed a confidentiality agreement. There will be no way to link your feedback to your identity. Data will be kept safe and secure by locking hard copies in locked cupboards in the researcher's office and electronic data will be password protected. As soon as data has been transcribed it will be deleted from the recorders and data will be stored for at least five years.

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study but refreshments will be provided during the interview in the form of cold drinks only. There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

- You can contact Mrs Khumo Shopo at 018 299 2189 or 083 239 501 if you have any further queries or encounter any problems.
- You can contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 018 299 2094; carolien.vanzyl@nwu.ac.za if you have any concerns or complaints that have not been adequately addressed by the researcher.
- You will receive a copy of this information and consent form for your own records.

How will you know about the findings?
The research report will be handed to the hospital's management. In addition, the researcher is willing to conduct a PowerPoint presentation of the results to management and invite participants to this presentation.

Declaration by participant

By signing below, I ..... agree to take part in a research study entitled: *Nurses' attitudes toward health information systems in a private hospital.*

I declare that:

- I have read this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions to both the person obtaining consent, as well as the researcher and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) ..... on (*date*) ..... 20....

....

Signature of participant **Signature of witness**

Declaration by person obtaining consent

I *(name)* ..... declare that:

- I explained the information in this document to the above-signed participant.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter.

Signed at (*place*) ..... on (*date*) ..... 20....

....

Signature of person obtaining consent **Signature of witness**

Declaration by researcher

I *(name)* ..... declare that:

- I explained the information in this document to the signed participant.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter.

Signed at (*place*) ..... on (*date*) ..... 20....

....

Signature of researcher **Signature of witness**

Annexure E: Example of a transcription

2015/09/11

Legend: I= Interviewer P = Participant

I – Good morning sir,

P- Good morning ma'am

I – How are you?

P – I'm ok thanks yourself?

I – I'm good thanks. My name is Khumo Shopo, and thank you for agreeing to do the interview with me. Can you just start telling me maybe your age and qualifications?

P – ok, I'm..... *(Participant says his names in full)* and I'm 34yrs old and working here as an enrolled nursing auxiliary for the past 2 years.

I – Ok so you've been here for 2 years working as an ENA?

P – Yes

I – Ok, than you very much. Er, you've been using the information systems in the hospital?

P – Yes mam,

I – OK, share with me your attitudes towards the HIS' that is used in the hospital

P – Yah, I find it very attractive because of where I was before there were no such things, there was no technology of this nature. So since I was here I got attracted and then I am even willing to go further you see 'cause I knew nothing about the computers honestly when I started here, so now I'm attracted and I would like to go further using the medical health system, *(smiling and showed enthusiasm)*.

I – Ok, so it's interesting to you to use the information system, you like using it?

P – Very much

I – Ok, is it worthwhile*..... (P1 – Yah, its' worthwhile)....*for you when you compare it to when you were not using it at the previous hospital?

P – Yah, it's worth it

I – Is it?

P – Yes*.... (Smiling)*

I – Ok. So, about using the HIS' as a nurse, tell me about that, to do your duties as a nurse and using HIS'?

P – Yah, it's good. Um... quite good because of I can manage my own time and I don't take too much time doing one and the same thing, recording .....it's for recording purposes, so I think it is advanced. You just go to the screen and do whatever you do and then save. Everything is there. So I find it very very, it's good actually

I – So it's useful for you when you using it with the patients?

P – Yes it's' very useful.

I – And I hear you mentioning time, can you tell me more?

P – Yah, and then er...it's time efficient because of I don't have to go down there write long stories, just open the system and I know where the folders in the computer and then from there again it can save a lot of information in the computer because of sometimes some documents can get lost so if you save it there it's there forever. If something you write in the file its still in the computer, if there's somebody looking for this thing then you can get it.

I – Ok, so it's easier to get information from the system?

P – It's very much easy.

I – Ok, and then what is your attitude about the health information system that is used in the hospital?

P – Mam, sorry?

I – The HIS'? The software that is used?

P –Er... I think its fine, its' okay, it's okay. Even I'm not that too much er ...er... related to computers, but I can see myself I'm getting familiar with that. That's why I'm saying that if maybe, I can...I wish I could go further.

I – When you say you can go further, in which sense?

P – Like in the very same way that maybe I could train other....I could undergo other training like having other access modules in the computers like the one PN's uses is not the same as us. So I wish I could use things like..... *(Software for staffing and scheduling)* and the rest. *(Speaking with passion)*

I – ok so the access that you have is not the same as the PN's?

P – Yes

I – Ok but you'd like to use the system more?

