INVESTIGATING FACTORS THAT HINDER THE ADOPTION AND USE OF PRIMARY HEALTHCARE INFORMATION SYSTEMS (PHCIS) IN THE WESTERN CAPE OF SOUTH AFRICA

BY

MASIBONGE EMMANUEL NKWENKWEZI

THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE MASTER OF COMMERCE (MCOM) IN INFORMATION MANAGEMENT
IN THE FACULTY OF ECONOMIC MANAGEMENT SYSTEMS
IN THE INFORMATION SYSTEM DEPARTMENT
AT THE UNIVERSITY OF THE WESTERN CAPE

http://etd.uwc.ac.za/

Declaration:

I, Masibonge Emmanuel Nkwenkwezi, hereby declare that this research report is my own work submitted for the Master's degree in Information Management at the University of the Western Cape. This research work in its entirety has not been previously submitted for any degree and in any other institution. All the sources quoted and cited are acknowledged by means of in-text reference and an appended list of references.

Masibonge Emmanuel Nkwenkwezi
Date:25-02-2022

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Acknowledgements and dedication

First, I would like to thank God Almighty for the guidance, knowledge, understanding He provided me during my studies. I owe a special thanks to my supervisor, Professor Mmaki Jantjies, for the guidance, encouragement, assistance, and support in the fulfilment of this research work. Without her assistance and support, this work would not have been possible.
I would like to also thank the Western Cape Department of Health at the District level and the Khayelitsha sub-district for opening doors for me to conduct the pilot and actual interviews despite their busy schedules. My gratitude for the assistance and support also goes to the facility managers and healthcare officials who availed themselves despite their busy schedules. Not to be forgotten, I would like to thank my family for their continued support.

http://etd.uwc.ac.za/

Table of Contents

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

List of Figures

List of tables

List of Appendices

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

List of abbreviations

- ART – Anti-Retroviral Treatment
- CDC – Community Day Centre
- CHC – Community Health Centre
- DHIS – District Health Information Systems
- DIT − Theory of Diffusion of Innovations
- GIS − Geographical Information System
- HIS – Health Information Systems
- HIT – Health Information Technology
- HIV – Human Immunodeficiency Syndrome
- ICT − Information Communication Technology
- MDG − Millennium Development Goal
- MDHS – Metro District Health Services
- MMS − Material Management System
- NHLS − National Health Laboratory System
- PACS − Picture Arching and Communication System
- PEOU − Perceived Ease of Use
- PGWC – Provincial Government of the Western Cape
- PHC − Primary Healthcare
- PHCIS − Primary Healthcare Information System
- PU − Perceived Usefulness
- RIS − Radio Information System
- SINJANI − Structured Information Jointly Assembled via Networked Infrastructure
- TAM − Technology Acceptance Model
- TPB − Theory of Planned Behaviour
- TRA − Theory of Reasonable Action
- TTF − Theory of task-technology Fit
- UTAUT − Unified Theory of Acceptance and Use of Technology
- WHO − World Health Organization

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Abstract

In the past, the Western Cape Department of Health had no formal or technologically enabled system for patient administration. This resulted in an administrative burden, increased waiting times for patients and doctors who needed results back from other sections, and missing patient files within the community health institutions such as clinics and hospitals. The Primary Healthcare Information System (PHCIS) was developed to solve this problem. However, it was later discovered that even though the PHCIS had been installed across the Western Cape clinics, there was a limited adoption and use of the PHCIS. Hence, the aim of this study was to investigate the factors that hinder the adoption and use of PHCIS by healthcare workers in the public healthcare clinics in the Khayelitsha sub-district in the Western Cape Province.

The objective of this study was to determine the perceived usefulness and the perceived ease of use of the PHCIS. Further objectives were to assess the attitudes held towards using PHCIS, and thus, to understand the behavioural intention to use PHCIS and the actual use of the PHCIS.

The study followed an exploratory method and was conducted through qualitative research. This study employed a purposive sampling technique to identify qualifying research participants. For data analysis purposes, the study employed a content analysis approach to find themes and relationships that emerged from the collected data. The interview questions for the research were semi-structured. The interview questions were designed using the Technology Acceptance Model (TAM), which also served as a theoretical underpinning. The data was gathered at three (3) healthcare institutions in Khayelitsha sub-district: Nolungile clinic, Michael Mapongwana clinic, and Khayelitsha Site B clinic.

The outcomes of this study demonstrate the involvement of numerous variables that impede the adoption of the PHCIS and the use in the clinics under review. **Human factors** – user attitude, disruptive routines, social status, incentives, ICT skills, training, user involvement and increased workload. **Organisational factors** – top management involvement and organisational culture. **Technological factors** – ICT infrastructure, system integration, system functionality, system complexity, technical support, system fears, privacy, and security. **Legal factors** – issues of compliance with legal frameworks.

This study's contribution will be its benefit to academia as well as the healthcare sector system developers, business analysts, and healthcare system consumers. This study adds value by expanding the TAM model with the additional dimensions of motivation and experience. The

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

findings of this study can be applied by present and future public healthcare workers in the Western Cape and other provinces planning to adopt the PHCIS.

Further work is needed to understand compliance through the PHCIS with the Protection of Personal information Act No.4 of 2013. It is also suggested that more research be conducted to assess how the PHCIS connects with other patient administration systems, since several systems were stated to function in isolation and to various standards. More data is also needed on healthcare professionals' perceptions of the adherence to the PHCIS' security and privacy systems or policies, as well as how these might be improved. Much more work will be required to develop the PHCIS' implementation framework, especially, given that other districts and provinces have yet to implement this system.

