University of the Western Cape

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The role of electronic healthcare systems (EHS) for patient recordkeeping in the Western Cape

by Kaashiefah Davids

Student number: 2443492

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Supervisor: Dr Carolien van den Berg

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Declaration

I declare that “The role of electronic healthcare systems (EHS) in patient recordkeeping in the Western Cape” is my own work, that it has not been submitted for any degree or examination to any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Name: Kaashiefah Davids Date: October 2019

Abstract

Information and communication technologies (ICT) have changed the way healthcare processes are being documented. This results in better quality and ethical vigilance to ensure a more accurate form of data recordkeeping (Stevenson, Nilsson, Petersson & Johansson, 2010). Health care in South Africa, is facing major issues relating to patient care, such as delays in patients receiving medical care. According to the national Department of Health, the improvement of public healthcare facilities is crucial (McIntyre & Ataguba, 2017). Information and communication technology (ICT) has the ability to significantly alter the status of healthcare services in the Western Cape, which can be achieved through the role of an electronic healthcare record (EHR). This can contribute to improved patient record storage and utilisation within healthcare institutions. However, there are medical care institutions within the Western Cape that are still making use of manual, processes to retrieve patient records. In doing so, the quality of patient care is limited. The acceptance and potential use of an EHR would promote an integrated system that could be accessed by a variety of authorised clinical professionals. Clinical automation is a universal trend that holds great prospects. It will not only decrease the complexity of paper-based systems, but also improve the healthcare sector by efficiently managing patients' data. It will also enhance compliance in terms of health regulations, thereby ensuring the accessibility of data in order to sustain care and improve the security of patient privacy. This study explores the ways in which patient recordkeeping is currently being utilised. It also examines the potential role of an EHR in recording patient information, and the factors that hinder the acceptance of an EHR by healthcare professionals, and finally explores the restrictions towards an EHR adoption according to healthcare professionals in the Western Cape. This study is positioned for an interpretive qualitative paradigm. The interpretive qualitative research method is aligned with transcendental phenomenology, as both are concerned with finding meaning within a certain phenomenon. This method was selected as it would guide the researcher through the research process.

The research found that the use of technology by medical professionals is a vital component in EHR adoption. A successful EHR acceptance and potential use is thus dependent on the attitudes of medical staff. Once medical staff are comfortable with changing the imbedded processes, healthcare facilities will reap the benefits of an EHR. However, this can only be achieved once staff view the system as essential. EHR has beneficial results that can transform the way healthcare facilities in the Western Cape conduct their daily operations and patient care.

Keywords

Electronic healthcare system (EHS)

Electronic health record (EHR)

Information and communication technology (ICT)

Paper-based system

Western Cape

Public healthcare facilities

Clinical services

Patient recordkeeping

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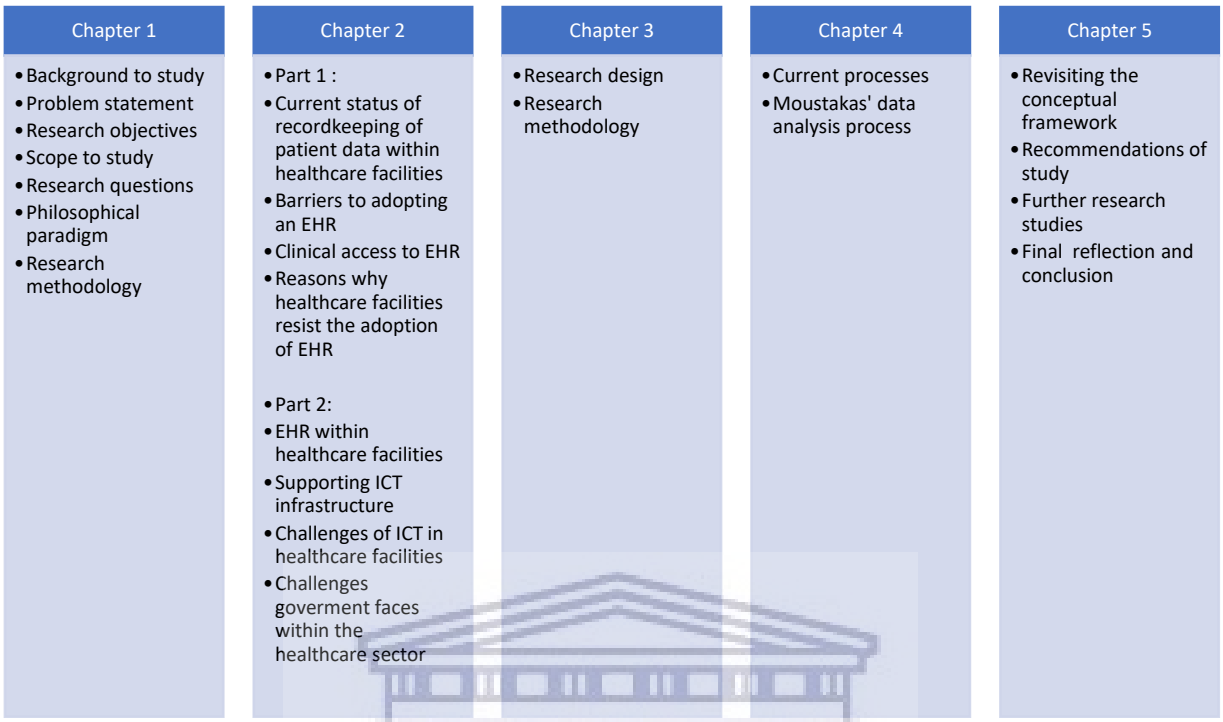
List of abbreviations

Abbreviation	Full meaning
ICT	Information and communications technology
EHS	Electronic healthcare system
EHR	Electronic health record
NHI	National health insurance
IT	Information technology
GDP	Gross domestic product

Definition of concepts used

Concept	Meaning	Source
Paper-based records	Paper-based records have been the traditional method of storing records and usually include the process of maintaining and storing documents in hard-copy format.	(McHugh, 2016).
ICT	Refers to communication technologies such as networking components, applications and systems that people and organizations to interact in the digital world.	(Rouse, 2019).
Electronic healthcare system	An electronic healthcare system allows clinical staff to store information instantly. It helps healthcare facilities to run smoother and in a more secure environment.	(Krishna, 2010).
Electronic health record	Refers to a digital record of a patient's health information.	(Practice Fusion, 2019).
Conceptual framework	A conceptual framework is a structure which the researcher believes can best explain the natural progression of the phenomenon to be studied.	(Adom, Joe & Hussein, 2018).
Healthcare record	A document that presents a patient's medical information	(Rouse, 2011).
Automation	Automation is the use of computer controlled devices to assume control of processes. The aim of automation is to boost efficiency and reliability.	(Market business news , 2020).
ICT Infrastructure	ICT infrastructure refers to digital telephone network, internet capability, internet servers, and fixed broadband and other technologies.	(Bagchia, Mallik & Pradhan, 2018).

Chapter 1: Introduction



Background of and rationale for this study

Information and Communication Technologies (ICT) has influenced change in the way healthcare processes are being documented. This results in elevated quality and ethical vigilance to ensure a more accurate form of data recordkeeping (Stevenson *et al.*, 2010). Health care in the Western Cape, South Africa is facing major issues relating to patient care, such as delays in patients receiving medical care. According to the national Department of Health, the improvement of public healthcare facilities is very important (McIntyre & Ataguba, 2017).

ICT can improve healthcare systems by managing the data of patients and providing quality medical records (O'Mahony, Wright, Yogeswaran & Govere, 2014). It can be used to record, monitor and store patient information, thus giving rise to the utilisation of an electronic healthcare record (EHR) (Seahloli, 2017).

The goal of an EHR is to eliminate paper-based records that are used within healthcare institutions and to produce services that are cost effective and can be accessed by the appropriate healthcare employees (Cline & Luiz, 2013). Accurate and in-depth information are crucial for patients and healthcare professionals in order to make calculated decisions with regard to various patient health issues (Kalema, 2014).

EHR assist in the development of management systems for patient care in medical care surroundings. It is possible that the incorrect medication can be prescribed or that a mistaken diagnosis occurs if healthcare professionals do not process the correct patient records. Moreover, not processing the correct data, at the time when needed, can lead to a managerial crisis in healthcare facilities. This discrepancy will thus negatively impact the quality of healthcare services and, in turn, the patient's results (Dimitrovski, Ketikidis, Lazuras & Bath, 2013). EHR serve to supply patient data that are needed by healthcare professionals. Even although the benefits of EHR adoption produce quality services, the reluctance to make use of the available technologies can lead to limited system usage (Tang, Ash, Bates, Overhage & Sands, 2006).

Healthcare professionals comprise one of the fundamental elements in the adoption process (Dimitrovski *et al*., 2013). The acceptance and usage of an EHR will only succeed if the end users perceive the system as significant (Tang *et al*., 2006). The adoption of EHR is an intricate process that involves user change management, innovation and collaboration, governance, business process involvement and medical record management (Dimitrovski *et al*., 2013).

EHR have developed into a prompt and comprehensive data repository that can be used in public healthcare facilities around the Western Cape. Public medical care institutions in the Western Cape have more recently and still are making use of old methods for patient data recordkeeping. Since then, healthcare facilities have slowly started to adopt EHR (Weeks, 2014).

Clinical automation is a universal trend that has the prospect to decrease the complexity of paper-based systems and improve healthcare systems by managing the data of patients. It enhances compliance in terms of health regulations, thereby ensuring the accessibility of data in order to sustain care and improve security of patient privacy (Cline & Luiz, 2013).

A total of 80% of South Africans are being treated by under-resourced public healthcare facilities, while the remaining 20% are treated by well-resourced private clinical facilities (Maphumulo & Bhengu, 2019). The objective of the National Health Insurance (NHI) is therefore to mitigate these issues by providing clinical care to patients that is more efficient as well as accessible (Els & Cilliers, 2018). The below topics will firstly explain how ICT can assist with healthcare, it will then introduce Electronic Health Record (EHR), the need for a new approach, problem statement, research questions, objectives, scope and lastly, the philosophical paradigm for this study.

1.1 The prospective of ICT in Western Cape communities

The 21st century has seen the peak of the revolution in ICT, as several developing countries have laid down strategies that would enable ICT to generate and communicate data from one platform to another (Simba, 2004). Technology is progressively being seen as one of the key fundamentals in order to facilitate the development of communities (Debrah, Bhebe, De la Harpe, Ruhode, M'Rithaa & Vainikainen, 2014).

Organizations are improving their service delivery by setting up systems as well as platforms that are made possible through technology (Debrah *et al*., 2014). Research has revealed that ICT can make a momentous contribution towards the healthcare segment in developing countries. ICT can be classified as processes or communicators; this means switching data into information and turning information into knowledge that can be used for communication purposes (Panir, 2011).

Technology has thus been utilised for patient recordkeeping. It provides numerous benefits to healthcare; therefore it has become imperative to incorporate ways to educate as well as train healthcare professionals. Developing communities such as those in the Western Cape have limited access to ICT. With the limited access to ICT in these communities, benefits that can be provide more prompt service to patients might be impossible to use (Debrah *et al*., 2014). Establishing ICT within the Western Cape communities is one of government's main objectives, however, due to the lack of infrastructure, this remains a challenge. Although the Western Cape has made incremental inroads in ICT development when being compared to other regions in South Africa (Western Cape Goverment , 2014).

1.2 View of ICT on healthcare

Globalisation has influenced all aspects of present-day life, thus penetrating the lives of individuals across the world. It has led to the transformation of traditional systems, innovation and competition within global markets through the use of ICT (Simba, 2004). ICT facilitates the sharing as well as the communication of knowledge and information through a number of different tools in addition to services. Revolutionising the world of ICT with new, cutting-edge technologies has made our world more connected; this includes the area of healthcare (Badri, 2015). In this present age, ICT is known as promoting development, as studies have indicated that it can make a huge contribution to the healthcare area (Panir, 2011).

ICT plays an important role regarding the enhancement of patient care and has revolutionised the way patient information has been stored through digitising medical-related information (Iroju, Soriyan, Gambo & Olaleke, 2013). ICT is transforming healthcare processes in order to assist medical professionals with daily functions. Healthcare has thus benefited enormously due to the growth in ICT. Even though the benefits of ICT are disclosed in theory, it is not clear whether these benefits are evident in medical professionals' work processes (Viitanen, Hyppönen, Lääveri, Vänskä, Reponen & Winblad, 2011).

ICT contains numerous technologies that can aid with the exchanging of data, thus improving engagement with as well as services that are being delivered to patients. It has the ability to enhance the way information is accessed (While & Dewsbury, 2011), therefore providing services that are simplified. It monitors patients' health issues as well as diagnoses over a period of time, providing the best and most suited treatment for individuals (WHO, 2012). The influence of ICT on several fields of human endeavour, such as business, architecture, engineering, law, tourism and the medical world, over these past years has been vast (Adesote & Fatoki, 2013).

ICT has brought about major change in human endeavours (Adesote & Fatoki, 2013). One of the sectors, namely the healthcare sector, has seen a significant growth in technology in terms of service delivery (Debrah *et al*., 2014). Technology that is utilised intelligently is able to develop medical indicators of many patients around the globe. An instance would be the case of Tanzania, where a health network was adopted in order to provide clinical staff with a knowledge-sharing platform and support for medical facilities. This allowed medical staff to get second opinions regarding a patient and even to refer patients to specialists located in different parts of the country. The common problem of moving patients from rural healthcare

facilities to bigger facilities due to the absence of medical expertise was thereby solved. The adoption of a health network has improved transparency and decreased costs associated with administrative transactions for clinical providers (Badri, 2015). The positive aspect of ICT is that it can be used to improve information sharing, although it can also be difficult to manage and control virtual information (While & Dewsbury, 2011).

As acknowledged by researchers, information and communication are some of the pillars within healthcare that can benefit from the use of ICT (Panir, 2011). ICT allows countries around the globe to constantly build their capacity for accessing research and programmes that are educational. Doctors in Bangladesh, for instance, are given access to online medical journals, whereas physicians in certain areas in Africa are able to use GPS-based systems to identify and track infectious outbreaks. These initiatives indicate that ICT can function as an important tool for medical staff to produce quality care for patients in developing countries. There clearly is much that ICT can contribute to patients' wellbeing and health (Badri, 2015).

1.3 History of EHR

Electronic health record (EHR) holds a wealth of data, consisting of patient treatments and diagnosis. A single patient makes numerous medical visits and with that comes a large amount of medical information that is documented on each visit (Mans, Van der Aalst, Vanwersch & Moleman, 2012). According to research, a patient can gather up to 50 000 data items during a life span. Such huge pool of information should be placed in storage (Wright, Sittig, McGowan, Ash & Weed, 2014).

Larry Weed established the idea of the problem-oriented medical record in medical care practice. The EHR initiative has been around since the 1960s. It originally was based on generating a system that would allow a third person to view records, in addition to confirm a diagnosis. Over the duration of his profession, Weed has worked as an entrepreneur, physician, health system visionary and scientist, and has always been a promoter of an enhanced as well as efficient science-driven health system (Wright *et al*., 2014). Weed believed that it would assist medical professionals to understand the nature of their patient's diseases more completely and that it would acted as a guideline for professionals. He also understood that EHR is not only a guideline and a learning tool but also the best representation of the care a patient is receiving. Today, the crucial elements within his system still exist in nearly all EHR globally (Aronson, 2019).

In 2000, EHR became well recognised when clinical professionals had the ability to document patient assessments, vital signs and laboratory test results on computers. The data recorded was stored and thus could be accessed at a later stage. Enhanced patient services, as healthcare professionals were able to allocate information needed such as patient history, prior treatment, medication interactions and immunisation records. This was ideal for those patients who had numerous clinical providers and a number of recommended medications (Mitchell, 2019). The objective of an EHR is to ensure that medical care delivered to patients is done with efficiency and effectiveness (Versel, 2019).

The adoption of an EHR eliminates enduring long waits for records from other health facilities (Mitchell, 2019). EHR have the ability to decrease the communication obstacles between healthcare practitioners and patients. With the improvement of communication between both parties, it will be simple to set up appointments, ask relevant questions, request referrals and report on problems (Tang *et al*., 2006).

1.4 The need for a new approach

EHR are emphasised as crucial components of evidence adoption and development. However, in order for the benefits to be fully achieved, EHR need to be more than just an electronic version of the traditional paper medical chart (Miriovsky, Shulman & Abernethy, 2012). Professionals within the sector of accounting, health care, finance and so forth often rely on the strength of record management in order to assist with daily operational duties. A record is therefore manifested with the intention of providing support for the delivery of accurate services within several sectors (Marutha & Ngoepe, 2017).

Clinical professionals require information, such as previous treatment, prescribed medication, diagnoses done on a patient and the progress made, in order to know the steps of action going forward. If clinical health records are managed incorrectly, the retrieval of patient records will become a tedious process, resulting in medical facilities not being able to render a service or, even worse, services being rendered inaccurately. Therefore, this could also give rise to an absence of effective systems for opening, indexing and tracking clinical records (Marutha & Ngoepe, 2017). The secure data that is captured by means of an EHR provides mechanisms that have the ability to facilitate comparative research on effectiveness. Essentially, it supports financial and administrative systems whilst collecting documents and displaying electronic data, as well as sustaining the required medical workflow (Miriovsky *et al*., 2012).

Hence, medical records are imperative, as they concern the information background of patients. Despite their imperativeness, clinical records are often not managed properly, resulting in missing information and an inability to access past treatments of a patient. Misplaced or lost records can have a destructive and negative impact on the livelihood of patients (Marutha & Ngoepe, 2017).

1.5 Problem statement

Every day, thousands of individuals seek medical care from a limited number of doctors who are employed in public health to improve the health of communities. To alleviate this overload, patient healthcare service should be provided more swiftly. The public healthcare sector consist of a number of shortcomings such as long patient waiting queues, poor quality healthcare delivery and infrastructure. Despite effects of improved quality of service in healthcare by government, communities reveal that services within facilities are failing to meet basic standards of care as well as patient expectations (Maphumulo & Bhengu, 2019). Furthermore, the planned implementation of the National Health Insurance (NHI) will place an additional burden on the healthcare system in South Africa.

The improvement of patient recordkeeping within public healthcare facilities in the Western Cape province of South Africa depends on accessible and reliable patient information that can be retrieved by healthcare professionals in order to make medical decisions (Seahloli, 2017). Utilising EHR to administer patient recordkeeping could improve healthcare services (Sikhondze & Erasmus, 2016).

Most patient record within public healthcare facilities around the Western Cape is paper based and stored in logbooks. The importance of automating processes is poorly understood by the public healthcare system (Cline & Luiz, 2013). Healthcare employees might not recognise the importance of the perceived role and use of an EHR and their acceptance of the technology. This study was prompted due to the limited research that explores the usage of technology in healthcare practices, more specifically in patient recordkeeping (While & Dewsbury, 2011).

1.6 Research objectives

The aim of this study was to examine the perceived role of an EHR in patient recordkeeping and to investigate the potential acceptance and usage of an EHR towards adoption by healthcare professionals.

The following objectives were addressed in this study:

- Potential role of an EHR in patient recordkeeping and how this could assist healthcare professionals in the Western Cape
- Factors that hinder the acceptance by healthcare professionals of EHR in the Western Cape
- Factors that would cause restrictions of an EHR towards adoption by healthcare professionals in the Western Cape

1.7 Scope

This study focused on public healthcare facilities around the Western Cape that have not adopted an EHR for patient recordkeeping. It also focuses on healthcare employees' perceived role, and not actual use, of an EHR in patient recordkeeping. The healthcare staff who took part in the study where doctors, administrative staff members, pharmacists and nurses. Private healthcare facilities were not taken into consideration for this study.

1.8 Main research question and sub-questions

With the adoption of an EHR, clinical services in the Western Cape would not only potentially experience an improvement in patient recordkeeping, but more so could produce a quality service within the integrated system. This study seeks to find answers regarding the acceptance and potential use of an EHR and therefore prompted the below research questions:

What factors influence the potential role of an EHR in the recording of patient information in a public healthcare facility?

The following sub-questions emerged from the main question:

i) **What will hinder the acceptance of EHR by healthcare professionals in the Western Cape?**
ii) **What factors would cause restrictions towards an EHR adoption according to the healthcare professionals in the Western Cape?**

1.9 Philosophical paradigm

A paradigm comprises epistemology, ontology, methodology and methods (Scotland, 2012). Each component is explored and discussed in order to indicate its relationship to this study.

Interpretive epistemology

An epistemological philosophical consideration enhances a reader's understanding of how knowledge is created, communicated as well as acquired (Scotland, 2012).

Interpretive research was chosen as the epistemological philosophical stance for the purpose this research, as it gives insight into the user's viewpoint regarding a phenomenon, and gives a sense of engagement with the data that was produced. It informs the researcher about an individual's experience as lived (Scotland, 2012). An interpretive researcher seeks to understand and explain sociological data thus focusing on human intent and meaning (Dugger, 2020). Data was gathered in order to understand the factors that influence the potential role of EHR in patient recordkeeping, the factors that cause restrictions towards an EHR adoption by healthcare professionals, and lastly, factors that hinder the acceptance of EHR by healthcare professionals.

Subjectivism ontology

A subjective ontology allows individuals to create their own reality (Walsham, 1995). This was done through conducting interviews for the purpose of this study. These interviews took place at five healthcare facilities throughout the Western Cape. This will be explained further in Chapter 3.

Research design

An interpretivist's goal is to provide an understanding as well as an explanation of the action of participants and usually produces qualitative data (Scotland, 2012). Secondary data was applied, this means that the researcher interpreted existing data (Crossman, 2019), which provided awareness of the association between EHS and healthcare professionals.

The interpretive epistemological philosophical stance used provides an understanding of the user's perspective, and thus meaning is discovered through interacting with the participants by conducting interviews (Scotland, 2012). These interviews form part of the qualitative research methodology (Crossman, 2020).

Research methodology

Research methodology is defined as the approach (Williams, 2007) and strategy used in the study, in addition to the choice of specific methods. Therefore, it is concerned with what, why, when, from where and how data is collected as well as analysed (Scotland, 2012).

Research methods are particular procedures and techniques that are utilised to gather and analyse research data. This research data is either quantitative, qualitative or both (Scotland, 2012). The research methodology that was used for the purpose of this study is the qualitative research method. The motive for selecting a qualitative rather than a quantitative research method is because, when being compared, qualitative research allows for the observation of individuals as they converse. It also assists in understanding individuals and their culture within their contexts (Myers, 1997). Lastly, the qualitative research method is commonly used in primary research, as it supports various approaches including interviews and surveys (DeVault, 2019).

The qualitative research method is associated with the inductive approach, which allows the researcher to gather findings through the interpretation of raw data, which could lead to the development of models (Thomas, 2006). Therefore an inductive study was chosen, as it produces a logical flow leading up to the findings relating to the acceptance and potential use of EHR in public healthcare facilities in the Western Cape.

Research participants

A sample of five healthcare facilities was chosen for the interview process. The sampling method was purposeful sampling, as explained in Chapter 3. These five healthcare facilities were chosen due to the large community they serve. For the purpose of this study, only the public healthcare facilities in the Western Cape were taken into account.

Fifteen interviews were held with employees from the selected public healthcare facilities. The interview was based on semi-structured questions, and four population groups were approached – medical doctors, nurses, pharmacists and administrative staff that are employed at healthcare facilities situated in Green Point, Zonnebloem, Athlone and, lastly, Silvertown.

These healthcare institutions are public sector institutions and had not started to adopted EHR.

Research instruments

There are various kinds of research instruments, namely interviews, observation and surveys. However, interviews and observation are used when embarking on a qualitative research study. There are various kinds of qualitative research instruments; however, the chosen one had to relate to the objective of the study. In order for the correct instrument to be selected, questions such as "What are you really planning to find out?", "How are you going to observe the target population?", "What's the best instrument to observe certain variables or indicators?" had to be answered (Trigueros, Juan & Sandoval, 2017).

The research instrument chosen for the purpose of this study was interviews. These interviews took place through face-to-face interaction, ensuring an adequate dialogue involving the researcher and healthcare professionals who wished to participate. The interviews consisted of 10 semi-structured questions that were answered by various healthcare staff members, as indicated previously.

The purpose of this study was to expand the understanding of the underlying views, motivations and reasoning (DeFranzo, 2011).

Data analysis process

Data analysis is a process whereby the researcher arranges the interview records, observation notes and material that was accumulated in order to understand a certain phenomenon (Wong, 2008). It is also imperative to bear in mind that, when a study has undertaken qualitative research, the researcher is considered as a vital data analysis tool (Leech & Onwuegbuzie, 2011).

In order to convert raw data into new information, a researcher who is embarking on a qualitative study should always be involved and engaged within the process in all stages of the research (Thorne, 2000). Transcendental phenomenology was chosen as the data analysis process. This will be further discussed in Chapter 3.

1.10 Ethics and confidentiality

It is thereby stated that the information that was gathered in order to produce this study is the author's original work. In addition, the author has acknowledged the work of others referred

to within this paper and they have duly been cited. Whilst conducting this paper, the author adhered to the highest ethical standards. The researcher obtained ethical clearance from the University of the Western Cape in order to conduct the interviews (refer to Appendix A).

There was no interaction with patients whilst the interviews were conducted, and similarly no clinical data was collected. The names and identities of the healthcare professionals participating in the interviews was protected in order to ensure their anonymity. The data collected during the interview process were stored in a secured computer that only the researcher and her supervisor have access to. Once the study was completed, all data was destroyed. All participants were informed prior to the interview that their participation was voluntary. Confidentially and anonymity were assured. The researcher has obtained permission from management to conduct the interviews. Before any interview took place, permission from participants were obtain through signed consent forms. The author was well aware of the ethical considerations and agreed to carry out this research in accordance with the ethical procedures.

1.11 Outline of thesis

This thesis consists of five chapters. Chapter 1 contains the background to the topic being investigated and looks at the problem statement guiding this research, the research questions, methodology and objectives, as well as the scope of the study.

Chapter 2 contains an overview of paper-based record keeping, ICT and EHR, including topics such as their definitions, history, who should have access to an EHR, and the social, ethical as well as legal perspectives in terms of patient privacy. This leads to an examination of the factors that hinder the acceptance of EHR by healthcare professionals as well as factors that would cause restrictions towards an EHR adoption according to healthcare professionals in the Western Cape.

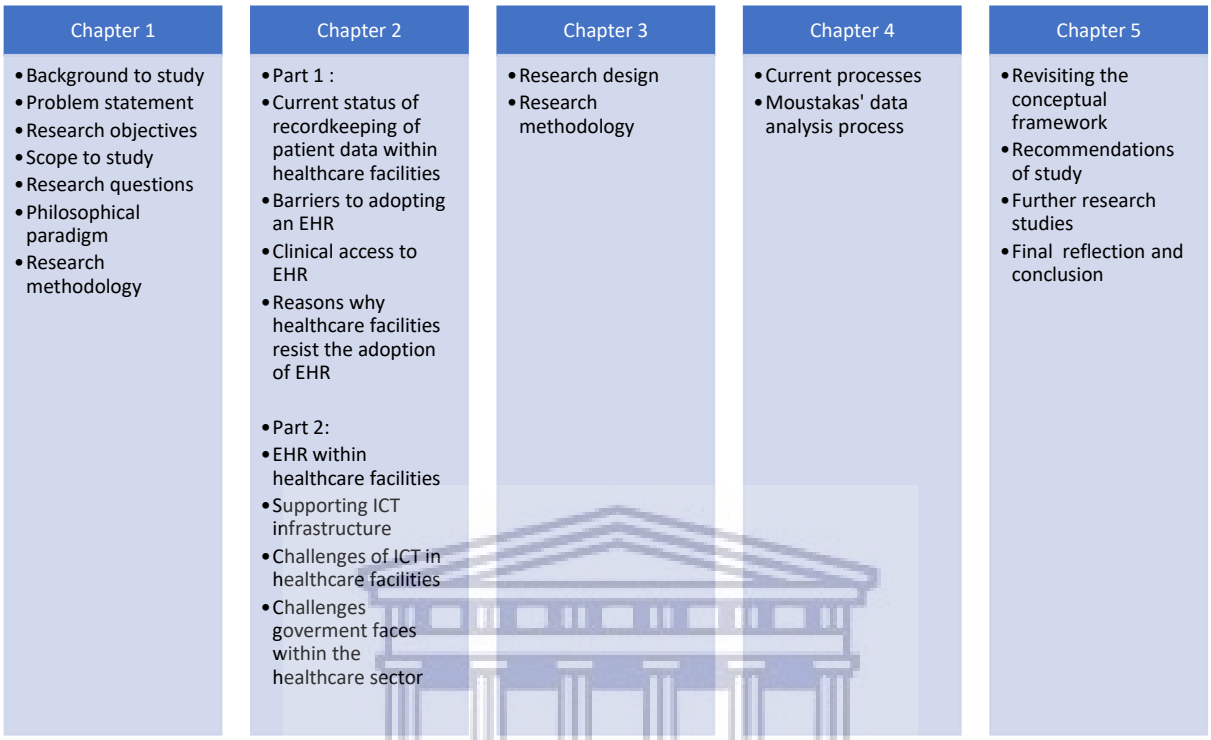
Chapter 3 explains the methodology, which consists of the research method and design that were used to guide this study. Chapter 4 outlines the analysis of the data that was collected and, lastly, Chapter 5 contains recommendations for future studies and the conclusions of this study.