P – More, yes

I – Ok. What... What aspects do you use in the system? Can you tell me about that?

P – I'm using like er..... patients' notes like when writing our nursing care in the system. And then when we discharge, discharge format, so that is there... And then also we use the.....the...the....when they coming from the operations, post-op notes we also write in the system. And also the documentation of the like vital signs and then even the wounds after checking the wounds you can save it on the systems.

I – So basically everything that you do on the patient you are able to record it on the system?

P – Yes, yes

I – And you find ....do you find the system difficult or how do you find the system?

P – No the system is not difficult. Only if like you are interested and willing to like to go further. In case of me if you get stuck alone they will in that peers and other people that can help you or if they are busy then you can call the people from the IT system, they can also help you. I find it very very interesting.

I – Ok, its' very interesting and easy for you to use?

P – Yes, yes, yes

I – Okay, now that you have stated to me your attitude about the HIS' that you use in the hospital, what motivates you or what urges you to continue using the system?

P – Can you come again, sorry?

I – You've told me about how you are using the system, how you feel about using the system. Now what urges you to continue using it or what motivates you to continue using it?

P – Ok, yah....I think er.....like patient information I think and I can see that.....it is safe when it is in the system, because only the health team and not all of us can go and get that information, understand...and then one other thing is, even myself like, I can see that maybe in future I would like to continue using it 'cause of even in the outside world I can also use that computer where I had no access in the past. So I would like to maybe go and become more computer literate

I – So in the past you were not using the computer (*P1 - Yes*) but since you started using it in the hospital then you are more interested?

P – Yah I'm very much interested,

I – So the... what actually motivates you to use it is – you find it useful and safe (*P1 - Yes*) with regards to patients' information that is kept in the system

P – Yes

I – What else?

P – And then even the.....I think even about our company because of information about the company is also in the system, it's safe. So no one can maybe get hold of that information, so there is confidentiality *(struggled a bit to pronounce).*

I – Okay. What are the things that enable you or prevent you that you have experienced while you use the system? Maybe things that are giving you more support that enable you to do your functions or carry out your duties on the system, or things that prevents you or acting as barriers that might prevent you from using the system?

P – The system *(completes the question)*

I – Yah.

P – Yah. The only thing is I can tell you honestly *(giggles)* is workload. Sometimes like for instance in my unit we do a lot of theatres and orthopedics. Sometimes they come in big numbers whereby we hardly get a chance of going back. You have to maybe ask somebody *"Do this for me"*; take this patient to theatre. From theatre again they call again, come back fetch the other one again. So sometimes and you get tired as well, so sometimes honestly I hardly get the chance, workload.

I – So the workload is sometimes. *(P1 – sometimes. Yah, Not every day but sometimes)...*preventing you?

P – Like during the week, sometimes*... (Emphasising)*...it's very bad

I – When it's hectic?

P – Yes

I – Ok. And then what enables you then to carry on with your work?

P – Err.....from there I think mmm...what else? Other than that there's no much because if its' just normal to me with the routine that's just normal can be a bit of a challenge so its' not that hectic

I – So the system doesn't give you a problem, if you want to go into the system and do your work you are able to do that?

P – Yah, me honestly, on my side I can

I – You as an individual?

P – Yah, yah. Not knowing about others like what are they struggling with, but me I can...

I – Earlier on you said that when you are busy taking patients to and from the theatre then you are not able to put in other information *(P1 – On the system).* If maybe you are all busy in the ward what happens at the end of the day, are you able to come back and....

P– No the thing is, if it's like that normally we do sacrifice like we pull one back from our team to do that task. Even if he/she cannot do that but most of the job will be done and then when it's quiet we go and carry on where they left behind

I – Okay, so you get someone else *(P1 – Yah, from the team)...*Just work on the system?

P – Yah on that, yes

I – Ok, is there anything else that you want to share with me regarding HIS'? Anything?

P – What I ....the thing is neh, like I mentioned earlier on that even as an individual I've got this interest on this thing ....I wish I could *(giggles a bit)* just know everything. And maybe it's not that possible but I wish I could go on and on like I should just know everything, like if you want policies where do I go if you want to do this and that I wish I could do that

I – So you know where to get policies?

P – Yah, but not all of them honestly,

I – Not all of them?

P – Yah, not all of them

I – Ok, but the nursing policies you are able to get to them?

P – Yes

I – Ok, no thank you very much for your time and for participating in the study. Er ...as I said earlier on, at the end of my study I'm going to come back to the hospital and give my er... er...results of what I found at the end of the study, so thank you very much.

P – No it's a pleasure

Annexure F: Confidentiality agreements

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CONFIDENTIALITY UNDERTAKING

entered into between:

I, the undersigned

Prof / Dr / Mr / (Ms) Lezyda Venter

Identity Number: 611212 0016 081

Address: PO Box 6528, Baillie Park, 2526

hereby undertake in favor of the **NORTH-WEST UNIVERSITY**, a public higher education institution established in terms of the Higher Education Act No. 101 of 1997

Address: Office of the Institutional Registrar, Building C1, 53 Borcherd Street, Potchefstroom, 2520

(hereinafter the "NWU")

1 Interpretation and definitions

1.1 In this undertaking, unless inconsistent with, or otherwise indicated by the context:

1.1.1 "Confidential Information" shall include all information that is confidential in its nature or marked as confidential and shall include any existing and new information obtained by me after the Commencement Date, including but not be limited in its interpretation to, research data, information concerning research participants, all secret knowledge, technical information and specifications, manufacturing techniques, designs, diagrams, instruction manuals, blueprints, electronic artwork, samples, devices, demonstrations, formulae, know-how, intellectual property, information concerning materials, marketing and business information generally, financial information that may include remuneration detail, pay slips, information relating to human capital and employment contract, employment conditions, ledgers, income and expenditures and other materials of whatever description in which the NWU has an interest in being kept confidential; and

1.1.2 "Commencement Date" means the date of signature of this undertaking by myself.

1.2 The headings of clauses are intended for convenience only and shall not affect the interpretation of this undertaking.

1

7 Jurisdiction

This undertaking shall be governed by South African law be subject to the jurisdiction of South African courts in respect of any dispute flowing from this undertaking.

8 Whole agreement

8.1 This document constitutes the whole of this undertaking to the exclusion of all else.

8.2 No amendment, alteration, addition, variation or consensual cancellation of this undertaking will be valid unless in writing and signed by me and the NWU.

Dated at Potchefstroom this 9 July 2015

Witnesses:

1 .....

2 .....
(*Signatures of witnesses*)

.....
(*Signature*)

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CONFIDENTIALITY UNDERTAKING

entered into between:

I, the undersigned

~~Prof~~ / ~~Dr~~ / Mr / ~~Ms~~ Ismael Ismaili

Identity Number: 6201285369086

Address: 15 [illegible] Orkney 2619

hereby undertake in favor of the **NORTH-WEST UNIVERSITY**, a public higher education institution established in terms of the Higher Education Act No. 101 of 1997

Address: Office of the Institutional Registrar, Building C1, 53 Borcherd Street, Potchefstroom, 2520

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8 Whole agreement

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8.2 No amendment, alteration, addition, variation or consensual cancellation of this undertaking will be valid unless in writing and signed by me and the NWU.

Dated at Potchefstroom this 03/08/ 20 15

Witnesses:

1 .....

2 .....

(*Signatures of witnesses*)

.....

(*Signature*)

Annexure G: Field notes of an interview

The setting for the interviews on all 3 days was as follows:

Closed ward where patients are not admitted anymore, an open office space provided by the nursing services manager. The room was private, clean and well-ventilated, two chairs available and another small table where the researcher put bottles of water and cold drinks for participants. The cellphone which was used to record interviews was put on the table and all participants gave consent to be recorded. Researcher was dressed in nursing uniform complete with distinguishing devices and a name tag. The participants came in one by one being directed by the mediator to the room where interviews were held. With each interview researcher and participants sat squarely in a relaxed environment.

Participant 001 11/09/2015

Personal notes

A young male nurse in his early 30's

Looks friendly but a bit nervous at the beginning of the interview, became relaxed during the interview.

Not a talkative person and only responds to what is asked

Observational notes

Dressed in neat uniform

Responds well to questions

Methodological notes

Enthusiastic about the health information systems

Showed interest in using the computers and learning more

Participant 002 11/09/2015

Personal notes

Young female EN in her early 30's

Seems nervous at times when talking, difficulty expressing herself in English

Observational notes

Also dressed in uniform, came for interview during her tea break

Responding to questions but appears nervous, talked for a long time trying to explain breach of confidentiality by staff member

Methodological notes

She is not really impressed by computers; she is fine with using either system (paper-based and computerised).

The feeling she projected with the system is attributed to the fact that she is not fast when typing

Seems concerned about the change in processes which is not reflected in the system

Participant 003 11/09/2015

Personal notes

Male EN in his early 30s'

Appears very friendly and smiling most of the time

Observational notes

Very enthusiastic, neither anxiety nor nervousness observed

Needed some time to remember aspects of his daily routine?