Summary

The significance of clinical healthcare charts in order to sustain medical services cannot be overemphasised. In order for medical records to make a contribution to the healthcare sector, it is vital for the adoption of an EHR in clinical facilities. Electronic records are thus a dependable and authentic option that is cost effective and reduces time to ensure speedy record retrieval (Marutha & Ngoepe, 2017). When being used to its full capacity, EHR are expected to develop medical documental records, ensure efficient access to patient data and deliver a basis for informatics-enabled research (Miriovsky *et al*., 2012).

The unsuccessful management of clinical records is not only an issue in South Africa, but also in the United States, where the department of health services has reported that one out of seven files in medical facilities are misplaced. This can contribute to poor records management and, as a result, it is important that medical charts are managed correctly so that citizens can obtain the needed care (Marutha & Ngoepe, 2017). This chapter has provided an overview of what this study entailed. The following chapter consists of a detailed literature review, and concludes by producing a conceptual framework.

Chapter 2: Literature review



Introduction

This study investigated the potential role of an EHR within healthcare practices, more specifically in patient recordkeeping in public healthcare facilities around the Western Cape province, South Africa. It also looked at factors that will hinder the acceptance as well as restrictions towards an EHR adoption according to healthcare professionals. The author explored old, physical methods of data storage that lead to inaccuracies, versus the potential of digital processes.

Prompt responses are critical for healthcare professionals due to high patient numbers and issues resulting from cumbersome patient recordkeeping. Technology can accomplish numerous transformations with regard to patient recordkeeping. In turn, this will lead to a shorter waiting time, thus enhancing customer service to patients and also making a positive contribution throughout healthcare facilities. It can provide a beneficial role in the public healthcare system (Venkatesh, Sykes & Zhang, 2011).

There has been some adoption of EHR around South Africa however, more than half of the public healthcare facilities are still making use of paper based record keeping (Katurura & Cilliers, 2018). Previous research has discovered that healthcare staff members have a

tendency to resist technology. Even though the benefits specified are favourable, one third of South African healthcare facilities have some form of functioning electronic healthcare recordkeeping. According to the National Department of Health, there are an assortment of systems that exists within the South African healthcare industry; however; there are five propriety systems that are in use yet have very little integration among them (Weeks, 2013). This has become a major obstacle, as even though there are available technologies and infrastructure, the EHR are not integrated with each other so that clinical professionals can obtain the advantages of an EHR (Coleman, Herselman & Potass, 2011).

This literature will firstly explain the healthcare sector within the Western Cape, it will then provide an overview of paper-based records, ICT and then EHR. Once that has been completed, the rest of the literature will be divided into two parts. Part 1 examines the factors that hinder the acceptance of EHR by healthcare professionals. Part 2 will then investigate factors that would cause restrictions towards an EHR adoption according to the healthcare professionals in the Western Cape.

2.1 Description of the healthcare sector within the Western Cape, South Africa

We live in a world that has limited resources and budget constraints within the healthcare system. However, the plea for quality clinical care is rather unlimited (Health Systems Trust,2017). South Africa is one of the very few countries in the world that has a distinct divide between rich and poor. The service delivery amongst public healthcare facilities is considered to be of poor quality when compared to others in the world (Sikhondze & Erasmus, 2016).

The murder statistics of South Africa compared to other parts of the world, such as Western Europe, are 20 times higher. The causes of these law-breaking crimes are traced back to poverty issues. After contagious sicknesses, trauma is the number one cause of death and therefore is among the highest trauma rates globally. The Groote Schuur healthcare facility, which is situated in the Western Cape, revealed that, in a one-year period, the majority of the 9 236 clinical cases taken on by the facility were assault. Of the most common injuries, which include assault, 21% were with a sharp object and 17% were with a blunt item, while traffic accidents accounted for 19% (Ohuabunwa, Sun, Jubanyik & Wallis, 2016).

The public medical care sector in South Africa is confronted by numerous issues, which include issues concerned with HIV/AIDS (human immunodeficiency virus/acquired immune deficiency syndrome), tuberculosis, malaria and clinical systems that are weak (Cline & Luiz, 2013). Within the last two decades, the growth in HIV/AIDS has taken a toll on the life

expectancy of patients who are affected. In 1995, it was discovered that, during the premature phases, this epidemic affected more young females than males, and that the Western Cape was home to 1.2% of HIV/AIDS carriers. Presently, there are more than seven million individuals who are living with HIV, and half of these individuals are on lifetime antiretroviral medication (Health Systems Trust, 2017).

When comparing South Africa to countries of a similar economic background, it is clear that South Africa spends a large quantity of the country's GDP (gross domestic product) on clinical services (Sikhondze & Erasmus, 2016). Challenges such as diseases and trauma, which have an impact on the healthcare sector, also have an impact on the healthcare expenditure of South Africa. The total health expenditure is the highest when compared to other countries that are at a similar level of economic development (Cline & Luiz, 2013).

In 1995 it was projected that 9% of South Africa's GDP was spent on the healthcare sector, amounting to R30 billion (Health Systems Trust, 2017). Between the years 2008 and 2012, an annual average of 9% of South Africa's GDP was consumed by clinical services. Even though the GDP expenditure is high, South Africa's clinical service is still considered to be poor when compared to other developing countries (Sikhondze & Erasmus, 2016). The public medical care sector increased healthcare spending from R30 billion in 1995 to an estimated R220 billion in year 2020 (Health Systems Trust, 2017). Despite the poor state of healthcare services within South Africa, there is a huge difference in the performance of public services when compared to private clinical services. The improvement in services regarding the public sector needs to be motivated by political as well as health leaders (Sikhondze & Erasmus, 2016).

Due to the high rate of crime and disease in developing countries such as South Africa, a healthcare facility that does not have a solid foundation regarding proper and sufficient patient recordkeeping will be more likely to break down. The percentage of trauma and infectious illnesses will continue to increase and efforts must be made to transform healthcare into a full EHR that is not dependent on traditional patient recordkeeping (Ohuabunwa *et al*., 2016). The state of medical care services has drawn awareness to transforming the delivery of care to patients (Sikhondze & Erasmus, 2016).

2.2 Potential impact of the NHI on healthcare in South Africa

The NHI promises universal healthcare to every South African (BusinessTech, 2020). This will allow every individual to access quality clinical care despite financial constrains

(Katurura & Cilliers, 2018). In order for the NHI to improve the quality of healthcare services, an EHR needs to be adopted in order to register and track patients medical history. An EHR adoption needs to take place in order for the NHI to work efficiently (Katurura & Cilliers, 2018).

The healthcare insurance will pay for clinical visits to public and private medical professionals through a centralised reserve that will be funded by income tax (Katurura & Cilliers, 2018). This could place strain on South Africans as taxpayers could face potential tax increases to fund the NHI (BusinessTech, 2019). While the NHI will only be introduced in several years to come (BusinessTech, 2020), this would strengthen these under-resourced public facilities by enhancing continuity of clinical care (Els & Cilliers, 2018).

2.3 Paper-based records

Health records have gone through major changes over the past few years (Mitchell, 2018). They have been collected and stored for centuries in the form of paper, however this has increasingly taken up space, as well as hindered access to effective healthcare (Boonstra & Broekhuis, 2010).

Paper-based records were first stored in storage rooms. When healthcare professionals needed a specific medical record, the process to retrieve that specific file was to request the file and it would be transported by means of a courier. This method took a lot of time and led to delays in treatment. Medical records that exist on paper are challenging due to difficulties with regard to reading various types of handwriting. Likewise, difficulties would be experienced when trying to locate specific information, resulting in improper treatment (Mitchell, 2018).

Vast quantities of space are taken up with thousands of physical records that are kept in storage facilities. These can only be found at one location at a specific time. Due to access to patient records being restrained, productivity is diminished in terms of service in healthcare facilities (Logan, 2015). Paper files can only be viewed and utilised by one individual at a time. This is a problem when patients have complicated healthcare problems that require multiple doctors and nurses (Hersh, 1995).

Not everyone has the skills to navigate their way around a computer. Paper-based records are less challenging for healthcare professionals to be able to access files, and not much skill is required in order to do this. Each patient that is allocated a bed at a medical facility has their chart attached to their hospital bed. This system makes it easier for medical professionals, as

in times of emergency the patient's folder can be found easily. When time is limited and a patient's life is at risk, paper records can be an effective means to save a life, and thus the time it would take to page through multiple screens on a computer in order to get to a patient's history is eliminated (Feigenbaum, 2017).

Healthcare professionals presume that an EHR might become a security threat. The enormous quantity of healthcare professionals who encounter patients' folders makes it incredibly difficult to keep track of each person who has access to it. Nevertheless, it makes it less challenging for individuals to retrieve these medical records without consent and, in turn, personal documents could be duplicated (Logan, 2015). However, this does leave room for doubt, as an individual can retrieve a folder without signing for it. Every so often, initials could be problematic to read, which defeats the purpose of security. An EHR resolves these issues, as every individual who requires a document has to log on to a system in order to retrieve it. If healthcare records are being used inappropriately, an EHR would be able to track the individual who is responsible (Feigenbaum, 2017). As computers became innovative, so did healthcare records (Mitchell, 2018).

2.4 View of ICT

In today's digital word, ICT is referred to as substances for clinical improvement that ensure a substantial contribution to the clinical health sector, especially in developing countries (Panir, 2011). ICT contains the elements that support modern computing and allow individuals and organisations to take part in the digital world, changing the human experience through the way individuals connect with each other and transforming the way individuals go about doing their jobs (Rouse, 2017). An EHR is an example of an ICT tool within healthcare (Mamlin & Tierney, 2015).

The transfer of knowledge in clinical facilities is dependent on numerous aspects, such as organisational structures, the culture of the facility, individuals, the strategy, processes and ICT (Sheng, Chang, Teo & Lin, 2013). Regarding the clinical sector, ICT refers to services that promote distant medical care (Rouleau, Gagnon & Côté, 2015). Medical care facilities are increasingly adopting ICT to enhance patient services and care. When patients who are seen as customers seek quality services through improved clinical treatment, emphasis is therefore placed on the medical care industry's information-handling abilities and infrastructure. The usage of proper technology can give rise to data that is reliable and therefore is considered as an important element in the clinical care sector. ICT is seen as an

aspect for economic progression, as it works as a channel between medical professionals and patients for communication purposes (Zakaria, Mohd Affendi & Zakaria, 2010).

ICT embodies digital technologies that promote electronic storing, processing and capturing of information so that the promotion of health and treatment of illness are possible (Rouleau *et al*., 2015). It handles data electronically, which means that it changes data to information or moves data from sources to recipients. It improves the communication procedure of transferring information as well as the exchange of knowledge (Panir, 2011). ICT has the ability to improve the lives of individuals in developing countries (Ruxwana, Herselman & Conradie, 2010).

However, clinical professionals need to be educated in the use of an ICT tools and to understand its significance. In doing so, they would obtain the skills and knowledge that are required to make full use of ICTs. The capability of medical staff to operate an ICT successfully rests on the design of the technology regarding the human aspect. A poorly designed user interface adds to clinical mistakes, and therefore minimising these issues require attentions to the social factors that influence clinical staff in their day-to-day work practice (Iroju *et al.*, 2013).

Introducing a new technology into a facility entails innovative medical processes in addition to cultural amendment, yet attitudes towards technology are socially shaped (Li, 2010). ICT is always changing, and so are the organisations that adopt it. Finding innovative ways to deliver clinical services has brought to light technological advances, thus resulting in a growth in the usage of ICT within medical care (Ruxwana *et al*., 2010). ICT is a dynamic and emerging process, constantly evolving across various phases of the adoption process (Li, 2010). It has the prospect of bringing about changes in medical and patient-care services. Bridging the economic and social gaps that are evident in the Western Cape communities thus gives rise to a broader range of clinical services to disadvantage patients (Ruxwana *et al*., 2010).

Due to the adoption of ICT, it develops the delivery service for patients by enhancing access to basic clinical services and having access to digital developments for constant advancement (Ruxwana *et al*., 2010). The adoption of ICT continues to be a challenge, although it requires changes at different levels, such as medical professionals, patients and medical facilities (Rouleau *et al*., 2015). The role of ICT is not only suited to businesses; it plays a fundamental role in the strategies of medical facilities (Zakaria *et al*., 2010).

2.5 Benefits of ICT

When technology is not incorporated into work practice, processes could go wrong. It has been proven that ICT has enhanced services in other business sectors, and therefore healthcare has taken an interest in investing in new technologies in order to reap the benefits of an ICT (Westbrook & Braithwaite, 2010). ICT offers an opportunity to present momentous as well as enduring transformation across the developing world (Devex, 2013). Within the healthcare segment, ICT enables innovation that is designed for the treatment of patients and, by doing so, presents itself to face the challenges of ageing societies (Haluza & Jungwirth, 2014).

ICT holds great promise in assisting new ways of delivering care, rather than duplicating the processes that already exists. It is time to adopt ICT within the healthcare sector in a way that produces factual developments and significant advantages that would aid clinical professionals to be able to make improved decisions. If ICT is exploited to its full potential, it can improve clinical workflows, thus concluding to a streamline system and quality of services (Westbrook & Braithwaite, 2010).

Substitution and transformation are areas in which ICT can produce the greatest gains. ICT is referred to as a disruptive technology, as it changes the current practice and infrastructure of an organisation. The aim of a disruptive technology is to alter the way work is done and, at the same time, to allow staff members to gradually undertake additional work functions. Certain clinical staff members view ICT as a threat to certain aspects of their job that they value. A new technology does not immediately lead to enhancements in work processes; however, it has to match new skills as well as behaviour. This comes with intense difficulty and high expenditure for healthcare facilities (Westbrook & Braithwaite, 2010). The benefits of ICT rely on funds and access to educational and cultural resources (Panir, 2011).

An effective dialogue between a patient and clinical professional is an unavoidable requirement in order to produce a quality relationship and therefore is crucial for the treatment of medical illnesses. However, this leads to a decrease in duplicated testing, clinical readmissions and death rates because of the enrichment of patients' knowledge. Communication problems amongst medical staff and patients could cause major treatment mistakes and poor compliance. In addition, a patient-centred ICT that is based on communication between a clinical professional and a patient contributes towards a medical advancement for patients (Haluza & Jungwirth, 2014).

The key to gain the advantages of ICT is to know what it needs to be used for and how ICT in clinical care is viewed. Presently, the main issue is to create efficiency by automating clinical processes that were done manually in the past, for instance, an electronic ordering system that ensures progress regarding the speed with which test outcomes are obtainable to clinical professionals (Westbrook & Braithwaite, 2010). The benefits of utilising ICT in clinical facilities are distribution of patient data amongst clinical providers, the ability to communicate with clinical providers inside and outside a facility, a decrease in patient transfer costs, the establishment of quality clinical care and, lastly, reporting on disease investigation (Sheng *et al*., 2013). Creating opportunities for clinical providers to embark on new roles and, in turn, providing cares in an innovative manner provide evidence of the advantages of ICT (Westbrook & Braithwaite, 2010).

The time to view ICT as an enabler of these benefits is now. It should not just be viewed as a technical fix or a behavioural issue; it is both. Clinical professionals need to be included in the design and adapt phases of processes and behaviour in order to make an adoption work (Westbrook & Braithwaite, 2010).

2.6 Cost of ICT development

In order to encourage the usage of ICT in healthcare facilities, government has embarked on a programme called Hospital Infrastructures, Procurement of Necessary Equipment and Management Skills, which assists in equipping all public healthcare facilities with cutting-edge ICT tools. This was funded with a total of R1.9 billion as a take-up grant (Owolabi, Mhlongo & Evans, 2016).

In the 2014 budget for South Africa, it was stated that R19.3 billion was set aside in order to refurbish and purchase ICT tools and medical equipment. An additional R1.2 billion was assigned to vital equipment needed in 856 clinics, 66 medical hospitals and 17 specialised hospitals. In 2011 and 2012, the South African government assigned a total of R442 billion to the development of ICT in public healthcare facilities, and an additional R442 billion was assigned to all teaching healthcare facilities to acquire the needed ICT tools in each facility. In addition, the National Health Insurance allocated R125 billion in order to provide ICT

tools to public healthcare facilities from the year 2012 to 2020, and an additional R255 billion in 2025 would be spent for the same purpose. This totals to a growth of 7% in public health costs over 10 years (Owolabi *et al*., 2016). The Sebokeng Hospital in Gauteng

province designed a regional adoption of an EHR, costing government R120 million (Cline & Luiz, 2011).

It can be concluded that the government of South African has spent a huge amount of funding on healthcare infrastructure, as well as on the development of ICT tools, as this would assist citizens with improved healthcare facilities as stipulated in the Constitution (Owolabi *et al*., 2016).

2.7 Definitions of EHR

EHR is described as patient data that is kept in electronic format; the data is a build-up of a single or numerous meetings within medical care settings. It automates as well as streamlines medical work processes (Weeks, 2013). It displays patient data, collects and stores data, and delivers consistent and coherent medical care (Boonstra & Broekhuis, 2010).

According to Kamadjeu, Tapang and Moluh (2005), an EHR is an integrated electronic clinical record that combines information obtained and formed within the period of a patient's medical encounters (Kamadjeu *et al*., 2005). It also further allows the sharing of patient data with an added advantage that current or historic information is therefore made available for clinical professionals in order to make decisions regarding health outcomes (Katurura & Cilliers, 2018).

This historical and current patient information consists of demographic information, prescription reports, radiology results, updated development description and laboratory data (Khan, Shahid, Henström & Andersson, 2012). It adds to the current medical health of a patient, which is then used to acquire, collect, improve, connect and manipulate data in order to deliver quality healthcare services. Some of the functionalities are that it maintains result reporting, proof-based conclusion support and quality management (Weeks, 2013). It creates an approach to produce structured and legible records, in addition to obtaining medical data about an individual. Furthermore, it is intended to replace traditional forms of recordkeeping and ensures prompt availability of data to authorised users within the medical care chain (Boonstra & Broekhuis, 2010). The features of an EHR are rooted in the advantages that are described by researchers (Weeks, 2013).

One of the main reasons why healthcare facilities are adopting this form of patient data recordkeeping is to enhance the quality and productivity of healthcare practice (Khan *et al*., 2012). It improves healthcare security and services, as well as reduces cost (Weeks, 2013).

Through the adoption of an EHR, there is a decrease in clinical errors, as a patient's historical information is provided before any medical decisions are made. Physicians can get access to any patient healthcare records, regardless of where the individual is residing. This can be extremely useful, especially when an emergency has transpired (Khan *et al*., 2012). It provides a safe communication channel amongst physicians and patients, in addition to reducing the occurrence of negative incidents. As a result, it offers a satisfying experience for patients through efficient clinical processes (Tang, 2003). An EHR optimises the records of patients, improves the communication of patient information between medical physicians, and creates a data repository that can be used for research purposes. It has great prospects to enhance safety, security, quality and efficiency in clinical settings, and is being adopted across the globe (Boonstra & Broekhuis, 2010). Although EHR are being utilised by healthcare facilities around the globe, some facilities in South Africa, more specifically in the Western Cape, have still not adopted this form of data recordkeeping (Weeks, 2013).

Data legitimacy is related to the precision and accuracy of data and therefore is concerned with the comprehensiveness of the data. It ensures trust by providing reliable data and therefore is an imperative characteristic for EHR adoption to be achievable. It is essential that the data is accurate, legitimate and comprehensive. Data trustworthiness is not only important for medical care, but also for concluding and reporting the outcomes of studies. Data that is not accurate can lead to many issues and repercussions that can be life threatening while a patient is in a physician's medical care (Dinh, Kennedy, Perkins, Peterson, Warner & Washington, 2010).

An electronic health-readiness valuation must be conducted before the adoption takes place, as this will ensure that clinical employees are ready for change. A successful adoption depends on various aspects, such as change management processes and training of staff members (Ajami & Arab-Chadegani, 2013).

2.8 History of healthcare records

Every patient has a story, and one of the important qualities that describe an exceptional healthcare professional is how that story is documented through a health record. Each patient that requires medical assistance is allocated a file that holds their medical history; this file comes in the form of a record (McClanahan, 2012).

The term healthcare record or healthcare chart refers to the document that records a patient's medical history. This is done in order to understand the patient's symptoms and to provide a more accurate diagnosis. However, it does not only include the medical encounters the

patient endures, but also the lifestyle of the patient (Evans, 2016). Laboratory testing, as well as physical examination, is done to match and confirm the history of a particular patient. Each time a patient visits the examination room, information on the patient is added to the record. In doing so, it allows the healthcare professional to retrieve a patient's past medical information. This is especially useful when there are various healthcare professionals involved and the sharing of information is then made possible (McClanahan, 2012).

The utilisation of medical records first surfaced in the ancient Egyptian hieroglyphic inscriptions, as well as in papyri from the year 1 600 to 3 000 BC. The use of paper healthcare records was only introduced from 1900 (Evans, 2016). Documenting patient information became popular in the 1920s as healthcare professionals came to the conclusion that they were able to treat patients more successfully given an accurate patient medical past. Healthcare records were acknowledged as being critical essentials for a patient's wellbeing, as well as quality of life. These types of records were usually written by hand on paper and kept in storage facilities (Brooks, 2015) in addition, only a single copy of these folders was kept in storage (Evans, 2016). These records were kept on shelves that were specifically made to store these files. These paper records held patients' visit notes, previous and present diagnoses, laboratory results and the type of medication taken. They were categorised according to the patient's last name, identity number and some form of chart numbering system (Marquez, 2017).

Healthcare employees were able to scan patients' paper-based files and upload the documents onto a computer system. Healthcare professionals could retrieve the patients' medication intake, historical diagnoses and the surgeries the patients had undergone (Brooks, 2015). Previously, if a paper record needed to be retrieved elsewhere, it could be made possible through the use of a fax machine (Net Health, 2016). The faxing of records helped medical professionals to access records without enduring the long wait for a paper-based folder. There were some documents that could be found electronically, but these documents were only laboratory and radiology results. The delay in treatment was caused by waiting on patient files to be delivered by courier or faxed if the patient sought assistance from a different healthcare facility than the usual practice (Mitchell, 2018).

Time is often considered the important factor when it comes to diagnosing patients and, because of that, EHR became essential. By the 1990s, most healthcare professionals were using computers for recordkeeping in their offices, although this was done to a limited degree. Change became evident with the introduction of the internet and, even in its early

period, it became the instrument for transporting healthcare information. The accessibility of patient information is made more likely through data technology (Net Health, 2016).

The rise of technology came about in the 1960s and 1970s, and brought forward the development of EHR (Evans, 2016). To add to this, the death of patients and medical mistakes caused by medical professionals started the pursuit of a sustainable EHR by the year 2000 (Brooks, 2015). As the inaccuracies of the paper-based record became more evident (Evans, 2016), the need increased to convert paper-based healthcare records to EHR by 2004, and this was acknowledged through the creation of the Office National Coordinator of Health Information Technology (Marquez, 2017). This office assists healthcare professionals to improve decision-making concerning the care of a patient and, in turn, medical care mistakes are reduced (Brooks, 2015). The usage of EHR changed the medical world, as healthcare professionals were able to treat patients from any part of the globe (Evans, 2016). Presently, the EHR is a reliable tool that is used to maintain patient information and to support the patient-healthcare profession relationship (Marquez, 2017).

2.9 Integrated view of EHR

We are presently in the golden age of health care, as the amount of accessible information in order to sustain clinical care increases. The world is still not done with dealing with paper-based systems; however, there has been a huge change in the past ten years, as almost 90% of medical records are being digitalised in some countries (Coorevits *et al*., 2013).

EHR plays a crucial role in medical care in contemporary society. Accurate methods of patient recordkeeping are a critical part of clinical practice. When a patient's folder does not present all the right details (Stevenson *et al*., 2010), it is possible for a medical practitioner to accidently provide the incorrect prescription or diagnosis (Aldosari, 2017). It therefore is important to ensure that all these aspects are correct, as this will decrease the number of clinical errors made and increase the trust in health care (Stevenson *et al*., 2010).

EHR digitalises patients' medical care information in the form of an electronic record. This electronic record is thus circulated across a common platform that authorised users are able to access (Cline & Luiz, 2013). These electronic health records can be created, edited and managed by credited practitioners. The purpose of an EHR is to provide healthcare service within healthcare settings (Clark, Hasanain & Vallmuur, 2014). These digital patient records can hold laboratory results, billing information, immunisation status, radiological imaging, profile information, demographics and personal history (Cline & Luiz, 2013).

The objective of an EHR is to bring quality and secure services to health care. The change from the traditional form of recordkeeping to digital promotes prospects that can be employed for data recordkeeping (Stevenson *et al*., 2010). An improvement in recordkeeping within public clinical facilities promotes good-quality service; however, the change may give rise to a risk, as the data can end up in the incorrect user's ownership (Fichman, Kohli & Krishnan, 2011). An EHR adoption supports a communication platform, simplifies patient recordkeeping, and decreases the number of clinical tests that might have to be repeated (Silow-Carroll, Edwards & Rodin, 2012). It increases a practitioner's production and access to patient information (WHO Global Observatory for eHealth, 2012). Patients' past and present information is documented and captured in an electronic system (Weeks, 2014).

When patients visit a healthcare facility, it is time-consuming to locate a record, giving rise to long queues and individuals becoming irritated and discouraged. EHR reduces the extensive wait patients undergo, giving rise to higher production (Weeks, 2014). The use of an EHR has an affirmative impact on the management of medications. In addition, it decreases the loss of patient follow-ups and generates accurate and timely patient data (Blaya, Fraser & Holt, 2010).

Some of the negative aspects are that it is time-consuming to enter patient data (WHO, 2012). Despite the fact that there is existing confirmation that can enhance patient workflow processes within clinical care, the majority of practitioners continue to utilise manual processes inside medical settings (Cline & Luiz, 2013). In order to make use of an EHR, there are a few functions that are needed but are not present. Even though the EHR promotes structured data, these functions are needed to validate the comprehensiveness, precision and accuracy of the data (Coorevits *et al*., 2013).

Although there is great anticipation about and interest in EHR, its rate of adoption is slow and there are many adoption issues. These adoption issues are seen conflicting with doctors' customary way of working, and requires trained skills for working with a computer. The low rate of adoption suggests that resistance amongst physicians could be strong, as they would be the main users for EHR. Medical doctors have a huge impact on whether or not other healthcare users, such as nurses, pharmacist and administrative employees, support the use of EHR. Hence, they have the most influence on the adoption rate of EHR (Boonstra & Broekhuis, 2010). Focus should therefore be on equipping current healthcare staff with skills and knowledge that will support their work as well as enhance quality of care (Zeng, 2016).

2.10 Crucial components of an EHR

An EHR assists clinical providers to enhance the quality of medical care, and this is done by documenting patient data and at the same time increasing patient safety. The documented data is managed and shared with authorised clinical professionals, even if they are located in different areas of the globe (75Health, 2017). An integrated EHR allow data to be shared across a common platform. The figure below illustrates an integrated EHR for one patient encounter (Chara, 2011).

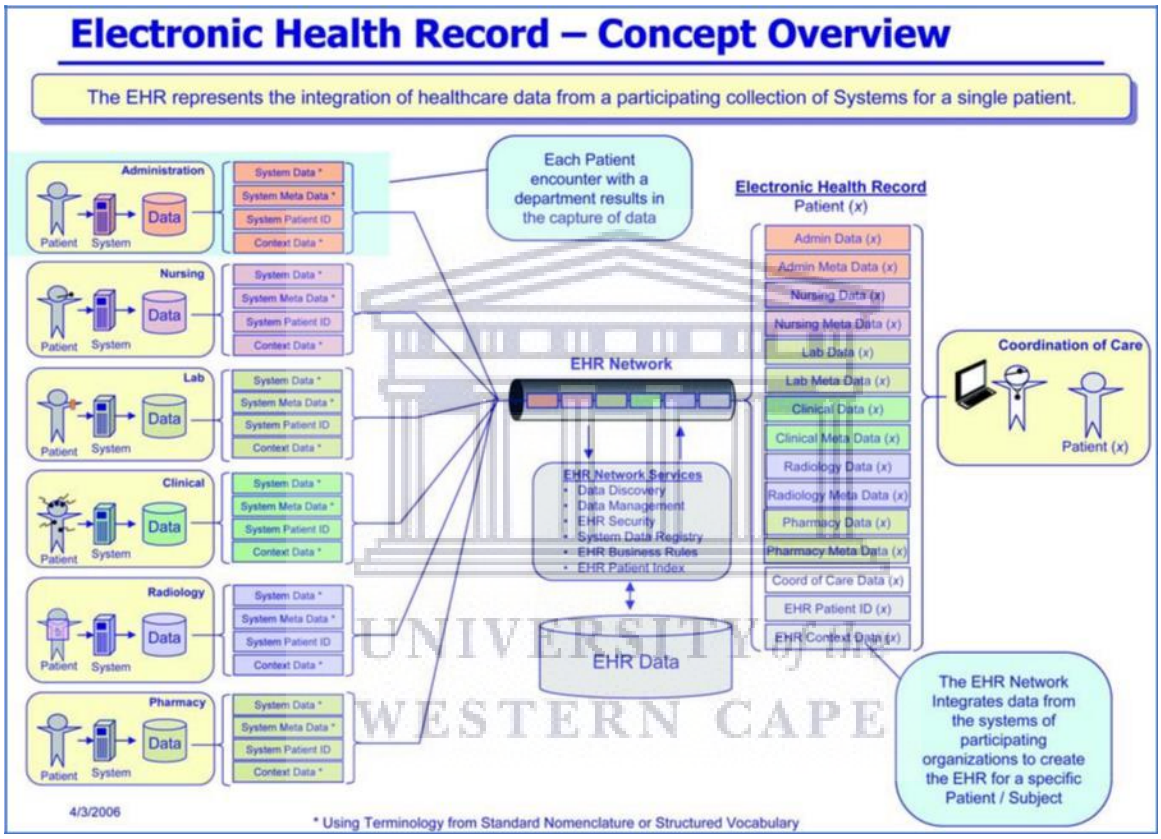


Figure 2.1: Components of an EHR (Chara, 2011).

An EHR is designed to combine patient information from various components as depicted in Figure 2.1. The number of integrated components is determined by the data structure and system adopted by the technical team (National Institutes of Health, 2006). These EHR components are explained below.

Administrative system

Each patient that is seen by a medical professional must have a medical record containing detailed personal data, for instance identification number, in order to be able to connect the patient to the correct record (Hicks, 2018).

The administrative system component is required for the functionality of patient registration and the release of a patient. Registration consists of patient information such as patient name, contact details, demographics, employer data, next of kin and so forth. When a patient is registered, the individual is given a unique identification number known as a medical record number (75Health, 2017). This unique number is unidentifiable outside a clinical facility and is used to link all medical tests, consultation notes, procedures and treatment to a particular patient (National Institutes of Health, 2006).

Laboratory system

The laboratory system component consists of recording patient results from laboratory tests (75Health, 2017). Usually, these systems are considered as standalone systems that interface with the EHR (National Institutes of Health, 2006). The goal is to deliver correct patient information to medical staff as efficiently as possible. Some of the main processes include, tracking of laboratory information, collect, archive, analyse and store laboratory data, and lastly, report test results for patient care (Association of Public Health Laboratories, 2017).

Radiology system

This type of system is used by the radiology department to gather a patient's radiology information and images; this may include patient scheduling, result reporting and image tracking (National Institutes of Health, 2006). The radiology system is typically used in conjunction with a picture-archiving communication system (Babić, Đinđić, Milošević & Stanković-Babić, 2012). This is useful, as it manages patient workflow, images, results and ordering procedures that need to be completed (75Health, 2017).

Pharmacy system

This system is used for storing and recording prescriptions that were used by the patient, as well as maintaining a drug formulary (75Health, 2017).

A clinical professional needs to be informed about the type of medication the patient previously used, as this could have an effect on the patient's health over time. This medication could be in the form of herbal medication, over-the-counter medication or even illegal drugs. Some medication when mixed together with certain remedies or drugs can worsen a patient's symptoms and cause harm. Therefore, providing all the correct information to clinical professionals is of greatest importance (Hicks, 2018).

Computerised physician order entry

A computerised physician order entry system allows medical professionals to order radiology, laboratory and pharmacy services electronically. It comprises a number of functionalities, from ancillary service ordering, results reporting and alerting (National Institutes of Health, 2006). Clinical professionals can also enter and send medication orders as well as treatment instructions and therefore is completed electronically (Rouse, 2018).

Clinical documentation

Every individual has a medical history, even if they have never been to a clinical facility before or never had their vaccinations done. A patient clinical history contains information such as diagnoses, allergies and clinical treatments. This informs providers about current illnesses – whether acute, chronic or seasonal, as well as the accompanying symptoms (Hicks, 2018).

A simple detail, such as overlooking a patient's allergy information, can be a serious problem when a patient is being treated. Clinical records that are current can save a patient's life in the event that he or she is unable to provide the missing medical history (Hicks, 2018). Examples of clinical documentation are providers' consultation notes, flow chats, chart tracking, release information, discharge summaries, appointment documentation and, lastly, power of attorney for medical care decision consent (National Institutes of Health, 2006).

Knowing what diagnoses have been made in the past, whether they worked or not, is important information for the clinical professional to have. This important information can save money and time in providing the correct diagnoses (Hicks, 2018).

Billing system

This includes all costs incurred while the patient was receiving medical care and can be captured by using a hospital billing system. In addition, all claims charged are submitted to insurance companies (75Health, 2017).

2.11 Benefits of using EHR within medical care facilities

Many researchers have studied the benefits of EHR adoption and what these benefits can bring to the healthcare sector. Some of these outcomes are organisational, medical and societal. Some medical outcomes are the quality enhancement of care and a decrease in clinical mistakes. Organisational outcomes are operational and financial performance.

Undertaking research that concludes in improving the health of society is referred to as societal outcomes (Menachemi & Collum, 2011).

Medical outcomes

The quality of medical care is described as being able to do the correct thing at the correct time in the correct way and also having the greatest potential outcomes. The quality of medical care includes the safety of patients, and the efficiency as well as effectiveness of clinical data recordkeeping (Menachemi & Collum, 2011).

EHR improves the patient flow in medical wards by streamlining clinical processes, which results in patients being discharged more rapidly. Since clinical processes regarding patient recordkeeping can be streamlined, health issues can be detected earlier, thus ensuring shorter staying periods and faster bed turnover. It also decreases the number of employees who are needed to perform paper-based processes; these staff members could be given new responsibilities (Silow-Carroll *et al*., 2012). The support of an EHR is required to transform clinical care that would progress patients' wellbeing. The progression of patients' wellbeing includes the enhancement of medical notes, reducing the duplication of prescriptions and laboratory testing and, lastly, the correctness of medication quantities (Hoyt & Yoshihashi, 2014).

Organisational outcomes

Through the utilisation of an EHR, clinical processes can be done swiftly and rapidly. Furthermore, it allows medical professionals to be able to increase their production output regarding the number of patients they consult on a daily basis. Compared to the traditional way of data recordkeeping, issues such as scribbled files can be avoided when ordering medication. It has a greater decision support system than the traditional format of recordkeeping, as it provides data that is associated with drug interactions and the required medicine (Hoyt & Yoshihashi, 2014).

Organisational outcomes include increased profits, avoided costs and intangible benefits such as improvement of legal compliance, ability to do research and job satisfaction amongst medical professionals. These increased profits stem from various sources, such as improvement in cash flows and reduction in billing mistakes. Costs incurred that can be avoided with EHR adoption are the accessibility of electronic patient data, reduction in medical employees that are used for patient management, and costs that are related to maintaining paper records and chart pulls (Menachemi & Collum, 2011). If a patient's

recommended medication is revoked, this would be done electronically, which would reflect immediately compared to if it should be done telephonically (Silow-Carroll *et al*., 2012).

Societal outcomes

Society can benefit from EHR adoption as some of these benefits are considered intangible (Hersh, 1995). These intangible benefits include conducting research that can be used as clinical information to enhance data quality and patient treatment as well as access to medical information (Gilia, Mistretta, Muriana, Piazza & Vizzini, 2017). Patients are more easily classifiable by clinical professionals through data provided, like gender, age of individual and symptoms of illnesses (Hersh, 1995).

EHR is not only considered as an innovative technology that could advance the healthcare sector, but also as one that could transform work processes within public clinical facilities around the Western Cape, South Africa. However, research shows that the adoption process has been slow due to high costs. Some clinical professionals still feel that this innovative technology will demote their production output and will make their work processes more complicated. Despite the opinions of some clinical employees, various authorities see it a key to improving daily functions within the healthcare sector. In order for the adoption process to be a success, authorised staff members need to be trained, and there has to be extensive planning, leadership and the support of clinical professionals (Hoyt & Yoshihashi, 2014).

2.12 Comparison of paper-based and EHR recordkeeping

EHR is a means of recordkeeping for healthcare, administrative and legal needs, which means that it is more than an electronic version of a paper document (Weeks, 2013). The following section provides a contrast between an EHR and a paper-based system.

Security of patient information

There are many advantages as well as disadvantages to paper and electronic systems. Firstly, computer hacking is not foreign in the digital world, which means that an unapproved individual could perhaps get access to private patient information. Computer viruses can lead to data being lost or damaged. With a paper system it can be demolished if a fire or natural disaster such as a flood takes place. The electronic format reduces the risk of losing valuable data permanently, as it can be backed up in various locations (Hamel, 2018).

Intricacy

Paper filing is considered less complicated to use than an EHR, as these files are kept in alphabetical order. It can get complicated for individuals who are not trained and lack computer skills to access a patient's information, as users require technical training in order to use the system. If the user is not trained well, important data can be damaged or deleted (Hamel, 2018).

Access time to data

Paper-based records are kept in storage rooms and can sometimes be disorganised, which could also add to retrieval time. These files can also be divided across several healthcare employees' offices, which could cause them to be unsystematic. EHR can be used by authorised healthcare staff members at any given time, as accessibility is a click of a button away (Hersh, 1995). Several healthcare professionals can obtain these electronic folders simultaneously. They can hold an enormous quantity of data as the information in a patient's document develops over the course of each medical visit (Johnston, 1998).

Cost

EHR reduces healthcare expenses far below the savings. It avoids wasting valuable resources such as tools and materials. These valuable resources could be misused due to repeated diagnostic testing, leading to a growth in expenditure. The savings earned from an EHR adoption are not recognised immediately. The majority of the savings would only be acknowledged after the adoption phase is a success, the associated procedures have been transformed and the reduction in resources has occurred (Hillestad, Bigelow, Bower, Girosi, Meili, Scoville & Taylor, 2005). Paper-based records are less costly when installed, however it could cost more as it takes up storage space over time (Coiear, 2015).

Editing and communication

Editing data that is in paper format might entail one having to rewrite the entire file and this could be time consuming. However, data that is in electronic format would be easier to edit and save, as the data is stored digitally (Hamel, 2018).

Legibility

Doctors have a reputation for not having the best handwriting, therefore it can be difficult to interpret, especially for those who are not familiar with certain medical language. With an EHR, the typeface is clearer and can be read by any healthcare professional. This is empirical, as it saves additional reading time when clinical professionals are trying to ensure

that what they are reading is the correct information when concluding medical treatments (Csiszar, 2018).

Storage facilities

The quality of an EHR is preserved without having an issue with deterioration of records. Since paper naturally deteriorates over time, this reduces the quality of traditional forms of recordkeeping (Csiszar, 2018).

2.13 Ethical, social and legal perspectives of protecting the confidentiality of patients' personal medical information

Over the past few years, the development of clinical information has allowed healthcare professionals to store their patients' data electronically. However, this raises concerns relating to the confidentiality of patients' private information (Barrows & Clayton, 1996). Confidentiality refers to the ability to safeguard patient medical information within an EHR as authorization is given based on their role privileges (Jayabalan, Kubbo & Rana, 2017).

The information confidentiality of patients has become a major issue regarding EHR. It is the trust amongst clinical employees and patients, as clinical employees are held accountable for safeguarding private data that patients share with them. Patients have the right to presume that the medical information about them is kept safe by the clinical professional. If there is a lack of reassurance relating to privacy, patients will be unwilling to provide the clinical professional with the correct information that is needed in order to make medical decisions (The Medical Protection Society, 2017). The aspect of privacy concerns remain to be unclear towards clinical staff as a result of prevailing breach thus lowering the trust of the technology (Rana, et al., 2017).

The purpose of an EHR is to provide clinical professionals with access to an integrated platform containing sensitive patient data. When the confidentiality precautions are not met, the potential for failure relating to keeping patient data safe is potentially high when being compared to an isolated EHR, and even with a paper system. However, with the accurate safety measures in place, an EHR can deliver greater confidentiality than a paper system. The problem is not with technology itself, but rather with not having the correct security policy in place. This type of policy stipulates what needs to be protected and to what degree, as well as the users who may have access to private patient data (Barrows & Clayton, 1996).

Password authentication is used to identify clinical employees who may have access to patient files as an indication of confidentiality. The authentication of passwords is not enough to ensure restriction of access. Additionally, approaches must be carried out in order to improve data privacy (Win, 2005). There are additional technological solutions that can be utilised to tighten privacy, such as fingerprint or voiceprint confirmation and passphrase encrypted smartcards. There are also certain safety measures that can be taken, such as encouraging routine audit trails in order to detect users who have access and who have viewed patient data, as well as activities on the system, for instance if information was deleted or added to the system (Barrows & Clayton, 1996).

Some of the privacy breaches that can be avoided are that the password on one's computer should be changed often and not allowing any one to use your password; if information is kept on pieces of paper, the pieces of paper must be disposed of immediately once the information has been documented in a file (The Medical Protection Society, 2017).

The constitution assures patients of the right to privacy, including the right not to have the privacy of their health consultations violated. Rule 13 of the South African Council's Ethical Guide instructs that clinical staff members can only reveal patient data without the individual's consent under certain circumstances, for instance if it was ordered by a court of law or if non-disclosure would serve as a threat to the wellbeing of the general public (The Medical Protection Society, 2017). The Protection of Personal Information Act stipulates that every clinical employee by law is required to protect the medical data of all patients as confidential and undisclosed. The National Healthcare Act not only compels clinical facilities to uphold healthcare records, but also to respect patient confidentiality (Anthony, 2014).

Patient files should not be left unattended where they can easily be accessed by individuals, in addition to patients who are knowledgeable about the depth of data that is being stored in these files (The Medical Protection Society, 2017). Clinical patients that do give consent for revealing personal data involving their health must be mindful about the amount of data that would be availed, should be informed about what is being availed, be well informed and capable to give consent and, lastly, provide consent that is free from compulsion (Rana, et al., 2017). Some of the common confidentiality attacks are done by people who have authorised access to patient data and take advantage of these privileges in favour of personal matters. Another way of addressing these confidentiality problems is to train users concerning precautions in addition to protection issues and personal responsibility (Barrows & Clayton, 1996).

2.14 Healthcare policies

Over the years, the South African Department of Health has undertaken numerous initiatives to enhance the healthcare system of the nation and has thus made major developments regarding legislation and policies (Health Systems Trust, 2017).

The Constitution guides the essential content of all laws and policies through the Bill of Rights. The Bill of Rights is referred to as a cornerstone of democracy and therefore regulates the content of health laws and policies within South Africa (Health & Democracy, 2010). Poverty is strongly related to poor health and illness, thus causing a lack of chances and hope to live a healthy life. Health care is a basic right; this means that health care should be available to and obtainable by all individuals (Jobson, 2015).

Sections 27 and 28 of the Constitution stipulate and grant individuals the right to use and receive health care, including reproductive health care. Furthermore, no individual should be declined and deprived of health treatment in an urgent, life-threatening situation. The right to receive healthcare service necessitates the stipulation of fair and equal access to basic precautionary, restorative, rehabilitative healthcare services and suitable cure for ill health, viruses, injuries sustained and disabilities, the prerequisite of necessary medication and care. Healthcare service, water, food, education and hygiene are essential elements required for excellent wellbeing (Jobson, 2015). Section 27 of the Constitution stipulates that government must protect the rights of patients by applying and developing a comprehensive legal framework. Government also promotes that individuals should be aware of their rights and creates the essential conditions for individuals to be able to access health care (Health & Democracy, 2010).

Creating these laws and policies means taking the necessary steps in order to make sure that the rights of patients are protected, promoted and fulfilled. In time, global access to quality health care will be accomplished; this will include the passing of laws by Parliament and the provincial legislatures (Health & Democracy, 2010).

2.15 E-readiness assessment

Several countries are determined to get some form of e-readiness measure, this should be completed before any adoption of an EHR take place (Mutula & Mostert, 2010). As a result, a suitable e-readiness assessment needs to be performed in the clinical sector to distinguish

opportunities and challenges to support technology within South African clinical facilities (Coleman & Coleman, 2013).

This is driven by the belief that, if there is a high level of e-readiness, this would empower countries to become inclusive global information societies in which individuals are able to create, share and receive information for their economic, cultural and social progress (Mutula & Mostert, 2010). Most South Africans utilise medical care that is funded by the government and, although a lot of funds have been invested in health care, the benefits are hard to attain. (Coleman & Coleman, 2013).

E-readiness assessment is the foundation on which technology investments are set out in healthcare facilities. Different assessment models are used in order to accomplish various objectives. E-readiness is defined as the degree to which a community is prepared to participate and thrive in electronic health adoption. Any form of innovation that is introduced into a community entails the community adapting to the change. The change requires to be assessed in order to evaluate the impact of and readiness for a new electronic health adoption (Coleman & Coleman, 2013).

An understanding of the e-readiness assessment of a country can be used for the purpose of providing the information needed in order to plan and compare across various regions. It can thus be used to gather information that could assist governments to plan technology integration strategies, as well as enhance components of e-readiness (Mutula & Mostert, 2010). South Africa is a developing country and, due to this, it suffers difficulties in adopting an EHR. Issues that government faces are cost associated, insufficient infrastructure, deficient technology skills, poorly formed strategies and so forth. Studies have brought to light that the concern in developing countries is not connected to the technology itself. It has to do with the daily integration, political affairs and societal aspects (Weeks, 2013).

Presently there are numerous e-readiness assessments that can be used in clinical facilities that evaluate certain dimensions (Coleman & Coleman, 2013). A recent study in South Africa by Kgasi and Kalema (2017) stipulated that there are five constructs of e-readiness assessments such as core readiness, societal readiness, acceptance and use readiness, structural readiness and engagement readiness (Beebeejaun & Chittoo, 2017).

2.16 Critical success factors in adopting EHR

The elements that make up a medical facility are the clinical staff members, technology and departments. All of these elements have to work together well so that a shared objective can be achieved (Wright & Yogeswaran, 2010).

Generally, if the productivity and production of a certain department is considered poor, this has a ripple effect in the rest of the facility. Therefore, in order to have a successful adoption process, the challenges concerning the process must be addressed. These challenges relating to EHR adoption should sometimes not be considered as a technology issue, but rather as a socio-technology problem. In order for the adoption process to be a success, users of the system should learn to adapt to the ways of incorporating technology into their everyday work processes (Wright & Yogeswaran, 2010). It is imperative that the aim of a new technology must be known to every individual who will be making use of the adopted system (Leonard, 2004).

Critical success factors (CSF) are described as factors that are needed in each aspect of a project in order to reach project success. These CSF are discussed below.

Medical initiative relation

The relationship between a clinical facility and an EHR must be clearly defined in order for adoption to be achieved. The information technology (IT) strategy or an EHR project must be aligned with the organisational strategy. This will influence the organisational strategy to influence IT (Wright & Yogeswaran, 2010) and will lead to an agreed-upon strategy for accomplishing the objectives of a healthcare facility (Kaye, Kokia, Shalev, Idar & Chinitz, 2010).

Clinical professionals' participation

The most CSF require the cooperation of all clinical professionals (Kaye *et al*., 2010). The user acceptance of an EHR can be a challenge, yet the involvement of clinical professionals in the strategy of a project and design of the system can lead to user acceptance. This allows the system to be tailored according to the needs of the users, and it also develops a sense of ownership among users (Wright & Yogeswaran, 2010).

Stakeholder participation

The participation and cooperation of all clinical professionals and stakeholders are established as CSF in the successful adoption of an EHR (Kaye *et al*., 2010). All stakeholders

need to be included in the EHR adoption process, and there should also be participation by top management so that the success can be maximised. It is imperative for the IT department and its support service to be included, as this will ensure that the system corresponds to the expectations of users (Wright & Yogeswaran, 2010).

Investment strategy

The funds assigned by government to a certain public healthcare facility should have a clear costing procedure in place. This will assist the sustainability as well as the accomplishment of the project (Wright & Yogeswaran, 2010).

Local vision

Expressing the goal of an EHR adoption will notify clinical professionals of the outcomes the system would like to achieve. As soon as clinical professionals are knowledgeable about the outcomes the system would like to achieve, they can address the issues they come across concerning the adoption (Wright & Yogeswaran, 2010).

Information management

The advantages of a system are dependent on the quality of data produced, and therefore the establishment of data quality must be addressed. Maximising data quality at all levels must be an active part of a project (Wright & Yogeswaran, 2010).

Organisational committee

A committee with a chief executive is compulsory for every successful project (Wright & Yogeswaran, 2010). This committee is defined as an executive body that makes decisions regarding a project and monitors the planned direction of a project team. An organisational committee is typically a group of stakeholders that consists of senior management and client representatives. These stakeholders are in a position to efficiently support and encourage the objectives of an organisation. They contribute towards recommendations relating to project methodologies and participate in the discussion of strategies and prospects for project development (Linman, 2011).

All required project changes need to be acknowledged and presented to a committee, which plays a big role in the design and direction of a project. Without such committee, the project will suffer from delivery that is not within the timeframe, an inadequate financial plan and badly defined deliverables (Linman, 2011).

Project management leadership

A project manager that has leadership skills is crucial and a prerequisite for the success of an EHR adoption (Wright & Yogeswaran, 2010). Project management is defined as overseeing and organising, in addition to adopting, a project (Bekker, 2015). However, a project is an undertaking that has particular beginning and end restrictions aimed at producing an outcome (Rouse, 2018).

The duty of a project manager is to guide all phases of a project, with the aim to deliver the project within the correct time frame and financial plan (Rouse, 2018). He or she leads a group of individuals who are assigned to a project towards a shared objective (Bekker, 2015). The adoption of controls is important to measure and evaluate the project performance against the planned financial strategy, goals and time frame. This is necessary to estimate any potential issues that could arise and, at the same time, to find solutions to these issues in order to keep the project on schedule (Rouse, 2018).

Human resources

If there is a shortage of information management technology, employees and expertise, this will have an influence on the project-adoption plan. If new staff join or others leave a clinical facility, there should be a practice in place whereby clinical staff are trained on the upcoming prospects. Developing a culture within a facility that promotes the sharing of knowledge amongst staff members will ensure that the clinical organisational knowledge is adequate all the time (Wright & Yogeswaran, 2010).

Change management

In order for change to take place successfully within a healthcare facility, there must be a clearly defined strategy and processes that are put in place for change management (Wright Yogeswaran, 2010). Change management is described as an approach to deal with the transformation of a facility's objectives, purpose, technology and processes (Rouse, 2018).

It is important to have various strategies planned to get the desired change that is required among clinical employees and facilities (Wright & Yogeswaran, 2010). The goal of these planned strategies is to control change within facilities and to support clinical staff to be able to adapt to the change. The process of change management must consider how change will have an impact on clinical processes and on staff members (Rouse, 2018).

Technical infrastructure

An organisation such as a clinical facility must have a detailed understanding of all the aspects that go into EHR adoption, such as the different types of IT systems and costs. Due to the expansion of software and hardware, added costs will be incurred for healthcare facilities. Healthcare facilities would need to have the capacity to cope as part of the future development of IT systems (Wright & Yogeswaran, 2010).

2.17 Transformation from paper record to an EHR

Healthcare facilities are faced with issues concerning transformation from traditional recordkeeping to an EHR whilst managing patient information and making it available when required. Medical files are a key aspect of the healthcare sector, and therefore entail a necessary change regarding clinical procedures. It is a complex transformation, as there has to be a shift in the way medical practitioners perform their day-to-day duties. The traditional practices has become embedded in clinical practitioners' way of thinking. To be able to move closer to the shift, users should understand the reason for wanting to make use of an EHR (Weeks, 2013).

Radiological records are filed separately and thus the transformation would be a time-consuming process. The strategic process entails that the problems concerning the traditional system are brought to light, as well as the establishment of changing to an EHR. In order to achieve stability of medical care, it is important to gain access to records that are consistent and integrated. In order for EHR adoption to be successful, a change plan needs to be put into place (Weeks, 2013).

The change can be achieved by managing complex decisions, consisting of the choice of system and adoption plan. Unsuccessful adoptions are due to not assessing healthcare processes and not putting the correct strategies in place, which leads to going back to traditional methods. For a successful adoption in medical care practice, the elements have to be coordinated carefully. Medical practitioners should be educated on aspects of data comprehensiveness and specific employees should be appointed to manage the data (Dinh *et al*., 2018).

The transformation process entails checking up on each phase of the change. Quality check-ups are important, as they ensure that the patient data captured in the electronic system is correct and corresponds to the paper folder. The change team should consist of all medical practitioners and IT (information technology) staff. IT staff have to know the medical care

requirements in order to create an electronic system and alter the data to accommodate the medical practice (Dinh *et al*., 2018). According to Weeks (2013), an integrated and structured phase approach should be encouraged in order to manage the transformation. During this phase, the new system is introduced and executed gradually, allowing for users to become accustomed to the functionalities of the EHR (Rouse, 2018). Once the change has been completed and the data transformation was done successfully, a strategy should be put in place on how the paper patient records will be destroyed (Dinh *et al*., 2018).

Today, medical care facilities in the Western Cape are still making use of the traditional form of patient recordkeeping. Certain clinical practitioners document their patient's consultation on pen and paper however, at a later stage transfer the updated data into electronic format. Most practitioners are comfortable with a paper-based system and only make use of an EHR when needed. This development has not gone unnoticed by the Western Cape Department of Health (Weeks, 2013).

Part 1: Factors that hinder the acceptance of an EHR by healthcare professionals

2.18 Current status of recordkeeping of patient data within healthcare facilities

It is still common to see clinical staff wheeling patient files in carts through the corridors of clinical facilities in the Western Cape as a result of complacency with the way patient recordkeeping is executed (Weeks, 2014). Medical visits can be a long process for most patients who attend public healthcare facilities across South Africa (Egbujie, Grimwood, Mothibi-Wabafor, Fatti, Tshabalala, Allie, Vilakazi & Oyebanji, 2018). The time that patients spend in a waiting room can therefore be viewed to a healthcare experience (Oostrom, Einav & Finkelstein, 2017). As a result, there is a connection between waiting time and patient satisfaction within clinical settings (Egbujie *et al*., 2018).

The World Health Organization has indicated that developing countries have a high usage of paper records and a low transformation to an EHR. The low transformation to an EHR is because of the absence of understanding and addressing issues regarding the delivery of clinical services in underprivileged surroundings (Sikhondze & Erasmus, 2016). A concern is that working with a paper system will not only lower the quality of service, but also will give rise to information that is not accurate enough for valuable assessment in the treatment of

patients. Where paper systems are used continuously, scanned image technology is frequently used for the electronic transfer of information when needed (Weeks, 2014).
Even though an EHR provides a platform that is used to produce services that are efficient, these technologies that are adopted within healthcare facilities are not the same. South Africa had more than 40 independent EHR, which are dispersed throughout the country, and, in addition, 25% of the 40 independent EHR could not share patient data within the facility or with other facilities (Katuu, 2016).

Some of the issues that lie in healthcare facilities, more especially with the medical record department, are that there are clinical employees, but there is very little equipment available such as scanners and so forth (Ohuabunwa *et al*., 2016). In some of the developing countries, patients do not have access to medical facilities because of challenges such as a lack of clinical professionals, insufficient healthcare facilities and the high charges for medical consultation. Therefore, an EHR would assist patients who have minimal access to medical services. It would transform the way information is being managed and, in doing so, it would provide efficient medical management (Ahlan & Ahmad, 2014). Technology plays an important role in the advancement of the delivery of care services; however, this can be expensive (Matsoso & Fryatt, 2013).

In the Western Cape, there have been numerous issues due to low bandwidth, the computer knowledge levels of clinical staff, and the motivation to utilise the electronic system properly. Due to some resistance from clinical staff members to utilising EHR, certain healthcare facilities have preferred to continue the traditional way of patient recordkeeping (Ohuabunwa *et al*., 2016).

It is essential to make sure that authorised users comprehend the reasoning behind the adoption from the start, in addition to the clinical tasks that would be automated (Cline & Luiz, 2013). The quality of patient recordkeeping ought to be enhanced and efforts need to be focused on speeding up the adoption of EHR. In doing so, it will allow for the sharing of patient data across a common platform, providing security and privacy in terms of personal healthcare data, as well as being able to rapidly identify healthcare threats, thus minimising human error (Agno & Guo, 2013).

2.19 Barriers to adopting an EHR

The Western Cape is faced with challenges regarding the adoption of EHR as there is urgent patient data needed by healthcare professionals that is not often provided (Weeks, 2014).

Challenges to EHR adoption are due to the lack of computer literacy skills amongst healthcare professionals, minimal internet skills, fear of technology and minimal health literacy (Archer, Fevrier-Thomas, Lokker, McKibbon & Straus, 2011). There is an urgent need for medical professionals to upskill their education in terms of computer literacy skills. Skilled resources remain a challenge in the improvement of the healthcare system in the Western Cape (Weeks, 2014).