Methodological notes

Very positive in terms of using the HIS

He finds the system interesting

Participant 004 11/09/2015

Personal notes

Female, ENA in her 50's and well-poised

She is dressed in uniform and very neat

Observational notes

Looks confident and relaxed

Expresses herself very well in English, very passionate about nursing and the HIS

Methodological notes

Positive in terms of HIS and hopes for other public hospitals to implement it

Showed concern about the younger nurses learning to think for themselves instead of depending on the system

Participant 005 11/09/2015

Personal notes

A young female EN in her early 30's

Very neat and dressed in uniform, also relaxed

Observational notes

Not very talkative participant, able to express herself in English and gives short responses to questions

Looks very confident,

Methodological notes

Interested in HIS, also commended the hospital for implementing it

Participant 006 11/09/2015

Personal notes

Male professional nurse in his early 40s'

Also neatly dressed in full uniform with distinguishing devices and relaxed

Observational notes

Very enthusiastic and talkative

Good in expressing himself in English and seems to be knowledgeable in terms of HIS

Methodological notes

Used hand expression a lot especially when he wanted to emphasise his point

Interested and have passion for HIS, recommended some changes in the system to make other aspects easier to use, e.g ordering from pharmacy

Participant 007 11/09/2015

Personal notes

An older ENA, a female in her 60s'

Very relaxed and friendly towards the interviewer

Have been in Hospital X since 2003

Observational notes

Talkative, explaining everything that the interviewer asks

Able to express herself in English, although few vernacular words were used during the interview

Making "clicking" sounds with her pen, but not anxious

Methodological notes

She is very happy about using HIS, especially the benefit of learning to use the computer

Highlighted the importance of record-keeping in nursing, no hindrances from the system

Likes to use some vernacular words during the interview

Participant 008 16/09/2015

Personal notes

Unit Manager, very friendly and in her 40s'

Comes across as a driven individual, indicated that she taught herself some of the things in the computer that need managers to use, e.g excel, power point, etc.

Observational notes

Laughed a lot with the interviewer, no sign of anxiety or nervousness

Able to express herself in English

Methodological notes

Knowledgeable about the HIS, highlighted the 2 systems used by the managers specifically

Generally positive towards HIS

Participant 009 16/09/2015

Personal notes

Elderly enrolled nurse, in her late 50s'

Also have been employed from 2003

Dressed in uniform and neat

Observational notes

Happy and appears relaxed

Smiling with the interviewer throughout the interview

Fluent English spoken and expresses herself well

Methodological notes

Very enthusiastic and passionate about HIS

Expressed the importance of keeping patient information safe

Correct documentation to be adhered to

Participant 010 16/09/2015

Personal notes

Professional Nurse in her late 40s'

Have been employed for 18years

Dressed in neat uniform

Observational notes

Appeared tired but she said that she is fine

Friendly towards the interviewer, relaxed

Methodological notes

Not happy about the confidentiality issues regarding HIS

Acknowledges the benefits of HIS and says it saves time.

Able to do work on the system and then afterwards go to document on the system

Participant 011 16/09/2015

Personal notes

Young energetic professional nurse

In her early 30's and working for 3 years at hospital X

No previous experience with the computer

Observational notes

Happy and relaxed, smiling throughout the interview

Clean uniform on, passionate about clinical nursing

Expresses herself in fluent English

Methodological notes

Verbalised her view on HIS, emphasis on nursing rather than on computer

Highlighted that there is pressure from managers on reports from PNs'

Participant 012 16/09/2015

Personal notes

Early 40's, female professional nurse

Have been employed for 9 years, working with HIS

Observational notes

Dressed in neat uniform

Very relaxed and is not anxious

Struggles a bit to speak fluent English

Methodological notes

Acknowledges the importance of record-keeping

Perceives the system as easy and useful

Participant 013 16/09/2015

Personal notes

A young female, ENA in her early 20's

She has been here for 5 years

Appears relaxed, friendly and laughing a lot during the interview

Observational notes

Speaks very fluently, slowly

No previous computer skill

Speaks English fluently

Methodological notes

Grateful for gaining experience on using HIS

More concerned about patient first and then go to the computer afterwards

Able to maneuver the system and find "things" in the system by accident

Participant 014 17/09/2015

Personal notes

Well poised lady, an ENA in her 40s'

Smiling a lot during the interview and speaks slowly

Have been working for almost 7years

Observational notes

Playing with a pen which could be interpreted as anxiousness, but she was not anxious

Able to express herself well in English

Dressed in uniform and very friendly

Methodological notes

Perceives the HIS to be good in terms of information being lost on paper

Record-keeping important, but perceives duplication as time-wasting (writing on the file and again in the computer)