Some of the problems that are discussed by Weeks (2013) regarding the utilisation of an EHR are the data entry of patients. Although the advantages are evident, according to physicians it is an interruption when information needs to be entered into the system while consulting with a patient. According to the physicians, paper records are easier to utilise when working with patients. They are more uncertain about adopting any form of digital system that could affect the time needed when consulting with a patient (Weeks, 2013).

The utilisation of an EHR may lead to privacy concerns, as important patient data is kept electronically. Medical professionals are concerned that the EHR may not be secure enough to store patient data and therefore fear that the data could be accessed by the wrong individuals (Boonstra & Broekhuis, 2010). The main worry is the loss of physical communication with patients due to the interaction with an electronic system. Resistance to transformation is a significant challenge that should be resolved and thus requires a change management approach (Weeks, 2013).

Due to the lack of computer literacy skills and support, healthcare professionals have been prevented from utilising any forms of technology. The utilisation of computers in developing countries has been limited because of the inadequate skills to navigate computers (Owolabi *et al*., 2016). The factor that delays the adoption process is not the technology aspect, but rather the human participation feature. The technology factor includes the availability of computers during patient care, and system reliability. The human resource factor is a complex problem that deals with individuals' culture (Weeks, 2013). Even though technology is accessible in certain healthcare facilities, there are still many South African clinical professionals who are not capable of using them. A total of 45% of South African clinical physicians lack the skills needed to operate computers, 42% stated that they have average skills to work with a computer, and 12% proclaimed that they had the skills to use computers (Owolabi *et al*., 2016).

To enhance the quality of medical data that can be accessed by clinical professionals, it is imperative that these clinical professionals obtain the appropriate computer skills in order to obtain patient information. This will lead to the training of healthcare professionals to operate computers and access patient information that relates to clinical practice (Owolabi *et al*., 2016). The EHR would be more challenging to use than paper-based systems if the users are not trained correctly (Ajami & Arab-Chadegani, 2013).

2.20 Clinical access to EHR

A patient's medical history is considered private information and, for this reason, access to a patient's information is restricted (Barrows & Clayton, 1996). The development of technology has raised privacy issues relating to patient records (Fernández-Alemán, Señor, Lozoya & Toval, 2013).

Due to the sensitivity of medical data it is imperative to protect patient records (Barrows & Clayton, 1996), as it can cause psychological, social damage, loss of employment or stigmatization to an individual should these be revealed (Horwitch , Sulmasy & López, 2017).

The three fundamental privacy goals are integrity, availability and, lastly, confidentiality. Confidentiality is defined as the procedure that ensures patient data is accessed only by those who have permission to do so. Integrity ensures that the data is correct and is not amended in an unauthorised manner. This protects a patient's information and safety. Availability refers to the accessibility of data when needed by an authorised clinical professional. The availability of clinical data is an essential key to effective delivery of care (Fernández-Alemán *et al*., 2013). Access control in EHR enforces full trust on the clinical professionals, as access policies are put in place (Li, Yu, Ren & Lou, 2010).

A clinical facility and professionals need to gain permission to view a patient's health record because of the confidentiality of patient information. Clinical professionals who are given permission to view a patient's record are given this based on the role they serve for the patient. Each clinical professional is made aware of the responsibility that they hold regarding being discreet about what they view in each record. Evaluating whether clinical professionals should have the right to view a patient's record is therefore an imperative security feature of an EHR (Ozair, Jamshed, Sharma & Aggarwal, 2015). These authorised healthcare providers range from nurses, healthcare students, social workers, physicians, dieticians, therapists and those who are constantly involved in a patient's care (HealthChampion, 2019).

An EHR provides consent to a patient to revoke access by a clinical staff member to a medical record. It also allows clinical professionals the capability to delegate admission. A patient record comprises various areas and the access policies to these areas are determined by the nature of the information stored in these files. Some patients would only want a physician to view the record and no other clinical staff if not required (Narayan, Gagné & Safavi-Naini, 2010).

The patient is seen as an active partner in the management of his or her personal data and thus patient integration is used to support the quality of care. The patient therefore plays a prominent role that can be used for a successful future adoption of an EHR. Besides the facility and clinical professional-related requirements, the patient's needs have to be taken into consideration. The acceptance by patients of an EHR adoption is crucial for the future success of an EHR. Should any issues arise due to adoption, it is mandatory to resolve these issues whilst in the early stages (Hoerbst, Kohl, Knaup & Ammenwerth, 2010).

2.21 Reasons why healthcare facilities resist the adoption of EHR

Even though we are living in a digital world, medical practitioners are still comfortable using the pen and paper technique as they find working with an electronic system somewhat of an unpleasant experience (WHO, 2006). In order to ensure patient security and records that are of a high quality, it is important to have information that is accurate. Healthcare practitioners should view EHR as a positive development towards the future of health care; if not, chances are that users would be unresponsive to the transformation (Stevenson *et al*., 2010).

Given the conditions that are present in developing countries, the change to EHR are limited due to the high usage of paper records, thus giving rise to a low transformation to EHR. There are issues and barriers that surround the delivery of medical care, which contributes to the limited adoption of an EHR in the Western Cape (Sikhondze & Erasmus, 2016).

Computer literacy issues

Medical practitioners consult with patients daily and it is time consuming to consult with every patient who seeks medical care. Even though the benefits of an EHR are evident, medical practitioners do not have the free time to understand the system's functionalities or even to go on training courses in order to understand how to navigate the system (WHO, 2006).

It takes skill and focus to be able to attend to a patient's medical problem and determine a diagnosis whilst writing a prescription, and to have typing skills that are not generally found in most skilled computer users. EHR can become complicated to operate and requires a certain amount of computer skills from medical practitioners, and at times this is still miscalculated by the EHR vendors (WHO, 2006). Some healthcare professionals are immune to the way data recordkeeping is being conducted and rather do not upskill themselves (Weeks, 2013).

A prerequisite for interacting with an EHR is that an authorised individual should have good typing skills, yet some medical professionals do not possess them. Not putting in the effort to attend these computer training courses could develop into an issue, as practitioners need to be driven and to be able to overcome their lack of enthusiasm. The successful adoption of an EHR depends on the computer skills of medical practitioners. Although people use the internet, some individuals are still not fully equipped to operate an electronic system, as they do not make use of computers at their place of work or even at home (WHO, 2006). The minimal utilisation of EHR could also be based on the absence of available computers, thus influencing the practice of EHR (Ajami & Bagheri-Tadi, 2013).

A multipurpose community centre is perceived to be a public place where individuals are able to get admission to computers, digital technologies and the internet. These centres equip individuals with the tools needed to communicate with others and, in turn, to develop the necessary skills. They offer diverse user groups an extensive variety of services for business, education, farm practices and so forth. They are located in underprivileged communities and shared by local residents. The prospects that are presented include the sharing of information, improving literacy and decreasing the societal isolation that is experienced in rural areas. These centres are faced with many challenges, especially in developing countries, which are hindered by an absence of technology skills, financial constraints and poor infrastructure (Mutula & Mostert, 2010).

Cultural issues

A study by Cline and Luiz (2013) discovered that culture would be one of the obstacles to EHR adoption. It was stated that 77% of clinical facilities that do not utilise EHR are opposed to it, 72% of medical practitioners are worried that the system will bring recurrent downtime, 64% of practitioners believe that it would give rise to an increase in work time, and 60% are concerned about their lack of computer literacy skills (Cline & Luiz, 2013).

If the values and viewpoints of healthcare professionals differ from what is needed for EHR adoption, a cultural transformation is required. Changing the culture of a medical care facility would be the most difficult element to break through, as people are content and familiar with the way current processes are being performed. Individuals will refuse this cultural change, even though the substitute option is best. EHR adoption is not only about the technology aspect; it is about the acceptance of change, which is essential in order to allow the usage of an EHR in everyday practice. A cultural change is considered the most essential part of an EHR adoption process and should not be disregarded (Weeks, 2013).

Privacy issues

The transformation from a paper to an electronic record format could disclose private data to hackers, which is one of the reasons why healthcare practitioners could not favour the change. Healthcare facilities that still make use of paper records claim that it is a safer option, since it limits the number of authorised users viewing the patient records at a time. Data privacy, security, storage and confidentiality are main concerns when it comes to EHR adoption (Meingast, Roosta & Sastry, 2006).

South Africa is considered to have minimal experience with healthcare systems and hence has limited privacy controls in place to ensure patient privacy. The legislative environmental structure of South Africa is always changing and developing, and therefore the country has adopted the Protection of Personal Information Act (PoPI) of 2013 (Els & Cilliers, 2018). This act alleviates the privacy concerns when gathering clinical data, but even so, the PoPI is not sufficient for the healthcare environment. The protection of patient information is an on-going issue, as technology continuously gives rise to issues of the confidentiality of clinical information (Els & Cilliers, 2018).

Resistance to change

Resistance to change is the main contributor towards technology failure. Resistance to change may affect technology usage however, the absence of resistance to change does not necessarily increase technology usage (Samhan, 2017). The problem of resistance to technology needs to be resolved in order for the adoption of an electronic system to take place, as this issue will affect presenting an EHR in healthcare facilities. The idea of capturing patients' clinical data electronically could potentially be daunting for some medical practitioners. In order for medical practitioners to feel comfortable to use and accept the new technology, training therefore is important. With the right strategy prepared, resistance to

transformation can be overcome, despite the fact that it would not be an easy task (WHO, 2006).

Resistance can be due to the clinical professional's preference to stay with the current way of conducting processes (Samhan, 2017). Current technologies, such as wireless devices, personal computers and mobile telephones that have information-capturing abilities, are starting to present solutions to these issues. At times, the issue of resistance does not relate to technology but rather to low computer-literacy skills. These problems must be dealt with once the adoption process has been put in place. Providing a computer training course for medical care practitioners will assist in improving these issues (WHO, 2006).

Part 2: Factors that cause restrictions towards an EHR adoption according to healthcare professionals

2.22 EHR within healthcare facilities

The adoption of an EHR has become popular in countries that are classified as poor area settings. Systems such as OpenMRS are being utilised in over 15 countries throughout Africa (Were & Meslin, 2011). The hospitals listed below indicates the internet and telemedicine capabilities within an EHR adoption.

Nessie Knight Hospital in South Africa has internet capabilities as well as telemedicine equipment. However, the hospital has a shortage of computers. This could diminish any EHR benefits that could be offered. The technology capabilities of St. Lucy's Hospital are a slightly improved, but still viewed as inadequate and insufficient. The hospital owns a few workable computers and has untrustworthy telephone services (Ruxwana *et al*., 2010).

Madzikane Ka-Zulu Hospital situated in South Africa has a large supply of ICT that is made available for healthcare professionals, including computers, a local area network (LAN), computerised radiology systems, telemedicine and even printers. These ICT services were only distributed to and obtained by certain departments within the medical facility, and thus only a few could benefit from them. Due to the absence of technical support and maintenance, this acted as a barrier to the effective use of EHR (Ruxwana *et al*., 2010).

The Nelson Mandela Hospital situated in South Africa has a large selection of telemedicine equipment. The hospital has also adopted an administrative system used for patient data as

part of its technology solutions. However, some departments within the hospital are not computerised and therefore minimise the realisation of EHR benefits (Ruxwana *et al*., 2010).

Many nations have eliminated isolated pilot projects and have gone with adopting EHR, which has thus become part of the country's national health strategy (Were & Meslin, 2011). EHR is most effective in human health development when it is incorporated within the national health strategies and plans of a country (Hamel, 2010). Often these health strategies required a large amount of the country's health funding in order for the adoption and maintenance of these systems to take effect. Therefore, these expenses come at the cost of other healthcare priorities. Millions of dollars in expenses are disbursed by organisations and governments in support of adopting EHR in poor locations. In the future, these expenses disbursed for the adoption of EHR will only increase in these locations (Were & Meslin, 2011).

2.23 Supporting ICT infrastructure

The ICT infrastructure of South Africa needs much improvement to be able not only to transport information across the nation, but also to produce a successful technology solution such as an EHR. There are healthcare facilities situated in rural areas that have minimal access to technology resources, which is seen as a major obstacle to adopting any form of ICT solutions (Ruxwana *et al*., 2010).

Looking at internet infrastructure, South Africa has fixed lines as well as broadband services. Even though South Africa has spent a fortune on investing in ICT infrastructure, the country is still faced with numerous issues. These issues pertain to users being unhappy about the services that are being received by using the internet. These bad internet services discourage users from making use of these facilities that are intended to improve service delivery. A total of 45% of South Africans live in rural communities, where the infrastructure is not as developed as in the urban communities and computer usage is very low (Mutula & Mostert, 2010). Within healthcare, due to the absence of an electrical infrastructure, this could increase clinical admissions, medical related complications as well as death rates (Gehringer, Rode & Schomaker, 2018).

During the year 2008, South Africa experienced a deficit in the electricity supply. Without access to adequate and dependable energy, social as well as development activities were constrained (Mutula & Mostert, 2010). Power cuts can be catastrophic in any clinical environment. Due to the power outage lasting up to 2 hours a day, healthcare facilities mortality has been estimated to increase by 43%. Today, Eskom is the main source provider

of electricity in South Africa and has not been able to meet the electrical demands. While South Africa has a strained healthcare system, secondary and tertiary public healthcare facilities appear to be well equipped with generators, however, primary healthcare facilities are not. It is reported that it could cost on average of R800 000 a month in order to run generators within a healthcare facility (Laher, 2019). The government of South Africa is making changes by investing in policies, poverty alleviation programmes and infrastructure development as a means to keep up with universal trends to better the service delivery to citizens. Even though these efforts are emphasised, the concern about bad service delivery to citizens remains an issue (Mutula & Mostert, 2010).

Healthcare facilities, especially in developing countries, have infrastructure that is poor, leading to broadband connectivity that is of a poor quality and in turn has consequences when practitioners consult with their patients, as the speed of the system could be sluggish (Ajami & Bagheri-Tadi, 2013). The South African government has embarked on a number of projects to construct numerous broadband fibre optic cables. These advances are projected to deliver bandwidth at reasonable prices that would inspire bulk discounts and bandwidth growth in South Africa (Mutula & Mostert, 2010).

2.24 Challenges of ICT access in healthcare facilities

There are many challenges relating to the usage of and access to ICT within medical facilities in developing countries such as South Africa. These challenges are explained below.

Low bandwidth

Bandwidth is one of the concerning issues facing the usage and admission of ICT in medical facilities in South Africa. There is an uneven distribution of available bandwidth and sometimes a complete lack of bandwidth (Owolabi *et al*., 2016).

The National Integrated ICT Policy of 2014 specifies that, the lack of an essential speed of bandwidth will have an effect on the healthcare delivery of South Africa. Telkom, which is the leading broadband supplier in South Africa, has identified numerous issues that influence the broadband strategy planning; these include geographical factors, demographics, low bandwidth speed, coverage as well as affordability (Owolabi *et al*., 2016).

In developing countries such as South Africa, and particular the Western Cape region of the country, there are issues such as inadequate implementation of broadband. There are some medical care institutions that have financial problems that are associated with to the adoption

of broadband. The broadband speed is sometimes insufficient to navigate through the clinical functions on the system. These functions include when medical practitioners have to transfer diagnostic images during the course of the day, when facilities are at their peak in terms of patients who visit these healthcare facilities (Gabriel, Jones, Samy & King, 2014).

Insufficient ICT funding

EHR is a crucial component of the healthcare sector; however, there are some areas around the Western Cape that have poor infrastructure for a deployment of this kind. Previous initiatives have not gone to complete adoption due to poor planning, in addition to the absence of financial support (Weeks, 2014), which is driven by high costs, poor initial medical practitioner acceptance, absence of any real incentives and data entry errors (Evans, 2016). The essential key that allows access and usage of ICT within clinical delivery is finance, yet there is inadequate spending on ICT in most developing countries. The limited financial resources being invested in ICT tools have an effect on ICT access in healthcare (Owolabi *et al*., 2016).

An audit assessment of ICT has revealed disparities in the treatment of ICT as a strategic enabler for healthcare service delivery within South Africa. The inconsistency in investment allocation as per province for health care is reflected as R188.3 million for Gauteng, R178.6 million for Limpopo and R105 million for KwaZulu-Natal. In normal terms, R15 million was allocated to the North West province, R20.4 million was distributed to the Northern Cape, and R32 million was assigned to the Free State province. This indicates that there is uneven allocation of investment spending concerning ICT in healthcare delivery. The key element for the access to and usage of ICT for healthcare delivery is investment, and therefore some medical care facilities would find themselves at a disadvantage (Owolabi *et al*., 2016).

The financial obstacles are the monetary problems relating to the adoption of EHR (Boonstra & Broekhuis, 2010). The products of an EHR are pricey and require major investments. One of the critical problems in the adoption process is that there could be a mismatch between financial compensation and costs (Ajami & Arab-Chadegani, 2013). These costs consist of start-up costs and ongoing costs. The start-up costs are all the costs incurred in order for the system to function in a medical care practitioner's office, such as the installation costs, contracting costs, and buying of the hardware and software. Many researchers believe that all these costs are substantial and should be considered as high barriers to adopting EHR. Ongoing costs are related to long-term costs that are incurred in order to upgrade, modify and maintain an EHR (Boonstra & Broekhuis, 2010). These costs arise because, in time, the

software will become outdated, software vendors could go out of business, automated process issues and programming errors arise, the capturing of data that is invalid, and that the computer crashes when it is needed (Ajami & Arab-Chadegani, 2013).

2.25 Challenges government faces within the healthcare sector

The cost of new technologies is high and, because of these high costs, the government of South Africa is not able to offer access to healthcare systems for its population. Due to this, the usage is either minimised or is not adopted at all. The higher the cost of new technologies, the more challenging it becomes to offer quality healthcare to the population (Biermann, 2006).

In South Africa there are 4 200 healthcare facilities that offer medical care to an average of 13 718 individuals each (Jobson, 2015), which consist of 75% of the population access medical care through the public system (Neely & Ponshunmugam, 2019). This shocking number of individuals per healthcare facility goes beyond the World Health Organization recommendation of 10 000 patient allocated to each facility (Jobson, 2015). These residence are made up of individuals who have limited access to education as well as high unemployment rates (Neely & Ponshunmugam, 2019). There is a shortage of medical professionals within the public sector of South Africa. At present, there are 165 371 skilled medical professionals in the public and private sector according to the Health Professions Council of South Africa, with 38 236 being doctors and 5 560 dentists. It is projected that 4 219 patients are allocated to one doctor within the public sector, when compared to private doctors who have 243 patients each (Jobson, 2015).

Each year 1 200 students complete medical school and are assigned to short-staffed healthcare facilities. In the year 2012, the National Health Facilities Baseline Audit found that there were 3 356 healthcare facilities with facility management present. However, 50% of these facilities had no form of visiting doctors, 84% had no assistance from a pharmacist and, lastly, 57% had no administrative supporting practice in place. South African's clinical overheads amount to R122.4 billion annually, servicing only 84% of individuals (Jobson, 2015).

The rural areas in South Africa are considered the most deprived and overlooked when compared to urban areas. In 2001, seven out of the 10 underprivileged municipalities were in the Eastern Cape (Grut, Mji, Braathen & Ingstad, 2012). The public healthcare sector of South Africa continuously provides service to patients that is inefficient and has an

inadequate level of quality in some healthcare facilities and, lastly, also poor infrastructure (Jobson, 2015).

2.26 Lessons learnt

Over the past few years, the South African government has recognised the significance of an EHR and improving the quality of services for patients. Therefore, investments in ICT infrastructure have grown progressively. In order for South Africa and, more specifically, the Western Cape to gain the advantages of EHR, technology must be accepted and used within healthcare facilities (Mutula & Mostert, 2010). This study investigates the acceptance and potential use of an EHR towards adoption by healthcare professionals.

E-readiness assessments can be used as an information-gathering guide in order to support government when proposing strategies for EHR adoption or enhancement (Harris, Goudge, Ataguba, McIntyre, Nxumalo, Jikwana & Chersich, 2011). Technology has the potential to relieve poverty and uplift the socio-economic standards of individuals. When utilised in the correct way, it can empower individuals to overcome social issues and improve democratic institutions (Mutula & Mostert, 2010).

Numerous initiatives on policy, regulatory framework as well as ICT infrastructure are embarked on by government and fall within efforts to improve services provided to citizens. Even though a large amount of funding has been dedicated to improving policy, ICT infrastructure and the regulatory framework, the nation still faces numerous challenges. However, the issue of bad service delivery continues to be voiced. These challenges include poor service delivery to patients, shortage of literacy skills amongst clinical professionals, bad internet connections, which discourage individuals from utilising these facilities that are intended to promote the delivery of services Mutula & Mostert, 2010).

Almost a billion individuals situated in low- to middle-income countries are not able to access the necessary medical services as they are too expensive. South Africa's healthcare policies indicate that medical services for all citizens are constitutionally enshrined; however, significant inequalities still remain due to the uneven distribution of resources. As a result, access provides freedom to utilise healthcare services, including the ability to exercise choice within the healthcare system. The right to receive healthcare access should be recognised and understood by the general public so that those who require it are able to get access it, irrespective of location, finances or who the patient might be (Harris *et al*., 2011).

2.27 Conceptual framework

Unified theory of acceptance and use of technology (UTAUT)

EHR has the ability to resolve many issues regarding patient recordkeeping; nevertheless, the adoption of new practices into daily routines is often considered problematic (Cresswell, Worth & Sheikh, 2012). UTAUT will be used to explain the acceptance and use of technology.

The theory explains four central constructs: performance expectancy, social influence, effort expectancy and facilitating conditions, as determinants of IT acceptance and usage (Cohen, Bancilhon & Jones, 2013). Performance expectancy is when an individual believes that, by utilising a system, major rewards will be gained. Effort expectancy is described as the ease of use related to a particular system. Social influence is when an individual believes that society determines whether or not to make use of a system. Lastly, facilitating conditions are when a person believes that an organisation's infrastructure is supportive of a particular system (Venkatesh *et al*., 2011).

The model integrates factors such as experience, age and gender, as well as voluntariness of use as significant in explaining acceptance (Cohen *et al*., 2013). It is further explained that these four central constructs are influenced by the behavioural intention to make use of a technology, and therefore the behavioural intention as well as the facilitating conditions are determined by technology usage (Venkatesh, Thong & Xu, 2016). Performance expectancy is moderated by age and gender whereas effort expectancy is moderated by gender, age and experiences. Social influence are moderated by age, gender, voluntariness and experience whereas facilitating conditions is moderated by age and experience (Venkatesh, et al., 2003).

The reason for selecting this framework was because it applies to end users and is used to understand the human elements that is associated with the acceptance of a technology. It is also used to understand the association between the potential to use and intention to use the technology based on the four central constructs which will conclude to acceptance of an EHR. The result of the UTAUT model was to theorizes the four constructs which therefore plays an important role in understanding user acceptance. End users acceptance of a technology has received huge attention since it has been introduced into organizations (Bhatiasevi , 2016). The data collected was based on healthcare facilities that have not yet adopted an EHR however, this model can be used as a guide should this technology be adopted within the 5 healthcare facilities that took part in the interview process.

The UTAUT model is therefore applicable to individuals of different genders, level of technology competency and skills as well as cultures, thereby indicating its reliability. Hence it is a useful tool in understanding the possibility of success of a new technology when it is introduced into an organization. It is also one of the most comprehensive model for explaining technology adoption (Bhatiasevi , 2016). The conceptual model below was developed based on the literature study.

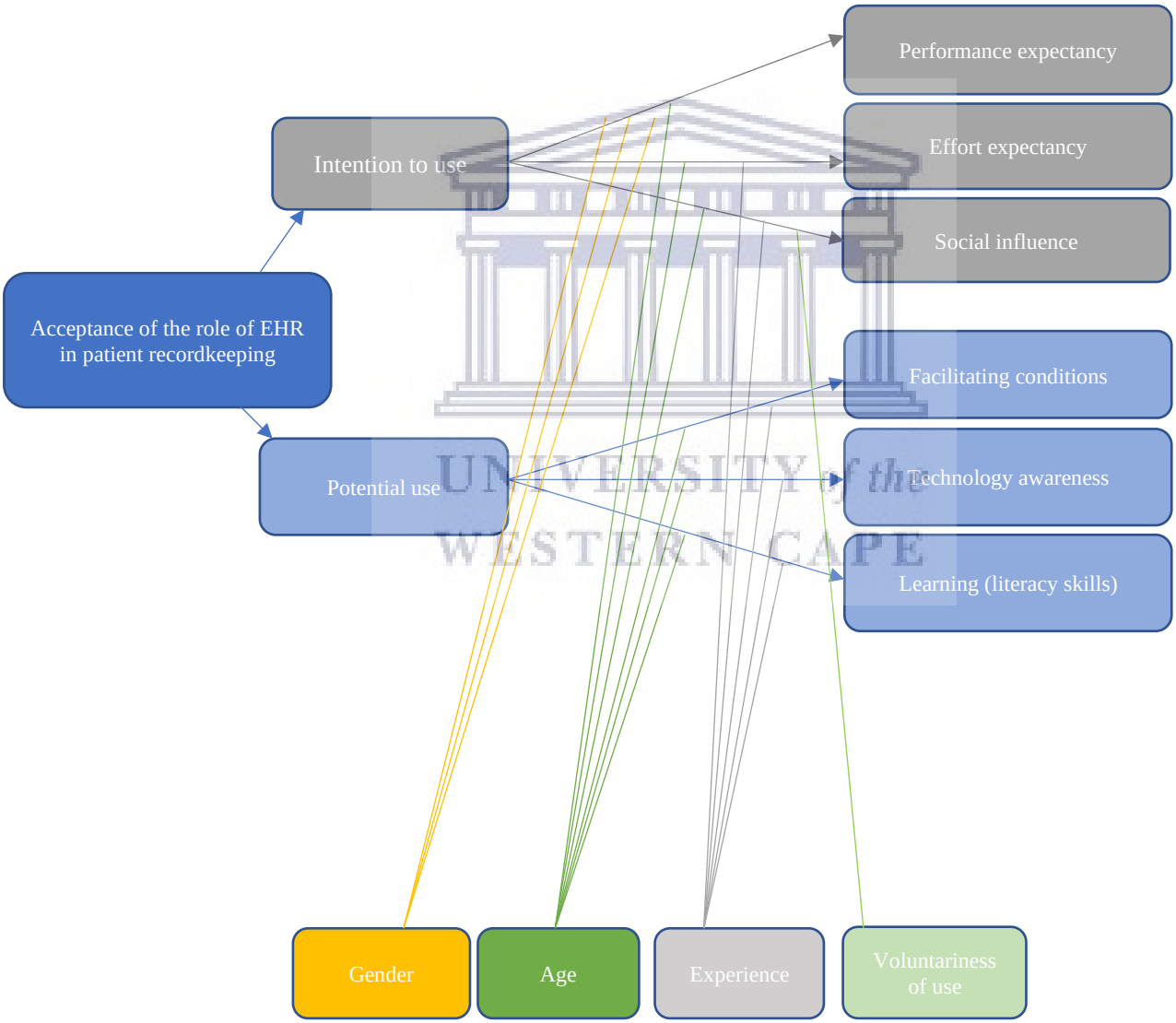


Figure 2.2: Conceptual model: EHR for patient recordkeeping (Davis, Davis, Morris, Venkatesh & Viswanath, 2003).

Due to the elevation of ICT in society, numerous prospective advantages have surfaced for physicians and patients within healthcare management and organisation. It not only assists medical care professionals with a better understanding of clinical issues, but also allows them to network with each other in order to gain a better insight into procedures and so forth. The revolution in ICT has produced a paradigm shift in clinical teaching and practice; as a result, more emphasis has been placed on the sharing of information (Karsenti & Charlin, 2008).

The challenge is to elevate technology awareness amongst doctors and other clinical practitioners through training on the numerous advantages of utilising technology to enhance delivery of care to patients. These will not only enhance the quality of clinical delivery, but also of the healthcare system itself (Karsenti & Charlin, 2008). Raising the technology awareness amongst healthcare staff can stimulate the potential use of technology as staff would be more familiar with the benefits of an EHR within work settings. The moderators such as age and experience will influence technology awareness and in turn the potential to use and accept the technology.

Learning (literacy skills) and potential use are similar constructs in technology acceptance. Learning is thus needed to adapt both the technology and the healthcare organisation in order to attain a suitable fit concerning the desired potential use and acceptance of a technology (Fichman *et al*., 2011). The moderators that influence the learning aspect of the framework is age and experience.

Some of the issues in technology acceptance are that certain clinical staff resist it. Clinical staff members are set in their ways and professional norms, as their concern is to treat patients and they thus view administrative work as an irritant. Due to the hierarchical nature of clinical care, the dislike of a particular technology by an influential clinical staff member could have a ripple effect on other caregivers (Fichman *et al*., 2011). In Chapter 4, the collected data will be analysed as well as using the above elements of the UTAUT framework.

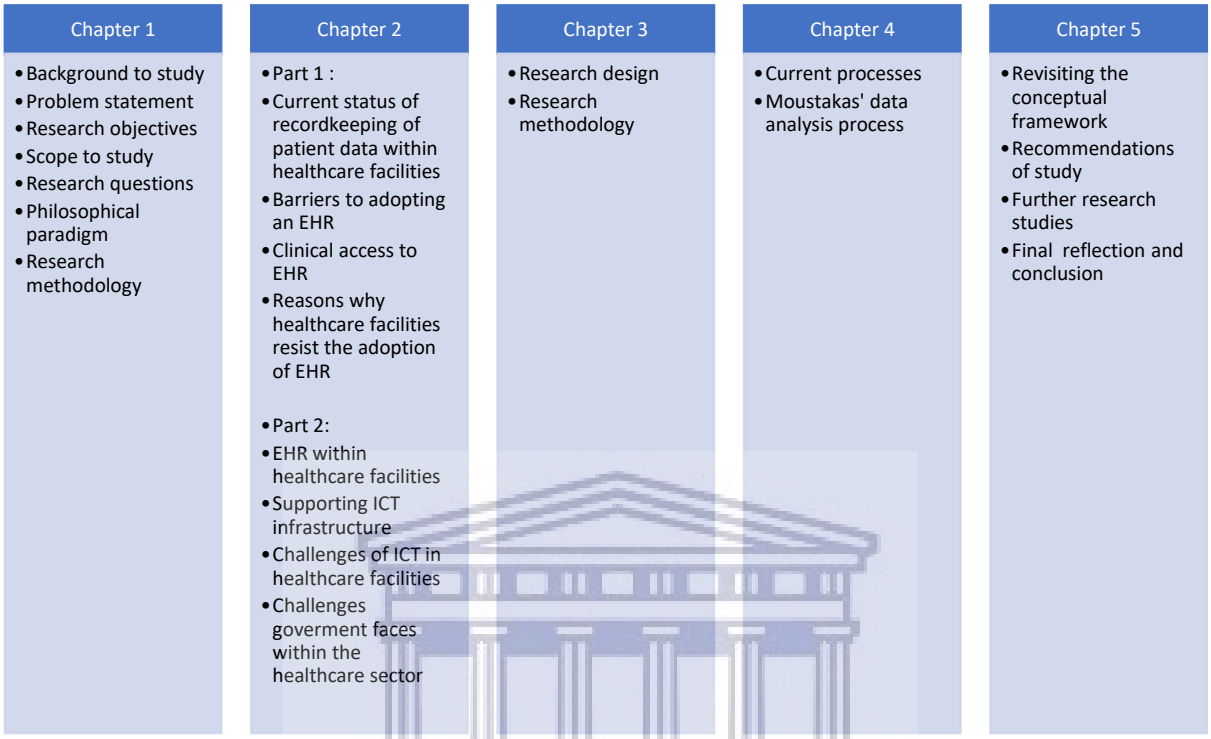
Summary

This chapter discloses that, although many research studies have been done on EHR adoption there have been very few studies on the usage of ICT on healthcare practices with emphasis on EHR and from a healthcare professional's perspective.

This study has addressed the potential role of EHR in patient recordkeeping, and examined the factors that hinder the acceptance of an EHR by healthcare professionals. It has also contributed to identifying the factors that would cause restrictions towards an EHR adoption.

The following chapter will explain the research methodology was used in this study.

Chapter 3: Research methodology



Introduction

The topics below provide an explanation of the research methodology guiding this study. They start by providing an understanding of what research is; then indicate the research objectives, research questions, research design, research site, and participants; the research instruments; and, lastly, the data analysis embarked on by this study.

Research, in essence, is defined as the process of evaluating and collecting information regarding a specific study or topic (Nordquist, 2019). It is used to interpret data in order to describe and understand a phenomenon (Mackenzie & Knipe, 2006). Therefore, the purpose is to provide answers to the research questions and, in turn, to produce new knowledge (Nordquist, 2019).

3.1 Research objectives

The aim of this study was to examine the perceived role of an EHR in patient recordkeeping and to investigate the acceptance and potential use of an EHR towards adoption by healthcare professionals.

The following objectives were addressed in this study:

- Potential role of an EHR in patient recordkeeping and how this could assist healthcare professionals in the Western Cape
- Factors that hinder the acceptance by healthcare professionals of EHR in the Western Cape
- Factors that would cause restrictions of an EHR towards adoption by healthcare professionals in the Western Cape

3.2 Main research question and sub-questions guiding this study

With the adoption of an EHR, medical care services in the Western Cape would not only gain an improvement in patient recordkeeping, but more so would produce quality service within the integrated system. This prompted the research question:

What factors influence the potential role of an EHR in the recording of patient information in a public healthcare facility?

The following sub-questions emerged from the main question:

i) **What will hinder the acceptance of EHR by healthcare professionals in the Western Cape?**

ii) **What factors would cause restrictions towards an EHR adoption according to the healthcare professionals in the Western Cape?**

3.3 Research design

The term research design is defined as the blueprint relating to the description of how the research questions would be resolved. The study was undertaken on the basis of this research design (Farooq, 2013). Research methods are classified as the processes and techniques used in order to gather and analyse the data collected. This collected data forms part of quantitative or qualitative methods or both (Scotland, 2012).

The research design was based on a transcendental phenomenological approach to a qualitative study. This approach was selected in order to answer the research questions guiding this study, which is thus the centre point of this research. In doing so, it also assisted the researcher to analyse the collected data and focus on the psychological phenomena that individuals experience (Groenewald, 2004). Transcendental phenomenology was selected for this study as it is concerned with understanding how meaning is formed through the perception of an individual's lived experience. It adds to the deep understanding of experiences that are lived by eliminating assumptions about knowing (Starks & Trinidad, 2007).

The description of these lived experiences is done by means of conducting interviews, observations, discussions and focus groups (Lester, 1999). Transcendental phenomenology explores a real-life happening or occurrence. The occurrence is knowable by means of interviews, and thus meaning is created through experience. By closely examining individuals' experiences, the aim is to capture the significance as well as common features of an experience (Starks & Trinidad, 2007).

Conducting interviews forms part of qualitative research. Hence, it is assumed that data is not independent of the knower, but socially constructed. Diverse cultural groups within society build multiple realities based on their value systems or world views, leading to numerous interpretations of an experience. Therefore, it is important to understand the phenomenon investigated from the viewpoints of the individuals included. This approach seeks to find answers to "what", "why" and "how" questions (Yilmaz, 2013). Selecting the correct and most suited research design is crucial in order to obtain the desired outcomes (Starks & Trinidad, 2007).

3.4 Research methodology

Research methodology is defined as the collection of guidelines and methods by which research is carried out, and is also seen as a structure for research. It is an overall approach or

road map for conducting a study; this is also connected to the research paradigm (Mackenzie & Knipe, 2006).

A research paradigm is referred to as an investigation through which data is gathered and examined in order to have an understanding of a certain phenomenon. It therefore is the selection of a research paradigm that determines the motivation and expectations of the study. If this is eliminated, there is no basis for the research design, methodology, methods and literature. A study that embarks on a positivist paradigm is likely to make use of quantitative research, however the interpretivist paradigm often uses qualitative research (Mackenzie & Knipe, 2006).

The research paradigm provides an indication of the type of data gathering and analysis approaches (quantitative, qualitative or both) best suited for a study (Mackenzie & Knipe, 2006). The methods of collecting and examining data are different (Yilmaz, 2013). In the literature, the concepts qualitative and quantitative are frequently used distinctly. One relates to the research paradigm, which stipulates the purpose of research. The other refers to research methods, which are determined how data is gathered and examined and used to draw conclusions (Mackenzie & Knipe, 2006).

Before the research method was selected for this study, the researcher needed to understand the difference between quantitative and qualitative research methods. The following provides an informative description of the various methods one can use before deciding on either. It also indicates how the researcher came to a decision regarding which research method to use. Once this has been explained, the chapter will move on to the research site, participants, instruments, data analysis process and, lastly, a summary of the chapter.

Qualitative research overview

A researcher that embarks on a qualitative study desires to gain a better understanding of a certain social phenomenon. By doing so, qualitative data is produced; this means that data will be produced by participating in interviews, observation and questionnaires. This type of research can be established within various fields by selecting certain methods, approaches and techniques (Myers, 1997). It involves interpretation and discovery of meaning through inductive reasoning (Yilmaz, 2013).

It is a method that understands social and human issues (Jabar, Sidi, Selamat & Ghani, 2009) by delivering an in-depth depiction of a phenomenon from the involved individual's

perspective. It attempts to comprehend how social experience is formed, and how reality is psychologically as well as socially formed. As a result, it is imperative for the researcher to build a close relationship with the individuals under analysis by documenting their experiences (Yilmaz, 2013).

Individuals create meaning of how they perceive the world and experiences linked to this by participating in interviews containing open-ended questions. The data that is collected by means of performing interviews or observation is generally in pictorial or textual format. It does not use statistical or quantifying techniques in order to understand the nature of a phenomenon (Yilmaz, 2013). Researchers that embark on the qualitative method assume that social reality is a human creation, as meaning is created through the interpretation of individuals' beliefs and views (Baškarada, 2014). This research method is used within the social sciences and includes case study, action research and ethnography, which are explained next (Myers, 1997).

Case study

Case study research is the most familiar qualitative approach used within the study of information systems. It is based on present phenomena surrounded by the real-life context (Jabar *et al*., 2009).

A case study entails investigating a particular entity in order to determine the understanding of a larger group of entities, which is done over a duration or a single period of time (Baškarada, 2014). This type of research is most beneficial when the study is set within its natural context (Houghton, Casey, Shaw & Murphy, 2013). The researcher would be able to gain a holistic view of the research problem. In contrast, this method should not be selected if the phenomenon is understood well and where actual context is not relevant (Baškarada, 2014).

Case studies are generally used in information systems (Baškarada, 2014) and in an assortment of disciplines, predominantly within the social sciences (Crowe, Cresswell, Robertson, Huby, Avery & Sheikh, 2011).

Ethnography

Ethnography is a research method that emphasises the importance of culture and tradition (Jabar *et al*., 2009). It is the study of behaviour, perception and social interaction that takes place in communities, teams and organisations (Reeves, Kuper & Hodges, 2008). The goal is

to understand human action by interpreting human behaviour (Jabar *et al*., 2009), as well as to deliver insights into an individual's actions and views (Reeves *et al*., 2008).

The data collected is completed through interviews, observations in addition to examining documents, and is done with no discrimination or previous assumptions. It is extensively practised in the information systems field and thus provides researchers with the required insight into human, social and organisational features, as well as further development (Jabar *et al*., 2009). It is the study of behaviour, perception and social interaction that takes place in communities, teams and organisations (Reeves *et al*., 2008).

Action research

Action research is defined as the development of a solution that would be of worth to participants involved with the researcher and simultaneously developing theoretical knowledge that holds worth and significance to a research society (Jabar *et al*., 2009).

The data collected is completed with, rather than on, the participants. This indicates that the participants will be co-researchers and, as such, equivalent partners. This provides knowledge and understanding that can be utilised by improving a situation to the advantage of all. The fundamental idea therefore is to have a dual commitment to both action and participants (Dick & Greenwood, 2015).

Qualitative research consists of an interpretive analysis that includes field work, interviews and archival study. It can be followed from this that the choice of research method is self-governing from the underlying philosophical position (Myers, 1997). Interpretive research analysis is a practice in social science that places emphasis on philosophical ways of understanding social reality. As a result, all social research is considered to be interpretive, as the aim of such research is to understand social reality (Bhattacharya, 2012). Meaning is uncovered, disclosed and experienced, and emphasis is placed on detail, description and logical thinking. The primary aim is highlighted to find meaning within the social phenomena (Bhattacharya, 2012).

Quantitative overview

Quantitative research is created within the natural sciences in order to attain knowledge of a natural phenomenon. The various methods of data collection are pursued through statistical analysis and laboratory testing (Myers, 1997), which consists of surveys and experiments that are built up from present theories (Williams, 2007). The tools used within this research

method are experimental performance scores, spectrometer readings, physiological interpretation and responses in accordance with surveys conducted (Jabar *et al*., 2009).

The research is not dependent on the researcher (Williams, 2007). The phenomenon has an objective reality that is independent of the studied participates and is viewed as independent and detached (Yilmaz, 2013). Therefore, the data collected quantifies reality, and thus meaning is discovered through the uncovering of the collected data. Researchers who choose this method seek for predictions and justifications, as the intention is to determine and prove relationship that can add to theory. The data collected can disprove or support the existing knowledge claims (Williams, 2007).

One of the main benefits is that it assists with measuring the responses of individuals against a limited group of questions, thus allowing for the comparison of data. These questions are closed-ended questionnaires and, as a result, the researcher can detect a pattern in the individuals' responses to certain phenomena. A deductive approach is required for this type of research, in addition to standardised responses; however, it fails to give insight into an individual's own experience. There is no describing of thoughts, feelings and experiences. A researcher who embarks on this type of method has to remain neutral and unbiased within the research process (Yilmaz, 2013). There are three types of classifications within quantitative research, namely experimental, descriptive and casual, which are explained next (Williams, 2007).

Descriptive research

Researchers who adopt this method use it to gain an overview of a phenomenon (Shuttleworth, 2008). Descriptive research views the present situation as it is in its current state. It identifies the characteristics of a phenomenon that is founded in observation (Williams, 2007).

It is a scientific method that includes observations without having an influence on them at all. It therefore is regularly utilised as a valid method for researching particular phenomena and is a precursor to further quantitative research (Shuttleworth, 2008).

Experimental research

Experimental research is usually used within sciences such as physics, biology, medicine, sociology, psychology and so forth to manipulate testing in order to understand processes. Commonly, experiments are done to forecast and explain a certain phenomenon or

relationship between variables (Blakstad, 2008). It involves the investigation of a phenomenon while at the same time measuring its results (Williams, 2007).

Causal comparative research

Causal comparative research discovers the relationship between the dependent and independent variables after a phenomenon has taken place. The aim is to conclude if the dependent or independent variable has an effect on the result by comparing groups of participants (Brewer & Kubn, 2012). It also allows the researcher the chance to study and inspect the relationships between independent variables and the influence they have on the dependent variables (Williams, 2007).

Quantitative research consist of the positivist method, which is based on proof from theory testing and quantifiable measures of variables (Jabar *et al*., 2009), as whatever occurs can be confirmed through logical evidence (Shanks & Parr, 2003). The hypothesis testing should be able to verify if the findings are truth or untruth. While conducting the testing, the researcher should be unbiased and independent of the phenomenon being studied (Shanks & Parr, 2003). A positivist researcher believes that there is a difference between what individuals know about an occurrence, compared to events in the outside world. The use of measures and statistical analysis, as well as the development of measurement modules, are important to this approach (Bahari, 2010). The table below illustrates the different types of qualitative and quantitative research methods and why they were not used for this study.

Table 3.1: Research paradigms considered for this study

Research paradigm	Reasons for decline
Qualitative: Case study research	Case study research focuses on in-depth data collection and is commonly used in exploratory research (McLeod, 2014). This study is not guided by exploratory research and is not suitable.
Qualitative: Ethnography research	This paradigm places focus on culture and tradition (Jabar *et al*., 2009) and therefore is not suited for this study.
Qualitative: Action research	Action research develops a solution that would be worth something to the participants involved in the research (Jabar *et al*., 2009). The data collected is completed with, rather than on, the participants (Dick & Greenwood, 2015). This paradigm is not suited for this study, as the data

	collected for this study was based on the participants.
Quantitative: Descriptive research	Descriptive research views the present situation as it is in its current state. It identifies the characteristics of a phenomenon that are founded in observations (Williams, 2007). This study did not conduct observations and hence this method was not suited for this study.
Quantitative: Experimental research	This approach is based on experiments that are used in order to explain as well as forecast a particular phenomenon or relationship between variables (Blakstad, 2008). This study was not focused on conducting any form of experiments and therefore this method was not a suited for this study.
Quantitative: Causal comparative research	Causal comparative research views the relationship between a dependent and independent variable regarding a phenomenon. The objective is to conclude if the dependent or independent variable has an effect on the result by comparing groups of participants (Brewer & Kubn, 2012). This type of research is not suited for this study as it has no dependent or independent variables.

This study is positioned for an interpretive qualitative paradigm. The interpretive qualitative research method is aligned with transcendental phenomenology, as both are concerned with finding meaning within a certain phenomenon (Bhattacharya, 2012). This method was selected as it would guide the researcher through the research process. By selecting the paradigm (step 1), the research journey could continue as seen in the figure below.

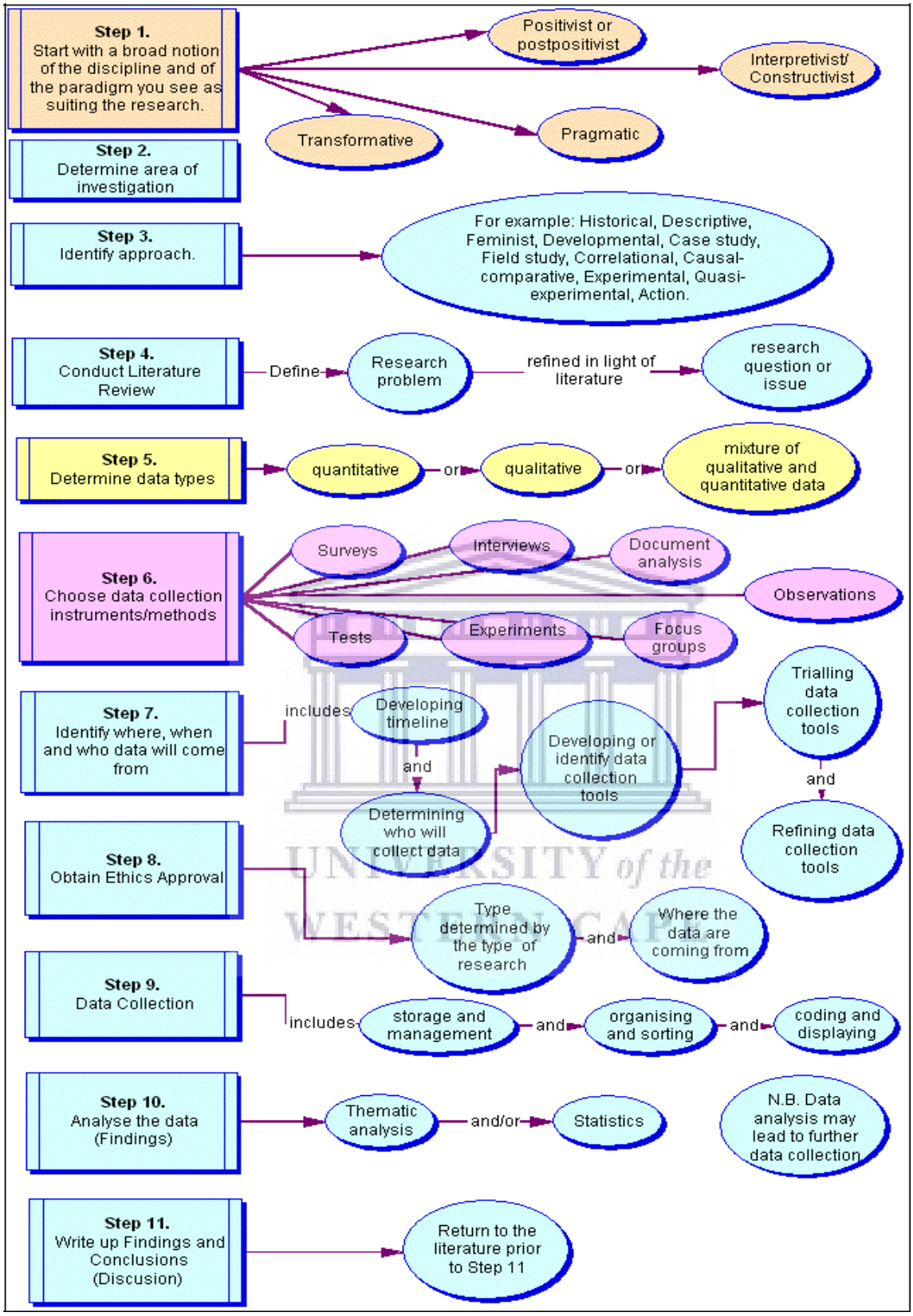


Figure 3.1: The research journey (Mackenzie & Knipe, 2006)

Primary versus secondary research

There are two types of data collection methods that can be adopted in a research study. These methods are grouped into primary and secondary research. Primary research is defined as data that is gathered by means of unpublished sources, whereas secondary research refers to gathering data from published sources. Examples of these published sources are books, journal articles, conference papers and so forth (Myers, 1997).

Primary research has two basic forms, which are specific and exploratory research. Exploratory research does not try to find a specific outcome. It entails performing interviews or focus groups, with quite a bit of interaction with and contribution from participants. In contrast, specific research is directed at a specific scope and therefore solves the issues found during the exploratory research. This is done through interviews and is also very accurate (DeVault, 2018).

There are a number of tools that can be utilised to collect primary data, namely questionnaires or surveys, psychological tools, mechanical devices and qualitative measurements. However, questionnaires and surveys are often used to gather primary data. The questions asked on these surveys or questionnaires must be carefully thought out, as well as suitable and fit for the objective of the study (DeVault, 2019).

The psychological tools used are Rorschach-like tests, in-depth interviews and the laddering question technique. The laddering question technique focuses on the participants' opinions and perspectives and explores them deeper . The questions are drawn up in a way that each question is a continuation of the response to the preceding question (DeVault, 2019). The in-depth interviews form part of semi-structured interviews, where the candidates have to response to open-ended questions. This method of interviewing is used often with candidates and is completed only once (Jamshed, 2014). The Rorschach-like test comprises the interpretation of ten inkblots printed on cards in order to exam the participants' character, personality, qualities and behaviour (Framingham, 2018). Mechanical devices are used for the determination of participants' physiological responses and reactions. These measurements consist of interest in and emotions relating to what was seen, heard or felt (DeVault, 2019).

Secondary research is defined as the analysis or review of previously collected primary data in the area of interest. This type of data collection is ideal for researchers who have limited time and resources available. It assists the researcher in investigating what was previously

known and what remains to be known about a specific study by means of secondary sources. It is important that the researcher has sufficient access to secondary sources from primary research data collections (Johnston, 2014).

This type of data collection can be done at libraries in order to get access to academic books, published journals and encyclopaedias. Secondary data can be collected from numerous sources, namely personal records, government records, the internet, electronic data, published data and public sector records. However, the internet is a helpful way of obtaining secondary data, on condition that the information is from credited references (López, 2013).

Some of the main differences between these two data collection research methods are that, while primary data contains data that is created by the researcher, secondary data is data that existed previously. Primary data is concurrent data, whereas secondary data narrates the past. Secondary data includes journal articles, publish books and the internet, whilst primary data includes observations, interviews, questionnaires and surveys. In addition, primary data involves plenty of time and costs, while secondary data is cost effective and easy to obtain. The primary data gathered is more precise and accurate in comparison to the secondary data (Surbhi, 2016). The key differences between these two data collection methods are that the comprise compiled and raw data (López, 2013). This study made use of both primary and secondary data. The primary data was gathered by conducting interviews with healthcare professionals, whereas the secondary data was collected from published data, journal articles and so forth.

Research site

A sample of five healthcare facilities was chosen to take part in the interview process. These five healthcare facilities were chosen due to their remoteness, as well as the large community they serve. Interviews took place with employees from selected public healthcare facilities in the Western Cape (refer to step 7 in diagram 1, the research journey).

The interviews were based on semi-structured questions with four population groups, namely medical doctors, nurses, pharmacists and administrative staff members employed at the healthcare facilities situated in Green Point , Athlone, Zonnebloem and Silvertown. The reason for collecting data from these four groups of individuals was to provide a broader understanding of the phenomenon from different types of professionals who potentially could work with an EHR.

These healthcare institutions are public sector domains and have not yet adopted EHR. The tables below illustrate the location of these healthcare facilities, the number of interviews completed, and the job classifications of the participants.

Table 3.2 Profession of each participant

Profession	Job classification	Age	Gender
Professional nurse	Junior	24	Female
Professional nurse	Junior	26	Male
Administrative clerk	Senior	28	Female
Community service medical officer	Intermediate	28	Female
Professional nurse	Intermediate	28	Female
Medical officer	Intermediate	29	Female
Medical officer	Intermediate	31	Female
Medical offer	Intermediate	31	Male
Clinical nurse practitioner	Intermediate	32	Female
Pharmacists	Intermediate	32	Female
Pharmacy supervisor	Senior	37	Male
Professional nurse	Intermediate	44	Female
Administrative clerk	Intermediate	53	Female
Administrative clerk	Senior	58	Female
Nurse	Senior	59	Female

Table 3.3: Healthcare locations

Town	Suburb	Healthcare facility
Cape Town	Green Point	Healthcare facility A
Cape Town	Silvertown	Healthcare facility B
Cape Town	Green Point	Healthcare facility C
Cape Town	Athlone	Healthcare facility D
Cape Town	Zonnebloem	Healthcare facility E

Table 3.4: Number of interviews conducted

Group	Healthcare facility A	Healthcare facility B	Healthcare facility C	Healthcare facility D	Healthcare facility E	Total
Doctor	2	1	0	1	0	4
Pharmacist	0	0	1	0	1	2
Administrative staff	1	1	0	0	1	3
Nurse	2	1	1	0	2	6
Total	5	3	2	1	4	15

Once the research site had been selected, the researcher could embark on qualitative sampling (Koerber & McMichael, 2008). The next topic will indicate which sampling method was chosen for this study, and why it was chosen.

Research participants

There are several ways to define qualitative sampling methods; however, most place emphasis on the three main classifications, namely convenience, theoretical and purposeful sampling methods (Koerber & McMichael, 2008). These three qualitative sampling methods are explained below.

Convenience sampling

A researcher who uses this form of sampling has access to willingly and readily available participants who are easy to connect with. This form of sampling method is also known as accidental or opportunistic. Even though this form of sampling places emphasis on readily available participants, some samples are reached more easily (Koerber & McMichael, 2008).

Purposeful sampling

Purposeful sampling is a method that is commonly utilised within qualitative research (Palinkas, Horwitz, Green, Wisdom, Duan & Hoagwood, 2015). Within a qualitative study, the sample type and size are dependent on five aspects, namely the nature and objective of the study, the scope of the research, the quality of the data produced, the research design and the use of the observed data (Starks & Trinidad, 2007). The purposeful sampling method is also known as subjective, judgemental or selective sampling (Crossman, 2018).

This sampling method is suitable when a researcher needs to get in touch with a targeted sample rapidly and when proportionality is not a priority (Crossman, 2018). The most essential principle is to produce the highest variation, which means that researchers should look to include individuals who has an extensive variety of viewpoints (Koerber & McMichael, 2008). An assorted sample would have a wider variety from which to filter the essence of a particular occurrence. The information from a small group of individuals that have experienced a certain occurrence might be enough to unravel its core elements (Starks & Trinidad, 2007).

Before the sampling method was selected, the researcher first took into consideration the purpose of the study and therefore could select the type of participants to be researched. The researcher collected data from all ranks of staff members who had different kinds of experience and education (Koerber & McMichael, 2008). This type of sampling approach was chosen as method to determine the sample size for this study. The reason for this choice of method was because the central goal of this type of sampling in a qualitative study is to pick out and analyse a small group of individuals (Yilmaz, 2013) who have experience of a certain phenomenon (Starks & Trinidad, 2007). The researcher had a choice in selecting the sample size and aligned the objective of this study to the targeted sample (Koerber & McMichael, 2008). These clinical participants had certain traits and characteristics, for instance none of them utilised EHR in their everyday work activities. This would provide the researcher with detailed information, as well as a profound understanding of the participants (Yilmaz, 2013).

Theoretical sampling

Theoretical sampling was created with the discovery of grounded theory. It therefore is a rigorous technique of examining qualitative research so as to create a theory (Coyne, 1997). In purposeful sampling, the sampling criteria and requirements are indicated in advance and do not change throughout the study. However, with theoretical sampling, the requirements for sampling are develop along with the study. This form of sampling method is stated as an iterative process from time to time (Koerber & McMichael, 2008).

Research instruments

A qualitative study contains detailed research of individuals' lives or the issues encountered within their natural environment in order to avoid any form of pre-concluded analysis. By conducting interviews, it documents the individuals' experience as it is lived, as well as their thoughts. Thus, when compared, qualitative research is an extensive process and more detailed than quantitative research (Yilmaz, 2013).

During the interview process, no questions should be directed in relation to what the researcher is searching for, but rather questions guided towards lived experiences. The instructions given should not be directive, thus allowing the participants to describe their experience. The follow-up questions will allow the individual to provide a more in-depth depiction of the experience that has transpired without directing his/her to what the researcher is looking for. This is founded on the knowledge of the individual and thus highlights the

importance of interpretation and insight. It assists in comprehending the experiences one endures and therefore provides insight into a participant's behaviour and, as a result, removing assumptions (Lester, 1999).

The number of participants required for the interview process is determined on the basis of the aim and objectives of the study (Starks & Trinidad, 2007). However, according to Creswell, the recommended number of interviewees is between two and 25 (Alase, 2017). This number is therefore aligned with the final total of 15 interviews chosen for this study. These interviews therefore form part of collecting primary data (Starks & Trinidad, 2007).

Interviews with clinical staff were scheduled in advance and communication was done by e-mail. The researcher contacted one clinical participant from each healthcare facility and requested a mailing list of staff employees. The researcher then e-mailed potential staff interviewees and explained the purpose of the study. The interview questions were also attached as a means to inform participants beforehand of the type of questions that would be asked. This method of accumulating more participants is called snowball sampling. This approach allowed the researcher to start off with a small group of participants who were easily accessible, and then develop the group by requesting that each participant recommend other prospective participants (Koerber & McMichael, 2008). One-on-one interviews are the most effective and frequently used tools in qualitative studies. There are three types of interviews that can take place, namely structured, semi-structured and unstructured interviews (Ryan, Coughlar & Cronin, 2009).

Structured interviews are commonly recognised as standardised interviews, and contain a fixed format that is represented to all participants involved in the interview process (Bryman, 2006). This sort of interview practice comprises an interview schedule that is followed all the way through (Ryan *et al*., 2009). This means that every individual will be given the same group of questions in the interview (Bryman, 2006). It does not leave room for changes in direction regarding the topic in question. There is no deviation from the order in which the questions are asked nor in the language used (Ryan *et al*., 2009).

These types of interviews involve asking predefined questions that contain a limited number of responses. These responses are placed in coded schemes that are very alike to surveys (Baškarada, 2014). Conversely, interview guides take a different approach regarding the interview process, as they allow the researcher to discover numerous issues concerning a certain topic. They are also grounded on the assumption that the questions are asked within a

definite and clear-cut manner that is comprehensible to the individual being interviewed. This method predominately creates quantitative data, but may possibly include qualitative questions (Ryan *et al*., 2009).

Semi-structured interviews are more focused on the individual being interviewed in order to gain a better understanding of a certain viewpoint. A researcher is capable of refocusing the interview questions in order to get innovative or new information if something intriguing arises (Baškarada, 2014). In doing so, open-ended answers are used, thus allowing the researcher to understand and view the world as seen by the participants (Yilmaz, 2013). This is a more flexible approach to the interview procedure (Ryan *et al*., 2009).

Due to this flexible approach, the researcher is permitted to follow a sequence of less structured questions, and is allowed to examine unplanned issues raised by the individual. The way the wording comes across to the interviewee during the interview process is flexible and an explanation is therefore made by the researcher. These interviews take place one on one and contains open-ended questions founded on the principle that the individual has control over the interview procedure. Emphasis is place on allowing the individual to tell his or her story without having to respond to a chain of structured questions. Hence, concerns are explored from a unique, personal viewpoint and perspective (Ryan *et al*., 2009).

Unstructured interviews do not provide any predefined answers and usually make use of open-ended questions. This allows for more flexibility during the interview (Baškarada, 2014). They do not engage with a specific framework for questioning. During the unstructured interview, the interviewer and the interviewee have a conversation about a specific topic in response to the interviewer asking broad, open-ended questions (Ryan *et al*., 2009).

There are no predetermined answers to the questions and therefore the interview moves in the direction of the interviewee's replies. This category of approach is nondirective and is supported by the belief that little is known about the study and hence no predetermined questions are posed (Ryan *et al*., 2009). This type of interview is the least effective; however, it can produce the most rich data and discover unpredicted responses. The questions asked would start with a "How" and cannot be replied with a "no" or a "yes" (Baškarada, 2014).

This study used a semi-structured approach in the phenomenological interview process (refer to step 6 in the research journey in Figure 3.1), as it provides insight into a certain

phenomenon and personal experience. This research project was granted ethically approval by the Biomedical Research Ethics Committee of the University of the Western Cape (refer to step 8 of the research journey and Appendix A). In order to ensure that this study was conducted in an ethical manner, the researcher provided each participant with a consent and information form. This consent form (refer to Appendix A) and information form (refer to Appendix B) were explained in detailed before each interview took place. The information sheet explains the purpose of the study, informed the participants that they were taking part in a research study, that the interviews were done voluntarily, that their identities would not be disclosed and, lastly, the risks and benefits of this study.

The researcher requested that the area in which the interviews took place was free from any disruptions. The interview visits were conducted in July 2019 and each interview was documented on a voice recorder. Before the interview took place, the researcher informed all participants that the interview would be documented in this manner. Interviewees who willingly agreed to participate in the interview process signed the consent form. Each participant was interviewed alone. The interviews lasted 30 minutes on average, as some participants spoke more than others. During the interview process, the researcher encouraged the participants to provide a description of their own personal experience, which included expressing their thoughts, feelings, memories, sensations and, lastly, explaining the phenomena (Lester, 1999).

The interview contained ten questions, as depicted in Appendix C. Each question is provided below, followed by linking this to the research questions. The below interview questions are based on healthcare facilities that have not adopted an EHR and as such are directed at perceptions towards the acceptance and potential use of an EHR. Sub-question 1 is based on the human aspect that could hinder the acceptance of EHR. These human aspects may include lack of computer skills, or trust in patient security data. Sub-question 2 relates to factors that restrict EHR adoption. These factors include the lack of computers, suitable infrastructure, networking equipment, printers, high costs, internet connectivity and unstable electricity supply (Katurura & Cilliers, 2018).

Interview questions	Research questions
Question 1 Explain the process of a patient seeking medical assistance from the time he/she visits the administrative counter until the patient comes into contact with you.	Linked to sub-question 2
Question 2 What kind of experience do you have working with any form of computers/computer system and have you embarked onto a computer training course?	Linked to sub-question 1
Question 3 Do you know what an electronic healthcare record (EHR) is and have you ever used it at your previous employment (if adopted) when performing your everyday duties?	Linked sub-question 1
Question 4 If you have or have not previously used an EHR, do you think that it would assist you to accomplish your day-to-day operations more efficiently?	Linked to sub-question 2
• When comparing the traditional patient recordkeeping to the electronic format, do you think that the EHR will assist you to retrieve patient information more promptly?	Linked to sub-question 2
• Do you think that, by making use of an EHR, it would have an effect on the quality of your or medical employees' decision process as one can have access to patient history quicker?	Linked to sub-question 1
• If you have or have never utilised an EHR before, would you think that the system is difficult to utilise?	Linked to sub-question 1
• Do you think that your computer literacy skills will assist you with the potential use of an EHR?	Linked to sub-question 1

• Would you feel more comfortable doing a training course should an EHR be adopted at your current healthcare facility?	Linked to sub-question 1
• If you could choose, which category of system are you more comfortable with?	Linked to sub-question 2
Question 5 Based on your knowledge of an EHR, what are the features or functionalities you would found helpful for patient recordkeeping?	Linked to sub-question 2
Question 6 What do you think are the key challenges that your current public healthcare facility faces with regard to EHR adoption?	Linked to sub-question 2
Question 7 Based on your knowledge, what changes would you recommend should an EHR be adopted at your healthcare facility?	Linked to sub-question 2
Question 8 Based on your knowledge, how significant is an EHR is to your work?	Linked to sub-question 1
Question 9 Do you think that personal patient data is more protected with an EHR?	Linked to sub-question 2
Question 10 Do you think that the waiting time to be consulted by a healthcare professional will be reduced (should this technology be implemented into your healthcare facility?)	Linked to sub-question 1

Data analysis

There are three different categories of phenomenological analysis, namely hermeneutic, transcendental and existential. This study used transcendental phenomenological data analysis, which places emphasis on an individual's experience (Phillips-Pula, Strunk & Pickler, 2011). When compared to quantitative research, which utilises statistical approaches, qualitative research explores the beliefs, thoughts, values, meanings, feelings and experiences of a phenomenon of study (Wong, 2008).

The first phase was to develop the research questions guiding this study, which was completed in Chapter 1. The second phase was to identify the sample that was willing to be part of the interview process; this was indicated earlier in this chapter. Data was produced by interviewing individuals who described their experiences relating to a phenomenon. Finally, the data was analysed using a method of categorising and coding the data that was derived from these interviews. These findings are then presented as an explanation and depiction of an interpretation of a phenomenon (Phillips-Pula *et al*., 2011).

Categorising and coding the data is considered the most vital step within a qualitative data analysis method. Categorising and codes are merely labels or tags that are used to identify topics among the data collected. The data produced for this study was derived by dividing the large volume of collected raw data and subsequently allocating it into groups. Essentially, it includes adding logic to the massive amounts of collected data by decreasing the size of the raw data, followed by detecting patterns, drawing conclusions from the meaning drawn from the collected data, and finally constructing a logical series and patterns of evidence (Wong, 2008).

There are numerous data analysis methods that can be used for a transcendental phenomenological study. However, the researcher applied the technique used by Moustakas (1994). Moustakas (1994) focuses on the essence and completeness of experience and thus views it as a relationship that is inseparable from the research subject. The researcher therefore eliminates all pre-judgemental thoughts and focuses on utilising a systematic approach in order to analyse the data. The steps to follow, according to Moustakas (1994), comprise epoche, identifying significant statements (horizonalization), clustering statements into meaningful units or themes, textual and structural descriptions and, lastly, description of the meaning and essence of the experience (Moerer-Urdahl & Creswell, 2004).

Epoche is regarded as the first step in a phenomenological reduction technique. Epoche is a Greek word that means to refrain from any kind of prejudgment. This is done before the researcher embarks on the data analysis process. According to Moustakas (1994), the researcher should set aside any views regarding the phenomenon and should focus on the participants' reported views. The researcher's perceptions are retained as indications of truth, knowledge and meaning (Moerer-Urdahl & Creswell, 2004).

The first step in the data analysis process, according to Moustakas (1994), is called horizonalization. This is a process whereby significant statements reported by the interviewee are brought forward. This is done by identifying information within the transcripts that points out the experience of a participant. The researcher presents these significant statements in table format in order to provide different views on a phenomenon. The researcher bore in mind that there no statements should be repeated or overlap (Moerer-Urdahl & Creswell, 2004).

The next step (clustering statements into meaningful units or themes) is to eliminate participants' statements that are overlapping or that are not relevant to the study. The statements that are not eliminated are called textural meanings. These textural meanings are then carefully examined and clustered into themes (Moerer-Urdahl & Creswell, 2004).

The researcher then describes "what" the participants experienced regarding the phenomenon, which is called the textual description, for example, "What kind of experience do you have working with any form of computer/computer system and have you embarked on a computer training course?" The researcher then provides a description of "how" the participants experienced the phenomenon, which is called a structural description, for example, "How significant is an EHS to your job?" The final step, according to Moustakas (1994), is that the researcher is required to give a description of the meaning and essence relating to the experience. This is accomplished by combining the structural and textual descriptions, which captures the essence of the experience and therefore presents the elements of a phenomenological study (Creswell, 2007).

During the data collection process, the researcher made qualitative field notes (refer to Appendix D). This is used in qualitative studies to assist the researcher with documenting

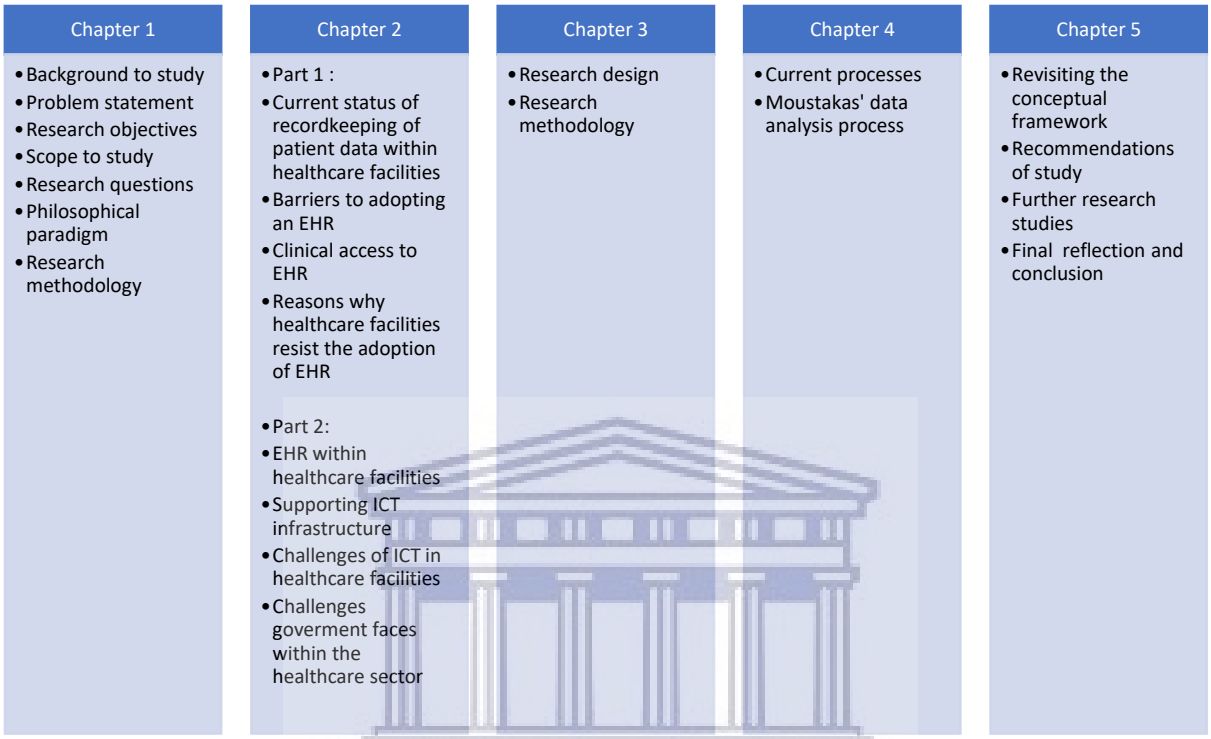
additional, related information during the interviews. It is a vital element for a rigorous qualitative study, as it enhances the collected data and therefore provides rich context for data analysis (Phillippi & Lauderdale, 2018). Once an interview was completed, the researcher labelled each recorded voice note, for example, "Nurse, 44 years old: Healthcare facility B". After this was completed, the researcher listened to the interviews again and transcribed them. The digital copies of the signed consent forms and data that were collected are kept on a password-protected computer and only accessible by the researcher and supervisor. All collected hard copies were converted into digital format.

Summary

This chapter provided a detailed summary of the research approach of this study. It also provided in-depth reasoning on why these methods were selected. The researcher also provided a guided method to phenomenological data analysis and stipulated the manner in which this would be completed.

The following chapter will describe, analyse, unfold and interpret the collected data that was gathered from various healthcare facilities in the Western Cape according to Moustakas (1994).

Chapter 4: Data analysis



Introduction

This study was completed in order to investigate the potential role of an EHR for patient recordkeeping in the Western Cape. In addition, it looked at what hinders the adoption of EHR by healthcare professionals and, lastly, the factors that causes restrictions towards an EHR adoption by healthcare professionals. At the end of this chapter, these research questions are answered and explained.

What factors influence the potential role of an EHR in the recording of patient information in a public healthcare facility?

The following sub-questions emerged from the main question:

i) **What will hinder the acceptance of EHR by healthcare professionals in the Western Cape?**
ii) **What factors would cause restrictions towards an EHR adoption according to the healthcare professionals in the Western Cape?**

Interviews took place with numerous employees of public healthcare facilities. These employees comprised pharmacists, doctors, nurses and administrative clerks. During the data analysis phase of this study (refer to step 10 of the research journey), the researcher selected a phenomenological framework in order to compare the interviewees' experiences with data in previous literature.

The collection of data using interviews took place with 15 healthcare professionals from the public sector. These interviewees comprised 12 females and three males, ranging between the ages of 24 to 59. In addition, it involved six nurses, four doctors, two pharmacists and three administrative staff members. The healthcare facilities that took part in the interview process are, facility A (situated in Greenpoint), healthcare facility B (Silvertown), healthcare facility C (Greenpoint), healthcare facility D (Athlone), healthcare facility E (Zonnebloem).

Before the interviews started, each participant was informed of the objective of this study, as well as the content of the questions asked. This was communicated to the participants via e-mail. Each interviewee signed a consent form that indicated that their participation was voluntary and that they were not forced against their will. The interview questions were constructed around the conceptual framework of the unified theory of acceptance and use of technology (UTAUT). The following section provides a brief overview of the current processes conducted at these five healthcare facilities.

4.1 Current processes

Before the interviews took place, the participants were asked to explain the processes that need to be completed for every patient that seeks medical care. An administrative clerk currently employed at healthcare facility E explained that every patient visiting the healthcare facility was required to have an appointment before he or she could be consulted by a medical professional.

Firstly, the patient was required to visit the administrative department. The patient's personal details such as residential address and contact number were checked and verified whether they were still the same as on the previous visit. Once this had been completed, the paper folder was retrieved by an administrative clerk, and labels were placed manually in each folder. These labels included the date the patient visited the healthcare facility. This process was completed for all patients and was quite a lengthy procedure, as folders sometimes go missing.

However, if a patient walks into the healthcare facility for the first time without an appointment, he or she first has to visit the triage department. The nurses in this department check the patient's vital signs and determine if it is an emergency or non-emergency case. Furthermore, the patient will visit the administrative department, where a folder is created. This folder contains personal information, such as name, surname, residential address, contact number, next of kin and financial details. This information is then captured on the computer and saved for the next medical visit. Each folder has a unique identity number, and the same number is used at all secondary hospitals.

As stated previously, the patient's personal details are captured on a computer, although the health department has not adopted an EHR whereby authorised medical staff can capture and view patients' medical history. Therefore, all historical and present medical patient information is handwritten and paper based.

In order to comprehend these participants' experiences with the existing system for patient recordkeeping, the researcher had to understand the literature that is based on the experiences of a paper versus an EHR record system. All five healthcare facilities that took part in the interview process are currently using paper folders for patient medical recordkeeping. These healthcare facilities have some form of electronic system that only captures a patient's personal information; however, no patient medical history is kept in an electronic format.

The next section of this chapter discusses and analyses the data according to Moustakas (1994). The following thus comprise the steps to be following according to Moustakas' (1994) epoche, identifying significant statements (horizonalization), clustering statements into meaningful units or themes, textual and structural descriptions and, lastly, a description of the meaning and essence of the experience (Moerer-Urdahl & Creswell, 2004) (see the figure below).

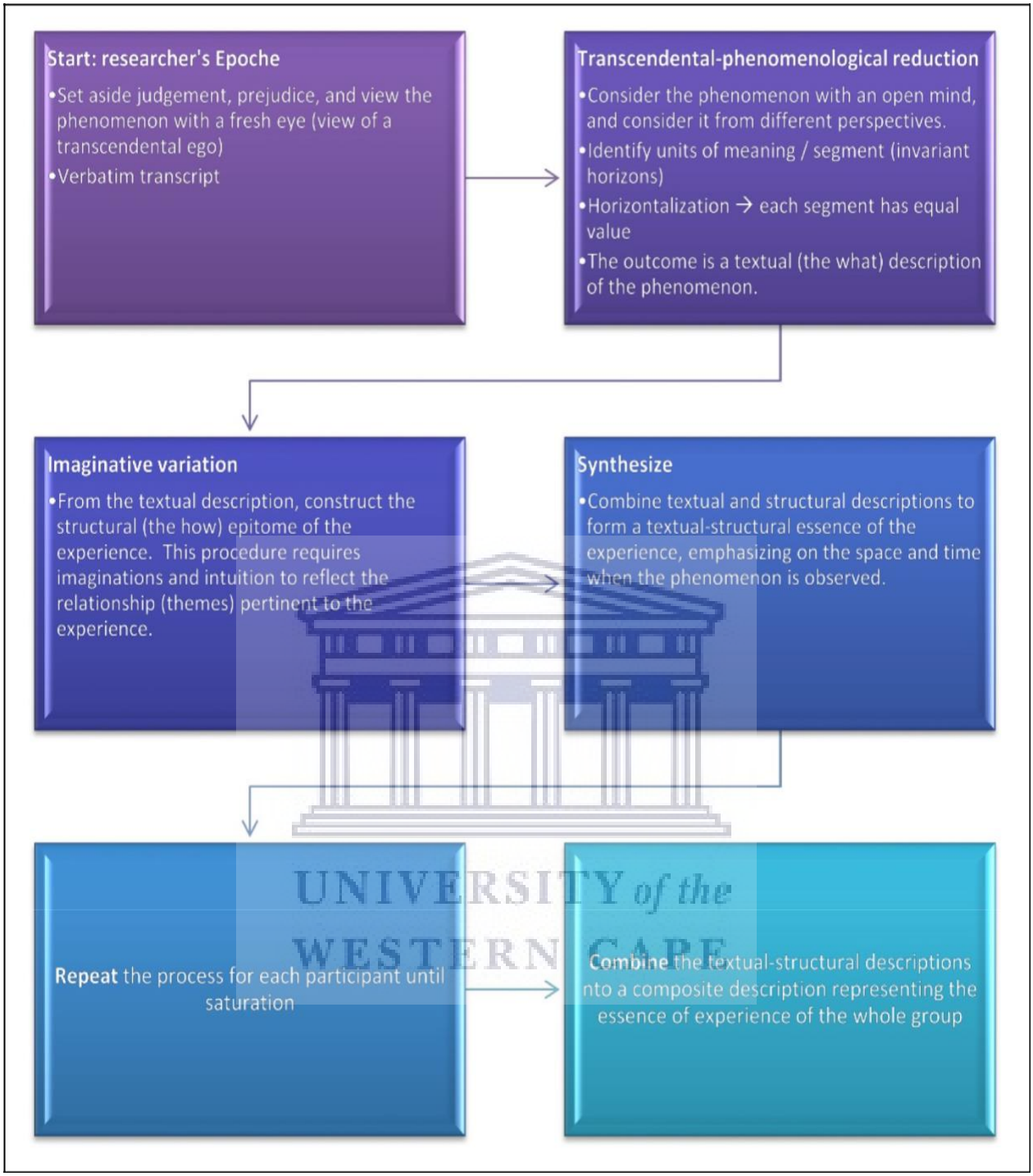


Figure 4.1: Data analysis process of Moustakas (1994)

4.2 Epoche

In an effort to proceed with the data analysis, the researcher put aside all prejudgements and preconceived ideas regarding the phenomenon of this study. All previous experience and knowledge of the phenomenon was eliminated and bracketed out. This is imperative in order to achieve "Epoche" (Moustakas, 1994).

Epoche is used as a preparation to attain new knowledge and experience. It therefore is a process whereby all predispositions are discarded to allow the researcher to view the phenomenon from a fresh perspective, as if it is viewed for the first time. This step is crucial in order to embark on and conclude the data analysis process. It is hence a starting point of this study in which the present is not influenced by the voices of the past and the voices of the present do not interfere with the direction of the researcher's thinking process. However, the past experience can be used as reference to note aspects regarding truth and knowledge (Moustakas, 1994).

By going through the process of epoche, the researcher allowed new understanding, experience and feelings to flow. Due to the nature of epoche, this was completed alone and required the researcher's absolute focus as well as presence. A moment of reflection allowed the researcher to review present thoughts on and feelings about the phenomenon. Next, the process allowed the researcher to be receptive towards the phenomenon (Moustakas, 1994).

Re-listening to the audiotaped interviews was done without referring to old habits of feeling and comprehension. The researcher suspended all preconceived knowledge and interpreted the data as presented. Furthermore, the researcher understood the phenomenon from its appearance (Moustakas, 1994).

This approach can determine how a situation is viewed, as well as what elements of information are seen, acknowledged and heard. When practised sensibly and realistically, the nature of things will be unveiled more fully and, in turn, findings can be related to truth and knowledge (Moustakas, 1994). After this method was completed, the researcher went back to the beginning of this chapter and reread the questions guiding this study in an effort to again immerse herself prior to the next step (data analysis). This ensured that the data analysis was rooted in the research questions and the interviewees' experiences.

4.3 Identifying significant statements (horizonalization)

As indicated in Table 4.1, the researcher identified statements that were shared by the 15 interviewees. These statements are represented in full sentences and provide an overview of the phenomenon relating to this study. Hence, they do not appear in any grouped form and in no logical order.

Table 4.1: Selected statements

Selected significant statements
Statement 1: When I first started working at this hospital we did everything manually; however from 2008 we started to use an electronic system to record patient information, such as telephone number and home address and so forth. It is a huge improvement to what we used before. The information that is saved on the computer is only patient information but it does not include the medical history.
Statement 2: Yes it will; however it still needs to be manually updated by a staff member. Patient information needs to be captured right the first time round so that we can trace the patient information. Yes, it is more efficient if the person captures the information right.
Statement 3: Yes, it will help because you can quickly obtain more information about a patient.
Statement 4: It seems complicated to use.
Statement 5: Yes, if you have previously been on a computer training course it would help you to work your way around the system; however the department of health does provide training to staff members who are working on an EHR. They start with the basic training to intermediate training.
Statement 6: We have been carrying out the same process for years and I do not see the need to change our job. If a patient walks into our facility that needs immediate medical assistance, it would take time to navigate my way through the system in order to retrieve the patient's file, this could become a serious issue.
Statement 7: The unique patient number can be traced. It helps with getting patient information quicker and trace patient history in times of an emergency.
Statement 8: Going fully EHR is very costly and the government does not have the funding for it. The issue of high theft especially in poor areas within the Western Cape or what is known as high crime areas.
Statement 9: The downtime especially with load shedding and we do not have enough generators within our facility. In load shedding times it is difficult to allocate appointments for patients.
Statement 10: Yes, it will go faster as we can locate the folders quicker in times of an emergency.
Statement 11: No computer course has been offered; however, I know the basics of a computer like how to put it on and off and how to check for patient results.
Statement 12: No, because the system is down most of the time and none of the systems are linked to each other.
Statement 13: Yes, it will improve the quality of services to patients.
Statement 14: I choose a paper system.

Statement 15: I have been working at this facility for years and I feel like if I must learn a new way of doing my job even though I know my job would be made easier, I will definitely get nervous about using a computer.
Statement 16: Medication, any medical follow-ups, and historic treatment that was given to patients.
Statement 17: An EHR is not really significant to my job.
Statement 18: Yes, but very basic such as the Microsoft packages.
Statement 19: I manage the nurses so having said that the patients visit the admin area and then they go to certain departments depending on the services they need.
Statement 20: The buy-in from the staff would be the main concern.
Statement 21: I cannot say as our hospital has not adopted a full EHR so I would not know.
Statement 22: Yes it will, as we will be able to view patient's medication history.
Statement 23: Yes especially when dispensing medication for our patients. We can see when or what kind of medication was previously given to the patient.
Statement 24: If the person does not have computer skills then it can get complicated to use.
Statement 25: Cutting out paper based and making it fully electronic. If we could access the dispense medication electronically, the filling system would not be so bad.
Statement 26: The system we are using for dispensing medication cannot load repeated medication; however, you can only issue medication once off. So we always need and depend on the paper folder.
Statement 27: It is not important; we can do our job without it as we have been doing it for a long time now.
Statement 28: Yes, I do think that patient information is more secured with an EHR.
Statement 29: Yes, I do think that the waiting time to be consulted by a doctor will be reduced with an EHR.
Statement 30: The only experiences I have with computers are very basic as the only training I had was done at high school.
Statement 31: Yes, I feel that by using an EHR it will improve my services to my patients.
Statement 32: My previous employment adopted an EHR; however, I felt that I could write faster than typing.
Statement 33: Paper as I am used to writing rather than typing.
Statement 34: There is a lack of computers within our facility as well as bad infrastructure.
Statement 35: Confidentially is the biggest concern.
Statement 36: If adopted, it can assist me to do my work more promptly.
Statement 37: Anyone can steal a paper folder and anyone can hack a computer.
Statement 38: Yes, as long as the internet connection is working then the process will be more efficient. Often patient folder gets lost, power failures occur and we do not have enough generators to accommodate the entire facility.
Statement 39: Using the system takes too much time and I would end up seeing less patients.
Statement 40: I would recommend that the system be integrated with other facilities as this would help if the individual is not a patient of the medical facility.

Statement 41: If the person does not have computer skills then it can get complicated to use.
Statement 42: Yes it will, as plenty of the time is spent at reception and that can be reduced.
Statement 43: Our healthcare facility does have computers, most of us do not have the basic computer training and lastly the infrastructure is very bad, more specially the Wi-Fi.
Statement 44: Never did a computer course before as we only use Microsoft Word. We just figure it out.
Statement 45: We are a public healthcare facility, everything we do is on paper. We write everything on paper.
Statement 46: Yes, it would assist me to check if patients need to come in for their follow up for example babies that need to come in for their immunisation.
Statement 47: I would not know.
Statement 48: To streamline processes as sometimes we wait long for patients to come see us and it is not they were at the healthcare facility late. It is because processes are so slow and services are so bad that it takes a while for patients to see us.
Statement 49: I think so; however computers can get hacked and information can be deleted and lastly, confidentially can be bridged.
Statement 50: An EHR would make my daily operations less frustrating due to the misplacement of patient folders, poor quality of folders and being able to share data between different facilities.
Statement 51: Budget is the main concern as in this clinic there are only two computers in the entire facility.
Statement 52: Yes, as we did computers in our first year of university.
Statement 53: Both, as most doctors prefer using the paper records still but in our department we use half paper and half electronic. The patient history is kept on paper.
Statement 54: Training of the staff and lack of computers.
Statement 55: I have never gone for any form of computer training.
Statement 56: As a doctor I haven't been on a training course as we do not use computers to do our job unless it is for blood results. However, if training was given to us we would know how to work our way around the system.
Statement 57: I previously worked at a healthcare facility whereby an EHR was adopted but there was a waiting area where doctors had to book a computer in order to look up a patient's medical records. There was not enough computers to accommodate all the doctors.
Statement 58: Currently it is not important because I don't have a computer in my office.
Statement 59: Yes, as sometimes patient files go missing and then we cannot view what the patient has been treated for previously. A new folder has to be created and the process to try and find the folder is a tedious process.
Statement 60: Electronic records are best

4.4 Clustering statements into meaning units or themes

Nine themes emerged from the collected data relating to the research questions. Interviewees' experience was clustered into themes, namely performance expectancy, effort expectancy, social influence, facilitating conditions, technology awareness, learning (literacy skills), negative attitudes relating to EHR, experience with paper folders, change in attitude towards EHR. These themes are not named in any logic order. The researcher identified overlapping statements and these were eliminated. Once this was completed, the researcher used these themes and statements to provide answers to the research questions guiding this study. The below provides an explanation on how these nine themes were derived.

Table 4.2: Themes and interviewees' statements

Theme 1	Interviewees' statements
Performance expectancy	**Statement 1:** "When I first started working at this hospital we did everything manually; however from 2008 we started to use an electronic system to record patient information, such as telephone number and home address and so forth. It is a huge improvement to what we used before. The information that is saved on the computer is only patient information but it does not include the medical history."
	Statement 2: "Yes it will; however it still needs to be manually updated by a staff member. Patient information needs to be captured right the first time round so that we can trace the patient information. Yes, it is more efficient if the person captures the information right."
	Statement 38: "Yes, as long as the internet connection is working then the process will be more efficient. Often patient folder gets lost, power failures occur and we do not have enough generators to accommodate the entire facility."
	Statement 7: "The unique patient number can be traced. It helps with getting patient information quicker and trace patient history in times of an emergency."
	Statement 13: "Yes, it will improve the quality of services to patients."

Theme 2	Interviewees' statements
Effort Expectancy	**Statement 4:** "It seems complicated to use."
	Statement 32: "My previous employment adopted an EHR; however, I felt that I could write faster than typing."
	Statement 47: "I would not know."
	Statement 39: "Using the system takes too much time and I would end up seeing less patients."

Theme 3	Interviewees' statements
Social influence	**Statement 8:** "Going fully EHR is very costly and the government does not have the funding for it. The issue of high theft especially in poor areas within the Western Cape or what is known as high crime areas."
	Statement 20: "The buy-in from the staff would be the main concern."
	Statement 57: "I previously worked at a healthcare facility whereby an EHR was adopted but there was a waiting area where doctors had to book a computer in order to look up a patient's medical records. There was not enough computers to accommodate all the doctors."
	Statement 33: "Paper as I am used to writing rather than typing."

Theme 4	Interviewees' statements
Facilitating conditions	**Statement 10:** "Yes, it will go faster as we can locate the folders quicker in times of an emergency."
	Statement 21: "I cannot say as our hospital has not adopted a full EHR so I would not know."
	Statement 42: "Yes it will, as plenty of the time is spent at reception and that can be reduced."

Theme 5	Interviewees' statements
Technology awareness	**Statement 17:** "An EHR is not really significant to my job."
	Statement 27: "It is not important; we can do our job without it as we have been doing it for a long time now."
	Statement 37: "Anyone can steal a paper folder and anyone can hack a computer."
	Statement 35: "Confidentially is the biggest concern."

Theme 6	Interviewees' statements
Learning (literacy skills)	**Statement 11:** "No computer course has been offered; however, I know the basics of a computer like how to put it on and off and how to check for patient results."
	Statement 18: "Yes, but very basic such as the Microsoft packages."
	Statement 30: "The only experiences I have with computers are very basic as the only training I had was done at high school."
	Statement 5: "Yes, if you have previously been on a computer training course it would help you to work your way around the system; however the department of health does provide training to staff members who are working on an EHR. They start with the basic training to intermediate training."
	Statement 45: "We are a public healthcare facility, everything we do is on paper. We write everything on paper."
	Statement 56: "As a doctor I haven't been on a training course as we do not use computers to do our job unless it is for blood results. However, if training was given to us we would know how to work our way around the system."
	Statement 52: "Yes, as we did computers in our first year of university."

Theme 7	Interviewees' statements
Negative attitudes relating to EHR	**Statement 32:** "My previous employment adopted an EHR; however, I felt that I could write faster than typing."
	Statement 9: "The downtime especially with load shedding and we do not have enough generators within our facility. In load shedding times it is difficult to allocate appointments for patients."
	Statement 40: "I would recommend that the system be integrated with other facilities as this would help if the individual is not a patient of the medical facility."
	Statement 34 : "There is a lack of computers within our facility as well as bad infrastructure."

Theme 8	Interviewees' statements
Experience with paper folders	**Statement 6:** "We have been carrying out the same process for years and I do not see the need to change our job. If a patient walks into our facility that needs immediate medical assistance, it would take time to navigate my way through the system in order to retrieve the patient's file, this could become a serious issue."
	Statement 50: "An EHR would make my daily operations less frustrating due to the misplacement of patient folders, poor quality of folders and being able to share data between different facilities."
	Statement 59: "Yes, as sometimes patient files go missing and then we cannot view what the patient has been treated for previously. A new folder has to be created and the process to try and find the folder is a tedious process."
	Statement 48: "To streamline processes as sometimes we wait long for patients to come see us and it is not they were at the healthcare facility late. It is because processes are so slow and

	services are so bad that it takes a while for patients to see us."

Theme 9	Interviewees' statements
Change in attitude towards EHR	**Statement 15:** "I have been working at this facility for years and I feel like if I must learn a new way of doing my job even though I know my job would be made easier, I will definitely get nervous about using a computer."
	Statement 25: "Cutting out paper based and making it fully electronic. If we could access the dispense medication electronically, the filling system would not be so bad."
	Statement 46: "Yes, it would assist me to check if patients need to come in for their follow up for example babies that need to come in for their immunisation."
	Statement 23: "Yes especially when dispensing medication for our patients. We can see when or what kind of medication was previously given to the patient."

Question 1

Explain the process of a patient seeking medical assistance from the time he/she visits the administrative counter until the patient comes into contact with you.

This question is linked to sub-question 2 whereby the interviewee is permitted to provide a detailed description of how current processes (theme: experience with paper based folders) are conducted in the healthcare facility. This is therefore linked to the experience with paper based folders theme of the conceptual framework stipulated in chapter 5 and will be further explained below.

Questions 2

What kind of experience do you have working with any form of computers/computer system and have you embarked onto a computer training course?

The above question is linked to sub-question 1 and gives the interviewees the chance to illustrate their computer literacy skills (theme: learning) and, in doing so, define how confident they are using computers/computer systems. This will also illustrate if they have

worked with computers in their previous/current employment and if they had any form of training courses completed.

Question 3

Do you know what an electronic healthcare record (EHR) is and have you ever used it at your previous employment (if adopted) when performing your everyday duties?

The participants were asked if they had knowledge (theme: learning) of an EHR and if they had used it before, as well as what are their thoughts were about using the system. This question is linked to the conceptual framework, which is associated with the learning aspect of the framework and is also linked to sub-question 1.

Questions 4

If you have or have not previously used an EHR, do you think that it would assist you to accomplish your day-to-day operations more efficiently?

- When comparing the traditional patient recordkeeping to the electronic format, do you think that the EHR will assist you to retrieve patient information more promptly?
- Do you think that, by making use of an EHR, it would have an effect on the quality of your or medical employees' decision process as one can have access to patient history quicker?
- If you have or have never utilised an EHR before, would you think that the system is difficult to utilise?
- Do you think that your computer literacy skills will assist you with the potential use of an EHR?
- Would you feel more comfortable doing a training course should an EHR be implemented at your current healthcare facility?
- If you could choose, which category of system are you more comfortable with?

A comparison between an electronic and paper-based system would specify which form of recordkeeping they would prefer based on their knowledge or what society (theme: social influence) has pointed out and is thus linked to sub-question 2. If the participants have or have not worked with the systems before, what are their opinions regarding the ease of use (theme: effort expectancy) of an EHR. Based on interviewees knowledge, they were also asked whether using an EHR would assist in the quality of their work output (theme: performance expectancy) as well as if training was provided would, they feel comfortable using the system (theme: learning). This allowed individuals to really provide feedback, whether positive or negative, on using an EHR and is hence linked to sub-question 1.

Question 5

Based on your knowledge of an EHR, what are the features or functionalities you would found helpful for patient recordkeeping?

Based on their knowledge, healthcare employees were asked to give feedback regarding functionality should a potential EHR adoption take place within their healthcare facility. They also needed to indicate if they were comfortable using the elements within an EHR (theme: performance expectancy). This question is linked to sub-question 2.

Question 6

What do you think are the key challenges that your current public healthcare facility faces with regard to EHR adoption?

Participants were allowed to mention and raise their concerns regarding why they think that an HER adoption within their healthcare facility has not taken place (theme: social influence). This is therefore linked to sub-question 2.

Question 7

Based on your knowledge, what changes would you recommend should an EHR be adopted at your current healthcare facility?

This question is linked to sub-question 2 and was directed at medical employees who have knowledge of an EHR and, based on their knowledge, which aspects they would change. This raised their concerns about the potential use of the technology (theme: negative attitudes relating to EHR).

Question 8

Based on your knowledge, how significant is an EHR is to your work?

The above question is linked to sub-question 1 and relates to the theme, change in attitude towards an EHR.

Question 9

Do you think that personal patient data is more protected with an EHR?

Questions 9 is based on knowledge (theme: ICT awareness) and therefore is linked to sub-question2.

Question 10

Do you think that the waiting time to be consulted by a healthcare professional will be reduced should this technology be adopted into your healthcare facility?

This question was grounded in the benefits of an EHR should this technology be adopted at their current healthcare facility (theme: facilitating conditions) and is linked tosub-question1.

The figure below provides an indication of the themes used in order to answer the research questions guiding this study (refer to step 11 of the research journey).

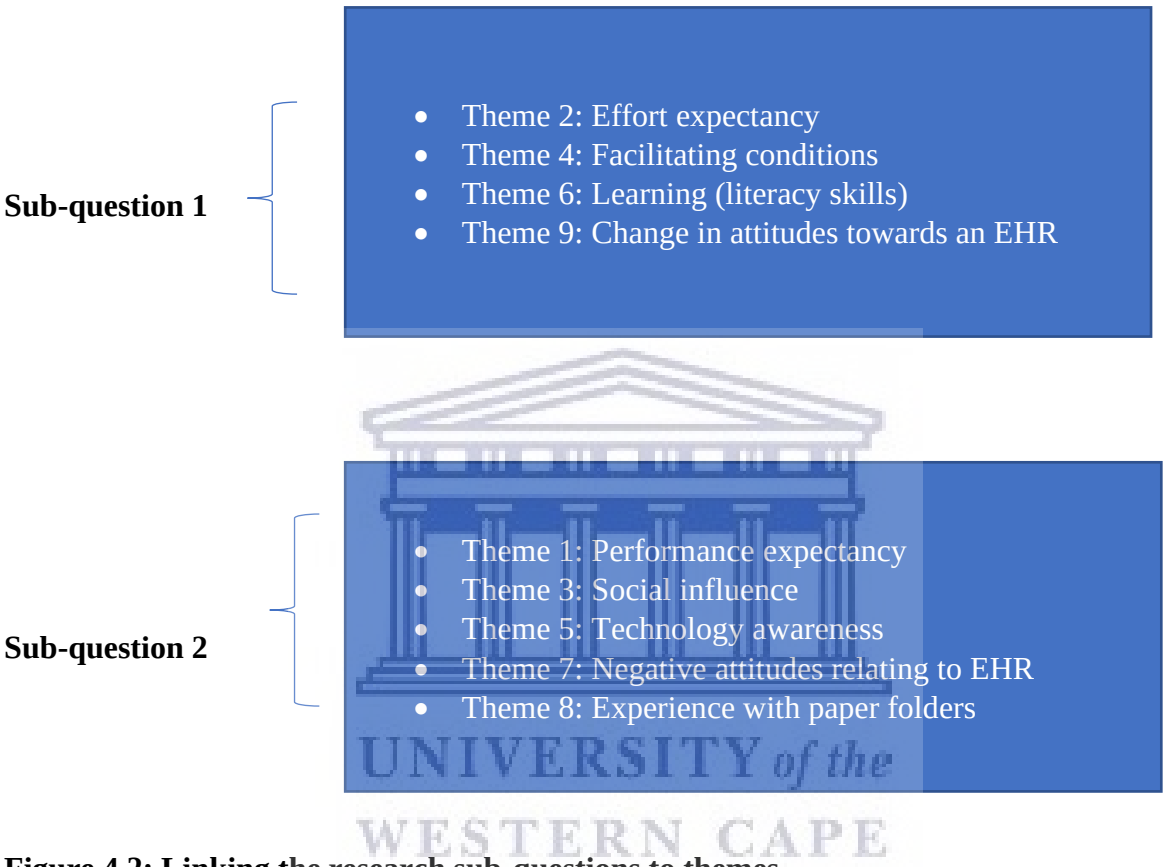


Figure 4.2: Linking the research sub-questions to themes

4.5 Findings and discussion of research sub-questions

Sub-question 1: What will hinder the acceptance of EHR by healthcare professionals in the Western Cape?

Theme 2: Effort expectancy

In this section of the interview, participants were asked if they would think that the system was difficult to use whether they have or have not used the system before. This would indicate their opinions regarding the ease of use of the system.

Interviewees who did not have much computer literacy skills indicated that the system would be difficult to use. A nurse said, “It seems complicated to use.” Some respondents even said that they were unsure of the ease of use of the system. A doctor said, “I would not know.”

Another doctor indicated that an EHR had been adopted at her previous employment; however, she preferred to hand write all her patient notes as she felt she could write faster compared to using a keyboard. She said, “My previous employment adopted an EHR; however, I felt that I could write faster than typing.”

Participants who were comfortable with paper folders pointed out that an electronic system takes a lot of time to navigate, even if they know the benefits such as that it is environmentally friendly. Furthermore, it is crucial for processes to be conducted swiftly, especially in a case of an emergency. In addition, total patient consulting intake would drop. A doctor said, “Using the system takes too much time and I would end up seeing less patients.” The data collected found that age and experience but not gender had an effect on technology acceptance. Interviewees with longer years of experience were more prone to imbedded practices of paper based record keeping. Age played a role because younger generations of staff were more likely to use the technology when being compared to older staff members.

Theme 4: Facilitating conditions

Some of the participants recognised the advantages of an EHR and what this would mean to their healthcare facility. These advantages that were discussed during the interview were that EHR adoption would allow them to save time with the patient-retrieving process and also give rise to better service and treatments. An administrative member staff said: “Yes, it will go faster as we can locate the folders quicker in times of an emergency.”

Some individuals had no experience working with an electronic system for patient recordkeeping and thus could not indicate if adoption would reduce the waiting time for patients to be consulted by a professional. A nurse said, “I cannot say as our hospital has not adopted a full EHR so I would not know.”

Due to the loss of patient folders, services could be hindered and, more specifically, the waiting time patients spend at the reception area would increase. A doctor said, “Yes it will, as plenty of the time is spent at reception and that can be reduced.”

Some older interviewees expressed less confidence in using an EHR. While conducting these interviews, older and more experienced employees showed less enthusiasm towards the adoption of a new technology and were less likely to use it when being compared to younger and less experienced employees. Younger employees proved to be more comfortable with technology when compared to older employees and thus had a positive effect on potential use of an EHR.

Below is a breakdown of the types of technologies that are available in these five healthcare facilities.

Table 4.3: Types of technologies available

Healthcare facility	ICT available
Healthcare facility A	Lots of computers, internet access in certain departments, telephones services, photocopy machines, printer and telemedicine equipment.
Healthcare facility B	No computers kept in consulting rooms and limited computers throughout the facility, internet access only in administrative area, limited telephone services, and lack of telemedicine equipment.
Healthcare facility C	Computers, internet access in certain officers, telephone services, a photocopy machine, a printer and telemedicine equipment.
Healthcare facility D	Computers, internet access, telephone services, photocopy machines, printers and telemedicine equipment.
Healthcare facility E	Computers, internet access in departments, telephone services, photocopy machines, printers and telemedicine equipment.

Theme 6: Learning (literacy skills)

Most of the interviewees had basic computer knowledge, such as using the internet, and were familiar with Microsoft packages. A nurse said, “Yes, but very basic such as the Microsoft packages.” Another nurse said, “No computer course has been offered; however, I know the basics of a computer like how to put it on and off and how to check for patient results.”

The administrative staff seemed to have more computer skills than most of the medical professionals. An administrative employee said, “Yes, if you have previously been on a

computer training course it would help you to work your way around the system; however the department of health does provide training to staff members who are working on an EHR. They start with the basic training to intermediate training." One interviewee, a doctor, had previously worked on an EHR at a private sector healthcare facility. This was the only respondent with prior experience using an EHR. Out of the fifteen participants, ten had basic knowledge of an EHR. Their EHR knowledge was minimal because most of their daily processes were conducted on paper. "We are a public healthcare facility, everything we do is on paper. We write everything on paper." The interviewees with longer years of working experience were not willing to change the way they conducted processes over the years and didn't feel the need to upskill themselves.

A doctor indicated that the only computer training classes she has done was in high school. She indicated, "The only experiences I have with computers are very basic as the only training I had was done at high school." However, a pharmacist indicated that the only computer training she has attended was completed in first year of university, as it was a compulsory module. She said, "Yes, as we did computers in our first year of university." Most interviewees described a lack of computer training within public facilities, however, younger interviewees were more willing to attend training should the technology be adopted when compared to older interviewees.

All of the respondents agreed that having strong computer literacy skills would be a benefit when navigating through an EHR. A doctor said, "As a doctor I haven't been on a training course as we do not use computers to do our job unless it is for blood results. However, if training was given to us we would know how to work our way around the system." The availability of literacy skills amongst professionals could potentially lead to the actual use and acceptance of a technology. This is because most professionals with a computer background are more likely to acknowledge the benefits of an EHR, especially when it is used to enhance their daily processes (Mugo & Nzuki, 2014).

During the interviews, the participants who realised the benefits of an electronic system and were aware of technology use and what it could means to their facility were more willing to consider the potential use of an EHR should the adoption take place. Learning (literacy skills) plays an important role, as many participants with minimal computer knowledge were unsure about adoption; however, the individuals who had computer skills were more willing to make use of an electronic system. There is a direct relationship between experiences and adoption, and therefore, based on the participants' experiences with a paper-based format, this

relationship could be either positive or negative. Based on the type of relationship, it could influence whether or not adoption is favourable. Attitudes thus also determine how individuals feel and view adoption.

Computer literacy skills are considered to be determining factors for EHR adoption. They are needed in order to raise positive attitudes amongst healthcare professionals, which could also be linked to greater EHR adoption. Hence, developed countries have now increased efforts to advance computer skills and have thus integrated training into healthcare programmes (Mugo & Nzuki, 2014).

Theme 9: Change in attitude towards EHR

An EHR has been recognised to play a key element within the healthcare system. These key drivers include enhancing the efficiency of service delivery, having better access to medical care services and improving the protection of patients (Florence, 2016). The aim of documenting information is therefore to keep up with and support patient care (Harman, Flite Bond, 2012). A pharmacist said, "Yes, especially when dispensing medication for our patients. We can see when or what kind of medication was previously given to the patient." An administrative employee said, "Cutting out paper based and making it fully electronic. If we could access the dispensed medication electronically, the filling system would not be so bad."

Another interviewee stipulated that, as she was a professional nurse, it would assist her with patient care in terms of viewing when patients last had an immunisation. "Yes, it would assist me to check if patients need to come in for their follow, up for example babies that need to come in for their immunisation." However, another interviewee said, "I have been working at this facility for years and I feel like if I must learn a new way of doing my job even though I know my job would be made easier, I will definitely get nervous about using a computer".

The collected data revealed that there is a relationship between age of the employee and the technology adoption. Younger employees felt that with the technology in place, it would act as a useful tool in terms of carrying out daily processes when being compared to older employees. Older employees had a higher barrier to potential use and adoption compared to younger employees as they were more familiar with the traditional way of patient recordkeeping. Older employees had a higher level of anxiety should a new technology be introduced into their working environment.

Sub-question 2: What factors would cause restrictions towards an EHR adoption according to the healthcare professionals in the Western Cape?

Theme 1: Performance expectancy

During the interview process, participants were asked to elaborate on whether it would assist with the quality of their work output if they were to use an EHR. A doctor who is employed at healthcare facility A indicated that by using an EHR it would assist her with improving the services she provides for her patients. The doctor said, "Yes, it will improve the quality of services to patients."

An EHR has the ability to enhance patient care as well as strengthen the link between the patient and the medical professional. This is achieved by providing access to updated and correct patient data (Lorenzi, Kouroubali, Detmer & Bloomrosen, 2009). When comparing an EHR and paper-based records, many of the interviewees said that they would be able to retrieve patient information more promptly with the technology in place. However, the data needs to be captured correctly in order to provide the patient with an accurate diagnosis. A member of the administrative staff said, "Yes it will, however it still needs to be manually updated by a staff member. Patient information needs to be captured right the first time round so that we can trace the patient information. Yes, it is more efficient if the person captures the information right."

Some participants reported that the process of retrieving folders would not be shortened by using an EHR, as the paper system allows medical staff to conduct the same process, provided that the folders are kept in a legible form. This was indicated because of the downtime with internet access in certain healthcare facilities. Younger employees (between the ages of 24-40) felt that even with the downtime, the technology would still play an imperative role in terms of enhancing processes. However, older interviewees (ages of 41-59) expressed that the retrieving of paper folders would still be the ideal way of conducting processes, providing that the folders are kept in a legible form. This had a direct influence on intension to use an EHR.

A nurse employed at healthcare facility E said: "Yes, as long as the internet connection is working then the process will be more efficient. Often patient folder gets lost, power failures occur and we do not have enough generators to accommodate the entire facility." Some even felt that if an EHR was adopted at their facility, they would still have to switch between the two forms of recordkeeping, as a bad internet connection and power failures are often an

issue. The adoption of technologies within healthcare facilities is dependent on the ICT infrastructure (Furusa & Coleman, 2018).

Most doctors agreed that the concept of EHR adoption within their healthcare facility was appealing. They would be better able to decide on treatments as more information would be known about the patient. Information that is well documented and presented would enhance accuracy of care. A doctor indicated, "When I first started working at this hospital we did everything manually; however, from 2008 we started to use an electronic system to record patient information, such as telephone number and home address and so forth. It is a huge improvement to what we used before. The information that is saved on the computer is only patient information but it does not include the medical history."

An administrative staff member employed at healthcare facility E explained that each patient was assigned a unique number and each patient can be identified by this number. This also assists staff to locate patients situated in other healthcare facilities. In addition, this is especially helpful when a patient history is needed in case of an emergency. "The unique patient number can be traced. It helps with getting patient information quicker and trace patient history in times of an emergency."

Theme 3: Social influence

A comparison was done between an electronic and a paper-based system. The participants were asked to specify which form of system for recordkeeping they preferred. Based on the results of the interview, three participants voted for an EHR, seven voted for a paper system and five voted for both types of recordkeeping. "Paper, as I am used to writing rather than typing." Social influence can either drive towards acceptance and intension to use as well as at hinder it.

All of the participants were allowed to voice their concerns about why their facility had not adopted an EHR. Lack of funding was one of the biggest concerns; some even indicated that they did not have a computer in their consulting room. A doctor said, "I previously worked at a healthcare facility whereby an EHR was adopted but there was a waiting area where doctors had to book a computer in order to look up a patient's medical records. There were not enough computers to accommodate all the doctors." Another concern raised was the buy-in from medical employees. "The buy-in from the staff would be the main concern." The collected data revealed that experienced and older employees are more doubtful about the benefits they could attain with an EHR. Thus, the lack of perceived benefits could

outweigh the cost factor of adoption as a main element for less use of EHR by older employees. The issue of theft, especially in poor areas or what are referred to as high-crime areas within the Western Cape, was another concern. “Going fully EHR is very costly and the government does not have the funding for it. The issue of high theft especially in poor areas within the Western Cape or what is known as high crime areas.”

Theme 5: Technology awareness

A nurse from the healthcare facility E said that she did not think that an EHR was needed in her current job. She said, “An EHR is not really significant to my job.” adopting a technology aspect was dependent on the role he or she has within the facility.

Many of the interviewees’ replies were dependent on their clinical duties. A doctor said, “Currently it is not important because I don’t have a computer in my office.” A nurse said, “It is not important, we can do our job without it as we have been doing it for a long time now.” The current process for requesting a patient folder starts with contacting the patient’s medical professional. The file is then manually delivered to the facility or, alternatively, it is scanned and e-mailed to the authorised requester. A doctor stipulated, “If adopted, it can assist me to do my work more promptly.”

One of the main concerns regarding adoption of an EHR was confidentiality, privacy and security of patient data. This was stipulated across all ages and years of experience and influenced the potential use of the technology. Some interviewees were sceptical that patient data would be more protected with the adoption of an EHR. This is an issue, as it could potentially mean that medical professionals would be despondent about using an EHR for their daily duties. A doctor employed at healthcare facility A responded by saying, “Confidentially is the biggest concern.”

Theme 7: Negative attitudes relating to EHR

Access to equipment such as computers is limited, as a doctor indicated that at her current employment there is a lack of computers for staff. “There is a lack of computers within our facility as well as bad infrastructure.” Several developing nations have insufficient resources to furnish medical facilities with new and upcoming technologies. As a result, there also is a lack of funds allocated to address long- as well as short-term needs (Furusa & Coleman, 2018).

However, some of the participants believed that using paper records would also allow them to accomplish their daily duties. Some participants even stipulated that they did not require an EHR in order to carry out their daily operations, especially in times when there is no electricity. An administrative member of staff said, “The down time especially with load shedding and we do not have enough generators within our facility. In load shedding times it is difficult to allocate appointments for patients.” The interviewees’ medical professional title seemed to have little affiliation with the responses that were given. However, their responses were based on previous experiences or on perception. A doctor said, “My previous employment adopted an EHR; however, I felt that I could write faster than typing.”

When asked what changes they would recommend should this technology be adopted within their facility, a doctor at healthcare facility A suggested that the system must be integrated with other neighbouring facilities as this would assist during patient care. She indicated “I would recommend that the system be integrated with other facilities as this would help if the individual is not a patient of the medical facility”.

According to the data that was collected in the interview, the relationship between age, experience and attitude regarding an EHR is predominantly negative. This means that as the interviewees experience and age increase, their negative attitudes towards potential use and acceptance increased.

Theme 8: Experience with paper folders

Some participants described feelings of frustration towards using paper-based folders. A 32-year-old pharmacist pointed out that the administrative process of retrieving patients’ medication history would be reduce, as paging through a folder for updated patient information is time consuming. He also indicated that making use of an EHR would help them to get access to patient data quicker and also view previously prescribed medication. He pointed out: “Yes, as sometimes patient files go missing and then we cannot view what the patient has been treated for previously. A new folder has to be created and the process to try and find the folder is a tedious process.” Most of the younger aged employees showed signs of frustrations towards traditional record keeping, this had a positive effect on potential to use the technology.

In most instances, participants who had previously experience working with an electronic system were interested and keen on streamlining processes. This would give to better services for patients. A nurse said, “To streamline processes, as sometimes we wait long for patients

to come see us and it is not they were at the healthcare facility late. It is because processes are so slow and services are so bad that it takes a while for patients to see us."

A nurse said, "An EHR would make my daily operations less frustrating due to the misplacement of patient folders, poor quality of folders and being able to share data between different facilities." Larger medical facilities need a very big area for storage that contains a high volume of records. This makes it rather challenging to maintain and preserve the information kept in these folders. Therefore, it is not uncommon to find that these folders are either insufficient or have issues with legibility (Côrtes & Côrtes, 2011). Another said, "Paper based is a longer process. I choose electronic as it is a faster process as long as you are very active and know your way around the system."

However, a doctor with years of experience indicated, " We have been carrying out the same process for years and I do not see the need to change our job. If a patient walks into our facility that needs immediate medical assistance, it would take time to navigate my way through the system in order to retrieve the patient's file, this could become a serious issue." Some interviewees felt that working with technology would hamper their job performance as the complexity of finding information, using programs and navigating through the system could be time consuming. Participants who had computer skills were keen and more enthusiastic about the adoption of an EHR than those who did not have much computer knowledge. Older generations would find navigating around the system more of a struggle.

4.6 Textual and structural descriptions

Textual descriptions

This section of the data analysis explains the group's description of the phenomenon relating to the potential role of an EHR for patient recordkeeping. Some participants expressed feelings of enthusiasm and eagerness towards using an EHR to conduct their daily duties. However, others had negative feelings towards the potential use and acceptance of an EHR within their healthcare facility. The adoption is determined by the attitudes of clinical employees. Positive effects of early user involvement in design and development will therefore conclude to a successful adoption of a new technology (Haighton, Kaner, O'Donnell & Shaw, 2018).

According to the collected data, the participants who felt enthusiastic specified that it would enhance patient care and provide quality services to their patients. It was also indicated that

the tedious part of their duties were when folders went missing and previous treatment could not be traced. Some even indicated that if patient information was correctly typed and saved, an EHR would make their job easier. Some interviewees explained feelings of frustration when it came to working with a paper-based folder, as some of these folders were not kept tidy and some papers were missing.

On the other hand, medical professionals explained the hurdles to providing quality patient care were viewed as significant causes of professional dissatisfaction. This professional dissatisfaction and negative feelings towards an EHR was justified by the lack of resources and poor infrastructure issues, as most of these healthcare facilities has issues with their internet connection and had insufficient generators for when power failures occurred. Others did not feel the need to change the way processes we being carried out, as long as the folders were kept neatly. One interviewee said that the biggest concern within her healthcare facility would be the buy-in from staff members. User acceptance is of the key elements for success in EHR adoption (Clark, Hasanain & Vallmuur, 2015). Ref Some interviewees even said that they can write faster than type and that using an EHR would interfere with their job by slowing down the process of assisting their patients, which would mean that they would consult with fewer patients daily.

When comparing the negative and positive attributes relating to both electronic and paper-based systems, three participants voted for and were keen for an EHR adoption, whereas seven voted for a paper system and also felt negative towards an EHR. Furthermore, five voted for both types of recordkeeping, as they were comfortable with technology.

Structural descriptions

The structural descriptions focused on how these participants ended up not being in favour of using an EHR for patient recordkeeping. Most of the participants had previously only worked with paper-based records, as most of them had only been employed in the government sector. These participants felt strongly about conducting processes in this manner.

The participants could be grouped into two groups. The first group of interviewees had basic computer skills and indicated that the system would not be difficult to use if training was provided. However, the second group with minimal computer skills felt that it would be more of a challenge to navigate the system. Participants who had basic computer skills were keen for and more enthusiastic about the adoption of an EHR compared to those with minimal computer knowledge.

The administrative staff members seemed to have more computer knowledge than most of the medical employees interviewed. Some medical staff, such as doctors and nurses, had taken a computer class at university while studying towards their undergraduate degree, and some even had computer classes at high school. The medical staff indicated that no formal computer training was provided in their current position. When the researcher asked these medical staff to share their computer knowledge, most of them only had knowledge relating to the Microsoft package, more specifically Microsoft Word and Excel. Computer literacy is one of the most common barriers to EHR adoption (Hasanain , et al., 2015).

According to the interview, some even voiced their opinion regarding the security and confidentially of their patient information. As mentioned previously, seven participants were in favour of a paper-based system compared to three participants who were keen on an EHR. This is more than half of the participants from healthcare facilities who took part in the interview process.

4.7 Description of the meaning and essence of the experience

During the interviews, participants gave reasons why they were not keen on EHR adoption. Many indicated that they had become accustomed to paper-based recordkeeping and were not in favour of changing the way processes were done. Many participants were also comfortable with the current processes at their healthcare facility.

Furthermore, in order to understand why they were not keen, the researcher recalled the participants feeling negatively towards an EHR. Within their healthcare facility, most of them indicated a lack of resources, insufficient computer training provided, poor infrastructure and the issue of power failures, accompanied with insufficient generators for the facility. Some even indicated that the EHR adoption was not needed in order to carry out clinical duties. It was also discovered that some of the interviewees had different feelings about their duties and responsibilities.

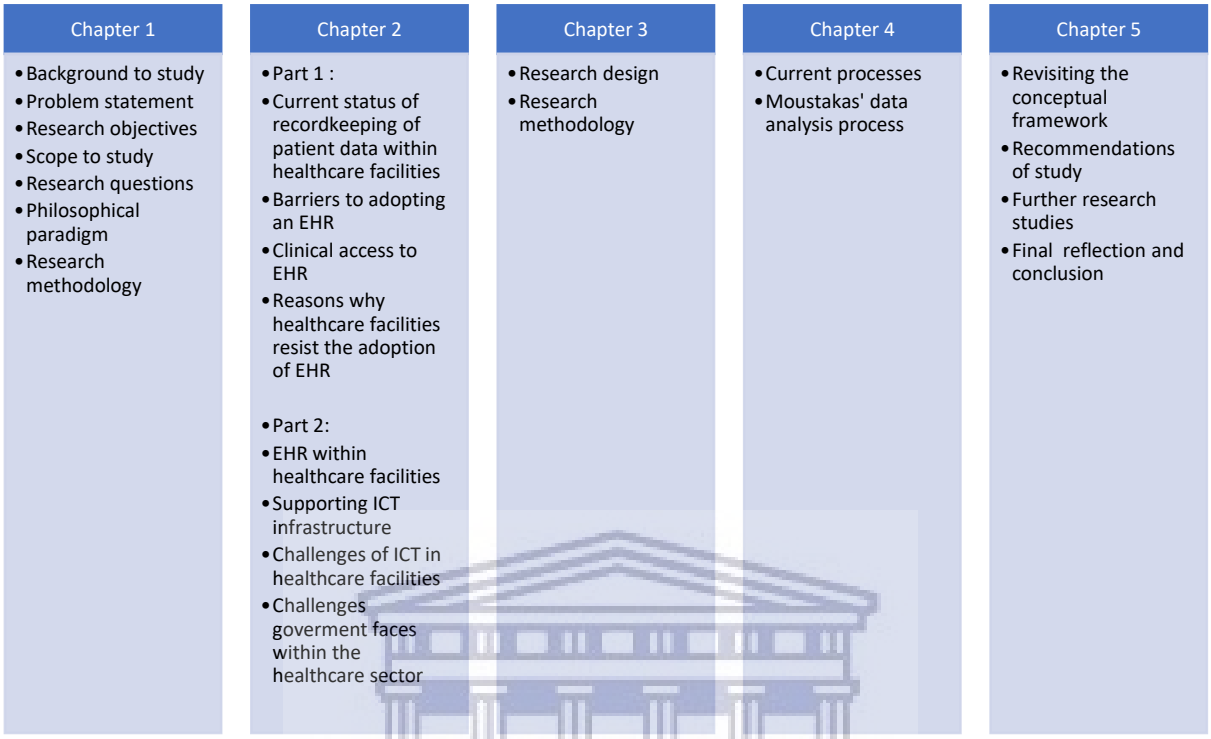
The computer skills of the participants had a big influence on their choice of system. The less computer knowledge the participant possessed, the more he/she was not keen on an electronic system. Overall, the interviewees were not in favour of an EHR, as most of them preferred the traditional way of patient recordkeeping.

Summary

This chapter discussed the experiences of 15 clinical employees at five healthcare facilities. These participants were not using an EHR whilst performing their duties. It also indicated that all of these facilities were making use of the traditional form of patient recordkeeping.

Some of the issues raised in the interview, such as the need for encouragement from professionals, are all concerns surrounding public health. Other matters pointed out were the lack of computers, resources, literacy skills, funding and, lastly, the poor infrastructure. The respondents' professional title had no affiliation with the manner in which the interview questions were answered. However, it was also recognised by the researcher that computer skills had a considerable influence on the participants realising the benefits of an EHR. Understanding the participants' acceptance of technology will assist the implementers of the healthcare sector (Tubaishat, 2017). The next chapter provides recommendations, and presents the final reflection on and conclusion of this study.

Chapter 5: Recommendations and Conclusion



Introduction

The aim of this study was to examine the perceived role of an EHR in patient recordkeeping and to investigate the acceptance and potential use of an EHR towards adoption by healthcare professionals. More specifically, the study looked at the effects of an EHR adoption in government hospitals, the factors that hinder the acceptance of an EHR by healthcare professionals and, lastly, factors that would cause restrictions of an EHR towards adoption by healthcare professionals.

The data analysis conducted in Chapter 4 was used to answer the research sub-questions and objectives two and three. This chapter proposes recommendations, make suggestions for further research, draws a conclusion as presents the researchers' final reflections.

5.1 Main research question and sub-questions

With the adoption of an EHR, medical care services in the Western Cape would not only potentially experience an improvement in patient recordkeeping, but more so could produce a quality service within the integrated system. This study seeks to find answers regarding the acceptance and potential use of an EHR and therefore prompted the below research questions:

What factors influence the potential role of an EHR in the recording of patient information in a public healthcare facility?

The following sub-questions emerged from the main question:

i) **What will hinder the acceptance of EHR by healthcare professionals in the Western Cape?**

ii) **What factors would cause restrictions towards an EHR adoption according to the healthcare professionals in the Western Cape?**

5.2 Revisiting the conceptual framework

Based on data analysis as set out by Moustakas (1994), there were themes that emerged from the collected data. Interviewees' experiences were clustered into nine themes, namely performance expectancy, effort expectancy, social influence, facilitating conditions, technology awareness, learning (literacy skills), negative attitudes relating to EHR, experience with paper folders, and change in attitude towards EHR. The unified theory of acceptance and use of technology (UTAUT) is considered an older model; however, the quoted themes are relevant to this model.

According to the UTAUT model, there are four elements that affect technology acceptance, namely social influence, effort expectancy, performance expectancy and facilitating conditions. Social influence is when individuals believe that others should determine whether or not they make use of a system, whereas effort expectancy looks at the ease of use of a system. Furthermore, performance expectancy is when individuals believe that making use of a system would assist them to achieve good job performance. Lastly, facilitating conditions refer to the supportive infrastructure in place to support a system that is used by individuals (Kiwanuka, 2015).

This study made use of a qualitative method of UTAUT while conducting an investigation of the acceptance of EHR by clinical professionals in the Western Cape. In doing so, it also took another look at the UTAUT model and therefore proposed an extension of the existing model with important constructs such as technology awareness, learning, experience with paper based folders, negative attitudes and change in attitudes towards an EHR. UTAUT should

include the technology processes as well as the environment in which the technology is being used in order to predict use and the acceptance of a technology (Kiwanuka, 2015).

The UTAUT applies more to end users than organisations, and therefore is used to understand human elements and factors within studies. However, it does fail to highlight traits of individuals (Kiwanuka, 2015), such as attitude towards an EHR, experience with paper folders, literacy skills, technology awareness and change in attitudes towards an EHR. These themes emerged from the collected data based on technology acceptance for a potential EHR adoption. The learning theme provides an overview of the computer literacy skill levels of the interviewees as this indicated the willingness to accept a technology. Technology awareness brought forward if the interviewees understood the type of benefits they can attain should an adoption take place within their healthcare facility. The experience employees have when it comes to working with paper based folders, provided an overview of the type of processes that are conducted at their facility. This also indicates if employees are comfortable using this type of method for patient recordkeeping. The negative attitudes towards an EHR indicated whether interviewees have any negative feelings regarding the potential adoption of the technology. The last theme, change in attitude towards an EHR, indicated if the technology will benefit them while conducting work processes should this system be adopted.

UTAUT, together with the themes, were used in order to study the adoption of EHR in healthcare facilities. When technology adoption occurs within a multiplex environment it is influence by numerous aspects and factors that needs to be analysed.

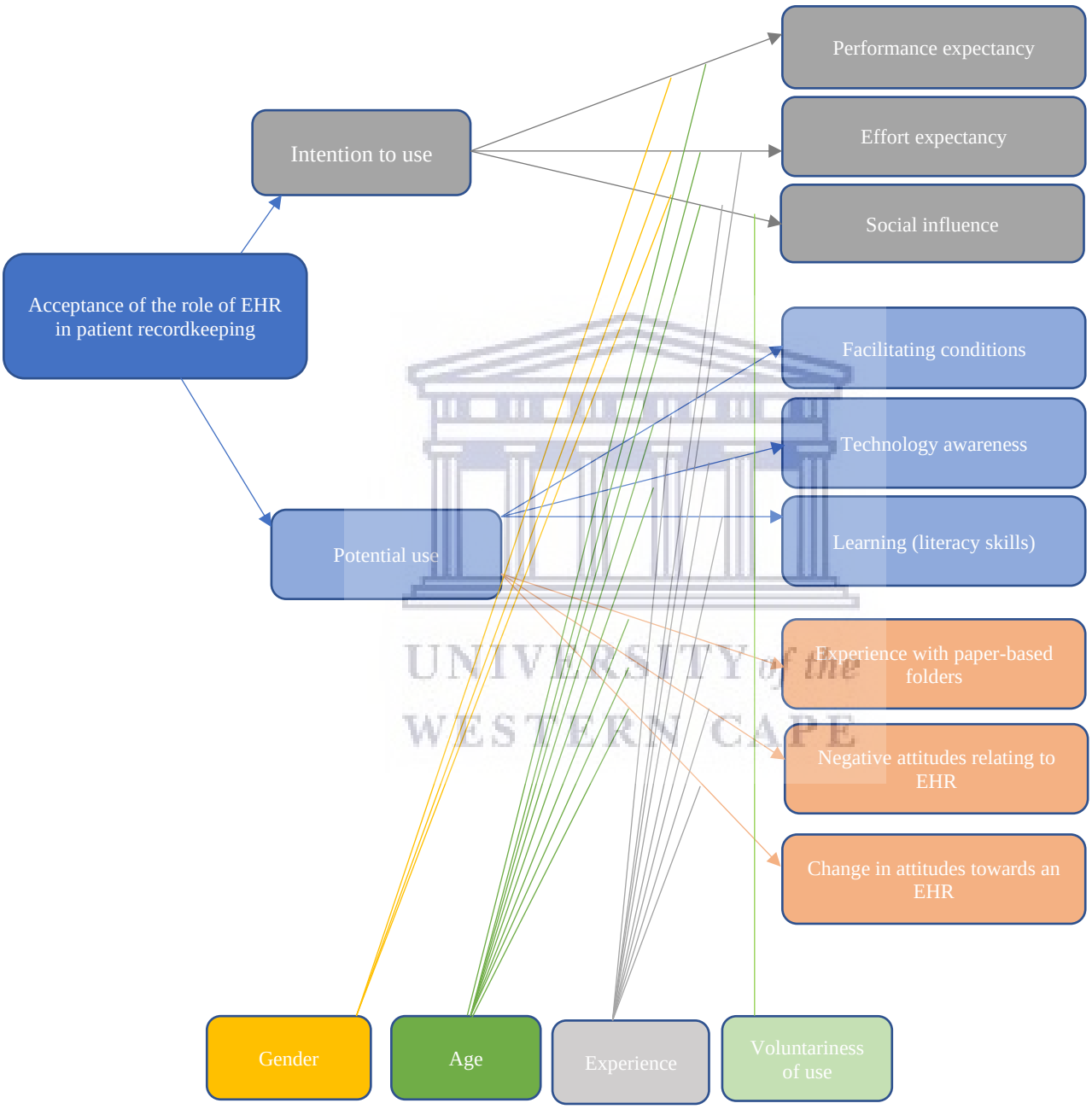


Figure 5.1: Updated conceptual model: EHR for patient recordkeeping (Venkatesh, et al., 2003).

5.3 Recommendations of the study

The biggest challenge towards an EHR acceptance and use is understanding resistance to change and reasons for this. There are some healthcare employees that will embrace a technology adoption and drive it and those that will resist it.

Given the benefits that accompany an EHR and what this means to public health care in South Africa, there are still uncertainties among clinical professionals regarding acceptance and potential use that need to be resolved. These uncertainties, which were discussed with the researcher during the interview process. The below explains how these recommendations are addressed to the main research question for this study. These recommendations contribute to existing literature and provide factors that influence the role of EHR as well as act as a guideline should the technology be adopted within these five healthcare facilities that took part in the interview process.

Recommendation 1:

The attitude of employees towards an EHR is considered as important in the acceptance and usage of such a technology. In order for clinical employees to be enthusiastic, they need to understand the benefits of the adoption and also be mindful of the protection of patients' personal medical information. An introductory meeting should be conducted whereby management introduce the EHR thus demonstrating the system.

In order for a patient to trust a medical professional, his or her medical records must be kept safe. The confidentially and safety concern that rises from patient medical information stems from the adoption of an EHR. Clinical staff should be educated of the safety procedures to safeguard clinical data within their facility. These safety procedures should contain a security programme in order to ensure the reliability of the data. The data that is shared for medical reasons must be confidential and safeguarded at all times. The access that is given to staff must be based on their role and responsibility within the healthcare facility. Each professional has different tasks to attend to, and therefore should not have access to similar patient information (Harman *et al*., 2012). A biometric authentication approach will assist with the security of protecting patient information as clinical employees that has this type of access

will only be able to access the system by using their finger print. This is an effective form of authorized identification as well as access control.

In today's digital world there are effective methods that can be utilised to help with the security of medical records. However, staff need to be educated on safety procedures in order to ensure confidentiality.

Recommendation 2:

Some participants pointed out their concerns regarding the use of an EHR at their previous employment. A concern was that the EHR was not integrated with neighbouring healthcare facilities' systems. This concern was also raised because staff would not be able to view patient information that belongs to another facility. According to research, an EHR allows patient information to be saved electronically and stored by various medical providers in one record (Sagal, 2015). EHR within each medical facility needs to be integrated in order to facilitate access to patients' electronic records.

An integrated EHR would help clinical staff to be able to consult with other colleagues for medical information. It would also allow all healthcare facilities to be linked to a common platform in order to share patient information. This means that there would be improved patient care and delivery of service. The accessing of patient information would be beneficial for monitoring and control of healthcare services. Power outages is a big concern of respondents raised in the interviews. This ties in with the issue of the lack of equipment such as generators within facilities and should be seen as a high priority in order for employees to carry out their daily processes.

Recommendation 3:

Before adoption can take place, staff members are trained to navigate the system. As such, it is imperative to identify the training needs of employees as well as the level of computer literacy. A one size fits all method for adoption will not work as each employee has different levels of literacy needs. This is where change management come into effect to tailor the approach according to individual facility needs and requirements.

The benefits of an EHR will only be attainable if healthcare facilities encourage change within their organisation. In order to achieve this, computer training involving clinical staff in the adoption process needs to take effect (Côrtes & Côrtes, 2011). Providing training can encourage healthcare professionals' ability and enthusiasm to utilise EHR successfully. It will assist staff to have a better understanding of how the system is used within medical

practice, as well as educate them on the functionality of the system, with which they might not be familiar. Equipping staff with training will also develop the use of EHR features, along with user satisfaction (Bredfeldt, Awad, Joseph & Snyder, 2013).

Effective, continuous EHR training will also allow professionals to feel comfortable and have a sense of control within the EHR environment. Focus on the requirements of end users during the early adoption of an EHR is imperative. In doing so, professionals will develop confidence within the technology environment. Not providing enough training is also a restriction that can impact the adoption of an EHR. By doing so, it will assist with the conversion from explicit to tacit knowledge, allowing this to facilitate adoption.

If staff are not trained well, they will lose sight of what is important, which is to provide quality services to their patients and, in losing sight of what is important, they can easily revert back to old habits. Staff buy-in is the most important element in the adoption of an EHR, and thus having a strong training foundation will ensure successful adoption. Change is not an easy process, but with the correct support, it can be an effective transition into acceptance and adoption.

5.4 Limitations

There are limitations to the scope of this study. Firstly, the data that is reflected for the purpose of this research was retrieved only from the public sector and does not include the private sector.

Secondly, the data is limited in that the study is done purely within the borders of the Western Cape and not in other parts of South Africa. Due to the sample size, this study was limited to a few medical employees' perceptions. The interviews were conducted at clinical facilities that have not adopted EHR.

5.5 Further research studies

This study looked at the role of an EHR within healthcare facilities in the Western Cape. Data was collected only in the Western Cape region; and further studies, should be conducted across South Africa. By collecting data across the nine provinces of South Africa, a more holistic experience regarding acceptance and usage will be obtained. This could also lead to a broader view of acceptance and potential use within healthcare facilities across South Africa. Furthermore, the implementation of NHI will further place the healthcare environment under strain, and the impact of an EHR needs to be reviewed in the light of this.

This study did not analyse healthcare facilities that have adopted an EHR, and therefore a follow-up study should investigate facilities that have adopted an EHR. By doing so, it would provide an understanding of post-adoption and the factors that influence professionals to adopt the system. In addition, the researcher would also like to build a conceptual framework that would assist EHR implementors when adoption occurs, and guide them in how this framework could be used to minimise adoption failures.

Final reflection and conclusion

Developing countries are slowly embracing technology to provide solutions to issues relating to the quality of health care (Mugo & Nzuki, 2014). EHR is becoming a popular choice of system to use in healthcare facilities to conduct administrative processes. EHR adoption is about change management, and thus changing from a conventional technology-based to a more people-centred approach (Cline & Luiz, 2013).

The research highlight the need for medical staff to accept the benefits in using the technology for successful adoption to occur. A successful EHR adoption and acceptance is hence determined by the attitudes of the medical staff. Based on the data findings, the researcher achieved the objectives of this study and therefore added to the body of knowledge by providing answers to the research questions based on the research problem. Thus providing valuable insights into the acceptance and usage of an EHR system.

In conclusion, the concerns that were raised in the data analysis and mentioned by the medical staff should be taken into account and solved, as this determines a successful acceptance and adoption. Once medical staff are comfortable with changing imbedded processes, the healthcare facilities will reap the benefits of an EHR. However, this can only be achieved once staff view the system as essential. EHR has beneficial results that can transform the way healthcare facilities in the Western Cape conduct their daily operations and patient care.

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Appendix A: Ethical approval and research participation consent form

University of the Western Cape Faculty of Economic and Management Sciences Department of Information Systems

Research Participant Consent Form

Title:	**The role of electronic healthcare systems (EHS) for patient recordkeeping in the Western Cape**

Please tick Yes or No to each of the following

	Yes	No
1. I confirm that I have read and understand the information sheet explaining the above research project and I have had the opportunity to ask questions about the project.		
2. I confirm that I am over the age of 18 years.		
3. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences.		
4. I understand that should I not wish to answer any particular question or questions, I am free to decline.		
5. I understand my responses and personal data will be kept strictly confidential.		
6. I give permission for members of the research team to have access to my anonymised responses.		
7. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the reports or publications that result from the research.		
8. I agree that the data collected from me may be used in future research.		

9. I understand that there are no risks or harm to myself by participating in the survey.		
10. I agree to take part in the above research project.		

If you have indicated YES to all the above, we may continue with the interview

Signature: _____

Please direct all queries to:

- Kaashiefah Davids, the researcher. My cell phone number is 065 994 7971 and my e-mail address is 2443492@myuwc.ac.za
- You may also contact study leader: Dr Carolien van den Berg, University of the Western Cape, Department of Information Systems, Telephone: +27 21 9593247, E-mail: cvandenberg@uwc.ac.za

NOTE: This research project has received ethical approval from the Biomedical Research Ethics Committee of the University of the Western Cape, Tel. +27 21 9592709, and e-mail: research-ethics@uwc.ac.za

Appendix B: Information sheet for industry

University of the Western Cape Faculty of Economic and Management Sciences Department of Information Systems

Research Project Information Sheet for Industry

Title:	**The role of electronic healthcare systems (EHS) for patient recordkeeping in the Western Cape**

Good day Participant

You are requested to voluntarily participate in an interview conducted for the purpose of this study. The researcher, Kaashiefah Davids, is currently a student at the University of the Western Cape and is finishing her Master's degree in Information Systems. Your participation will assist in the completion of her studies.

What is this study about?

ICT have influenced change in the way healthcare processes are being documented. This results in elevated quality and ethical vigilance to ensure a more accurate form of data recordkeeping (Stevenson *et al*., Nilsson, 2010). Healthcare in the Western Cape, South Africa is facing major issues relating to patient care, such as delays in patients receiving medical care. Technology can improve the healthcare systems by managing the data of patients and providing quality medical records (O'Mahony *et al*., 2014). It can be used to record, monitor and store patient information, thus the utilisation of electronic healthcare record (EHR) arises (Seahloli, 2017). The objectives of this study are the following:

- Potential role of an EHR in patient recordkeeping and how this could assist healthcare professionals in the Western Cape
- Factors that hinder the acceptance by healthcare professionals of EHR in the Western Cape
- Factors that would cause restrictions of an EHR towards adoption by healthcare professionals in the Western Cape

Is it compulsory to participate in this research and may I stop participating at any time?

Your participation in this research is completely and entirely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study, or if you stop participating at any time, there is no penalty.

What will I be asked to do if I agree to participate?

As a participant who gave consent to your participation in this study, you will be required to:

1. Participate in an interview with the researcher to discuss your views and opinions about the potential role of EHR in patient record keeping.
2. To explain what is understood about EHR and how it could assist healthcare employees in their daily operations.
3. To provide an overview of the current method of patient recordkeeping and your experience of using this kind of method.

This will require a few minutes of your time. If you do not want to answer any questions, you do not have to.

Would my participation in this study be kept confidential and is my anonymity protected?

You are not required to provide any personal details, such as your name, address or identity number. All other details, such as your age, education, employment status, etc., are therefore anonymous.

What are the risks of this research?

There are no known risks associated with participating in this research project. This research will not expose you to any harm as a result of your participation.

What are the benefits of this research?

This study will contribute to the limited research that explores the usage of technology in healthcare practices, more specifically in patient recordkeeping. It will also provide an understanding of the factors that hinder the acceptance by healthcare professionals of EHR as

well as Factors that would cause restrictions of an EHR towards adoption by healthcare professionals in the Western Cape.

What if I have questions?

If you have any questions, feel free to contact Kaashiefah Davids, the researcher. My cell phone number is 065 994 7971 and my e-mail address is 2443492@myuwc.ac.za

You may also contact the study leader: Dr Carolien van den Berg, University of the Western Cape, Department of Information Systems, Telephone: +27 21 9593247, e-mail: cvandenberg@uwc.ac.za

NOTE: This research project has received ethical approval from the Biomedical Research Ethics Committee of the University of the Western Cape, Tel. +27 21 9592709, and e-mail: research-ethics@uwc.ac.za

Appendix C: Interview questions

University of the Western Cape Faculty of Economic and Management Sciences

Department of Information Systems

Title of study

The role of electronic healthcare systems (EHS) for patient recordkeeping in the Western Cape

Name of researcher: Kaashiefah Davids

Interview questions

Name of public healthcare facility that you are currently working in:

Current position held:

Gender:

Age:

1. Explain the process of a patient seeking medical assistance from the time he/she visits the administrative counter until the patient comes into contact with you.
2. What kind of experience do you have working with any form of computers/computer system and have you embarked onto a computer training course?
3. Do you know what an electronic healthcare record (EHR) is and have you ever used it at your previous employment (if adopted) when performing your everyday duties?
4. If you have or have not previously used an EHR, do you think that it would assist you to accomplish your day-to-day operations more efficiently?

   4.1 When comparing the traditional patient recordkeeping to the electronic format, do you think that the EHR will assist you to retrieve patient information more promptly?

   4.2 Do you think that, by making use of an EHR, it would have an effect on the quality of your or medical employees' decision process as one can have access to patient history quicker?

   4.3 If you have or have never utilised an EHR before, would you think that the system is difficult to utilise?

   4.4 Do you think that your computer literacy skills will assist you with the potential use of an EHR?

   4.5 Would you feel more comfortable doing a training course should an EHR be adopted at your current healthcare facility?

4.6 If you could choose, which category of system are you more comfortable with?

5. Based on your knowledge of an EHR, what are the features or functionalities you would found helpful for patient recordkeeping?
6. What do you think are the key challenges that your current public healthcare facility faces with regard to EHR adoption?
7. Based on your knowledge, what changes would you recommend should an EHR be adopted at your healthcare facility?
8. Based on your knowledge, how significant is an EHR is to your work?
9. Do you think that personal patient data is more protected with an EHR?
10. Do you think that the waiting time to be consulted by a healthcare professional will be reduced (should this technology be implemented into your healthcare facility?)

Appendix D: Field notes

Length of activity: 25 minutes

Healthcare facility: Greenpoint Clinic

Professional: Nurse

Descriptive notes	Reflective notes
Nurse enters the room and introduces herself to the researcher.	Nurse walked in and sat at her desk. She seemed a bit nervous about the interview. However, once the researcher greeted her, she seems more relaxed.
The nurse gave a brief background about her job role.	Good eye contact while explaining her job role.
She started explaining how patient recordkeeping is being conducted within the healthcare facility.	The office space where the interview took place did not have a computer and there were many files lying on the nurse's desk. No form of any electronics in her office.
She indicated her views regarding an EHR.	While explaining her views, another professional came into her office requesting a file. The interview was put on hold for a few minutes as she assisted her colleague.
She spoke about paper-based systems.	Her views about paper-based recordkeeping were quite long and she spoke for 10 minutes.
She spoke about how processes would change if an EHR would be adopted within their facility.	After the interview was completed, she thanked the researcher for taking an interest in what she had to say. The researcher also thanked her for taking part in the interview.