It is recommended that users receive comprehensive training in the implementation and use of the PHCIS, especially when new capabilities are implemented. The user attitudes need to change through change management programmes. It is recommended that the relevant institutions provide rewards as a form of user encouragement to use the PHCIS. When new functions are added to PHCIS, they must not increase the user workload. It is also advised that users and senior management participate in the development, design, implementation, and continual improvement of PHCIS. Generators must be used for the functioning of the PHCIS, in the event of a power outage or cable theft. PHCIS must have competent technical support personnel who must ensure that the PHCIS can have a 100% uptime. Users' fears of using the system and system resistance must be addressed through involvement and change management programmes. The PHCIS must at all times address privacy and security concerns and must adhere to all legislative frameworks that impact its operations.

UNIVERSITY of the
WESTERN CAPE

Keywords:
Adoption
E-Health
Electronic Health Record (HER)
Health Information System (HIS)
Primary Healthcare (PHC)
Primary Healthcare Information Systems (PHCIS)

http://etd.uwc.ac.za/

CHAPTER 1: RESEARCH BACKGROUND

1.1 Introduction

This chapter presents the background to the study. It also outlines the problem statement of the study, and thereafter it discusses the study's primary research question, the sub-questions, and objectives, and presents the layout of the study.

1.2 Background

The South African healthcare system has several disparities that have affected the equitable access to healthcare support by communities (McIntyre and Ataguba, 2017). The Covid-19 pandemic brought this challenge into sharp focus, when clinics and hospitals played a key role in supporting patients during this time. The historic distribution of healthcare services and facilities across the country had been very limited for the previously disadvantaged communities, and an unequal allocation of healthcare resources in South Africa during the apartheid era. This led to a serious lack of healthcare resources in many underserved rural and remote areas, as well as in the townships across South Africa (SA). Following the 1994 general election, there was a transition to a new democratic country under black leadership. The new administration vowed to address these healthcare concerns through a variety of initiatives, including the strategies to capitalise on information technology and innovation, with the goal of achieving the Sustainable Development Goals (SDGs) of providing quality healthcare to everyone (Braa and Hedberg, 2000). The South African Government recognised the critical role that technology would have to play in facilitating more efficient healthcare services (Braa and Hedberg, 2000).

UNIVERSITY of the
WESTERN CAPE

The healthcare sector in South Africa initiated several electronic health systems in a quest to address the healthcare services delivery challenges experienced in the SA healthcare system. The role of these information systems was to support the administration processes of the healthcare institutions and reduce several of the challenges, including patients' key information storage, retrieval and use; patients' waiting time in healthcare institutions; and other planning and reporting issues. Some of the information systems that were implemented in the public health sector were the District Health Information System (DHIS); the Clinicom system; the Delta 9 system; the Pharmacy System; the National Health Laboratory System; the Picture Arching and Communication System; the SINJANI system; the Radio Information System; and the Material Management System. It also included the Primary Healthcare Information System (PHCIS), which is investigated by this study.

http://etd.uwc.ac.za/

Prior to 2004, the Western Cape Provincial Government lacked a formal computer system in its healthcare structures. Reception and pharmacy staff expressed dissatisfaction with the administrative burden, registries that were paper-based and chaotic, and files that were misplaced, which resulted in duplicate files being created or files being lost altogether, and a lengthy administration system that significantly affected the patients' waiting times (Chowles, 2014). These challenges resulted in healthcare facilities devising their own informal systems that were individually driven, lacked a consistent standard, and were not well supported. A PHCIS was subsequently developed in-house to centralise the registration of patients, patient management, folder tracking, an improved workflow, and making of appointments for hospitals and clinic visits. The PHCIS improved communication between facilities and patients' assessments. It was also meant to eradicate folder duplication, to locate medical records, and improve record-keeping.

The rollout of the PHCIS process began in 2006, when 176 primary healthcare clinics throughout the Western Cape Province used the electronic health records system to manage their administration tasks (Chowles, 2014). The PHCIS was implemented in most of the bricks and mortar public health clinics that reported to the Western Cape Department of Health. The PHCIS was launched in the following townships: Mitchell's Plain, Gugulethu, Retreat, Hanover Park, Heideveld, Vanguard, Macassar, Kraaifontein, Delft, Elsies River, Khayelitsha - Site B, Nolungile, and Michael Mapongwana. This research only focused on the Khayelitsha sub-district. Three (3) clinics we selected for this study: Khayelitsha Site B, Nolungile, and Michael Mapongwana.

UNIVERSITY of the
WESTERN CAPE

A study conducted by Alqahtani, Crowder, and Wills (2017) suggests that the percentage of an electronic healthcare system's adoption is still low in the healthcare sector. In the same vein, Juma et al. (2012) are of the view that despite the benefits of electronic healthcare systems, adoption and use remains low, especially in developing countries. Similarly, the World Health Organization (WHO, 2019) suggests that the adoption and use of electronic healthcare systems is generally lower in low- and middle-income countries. Adebesin et al. (2013) assert that changing socioeconomic, political and ICT infrastructural development factors contribute to a low adoption and use of electronic healthcare systems, which was proven in several lower-middle-income countries. Low rates of acceptance among medical professionals and underutilised electronic facilities have also been identified for a variety of IT initiatives across the African continent (Mengesha and Garfield, 2019). This issue of low adoption of some electronic healthcare systems has also been recorded in industrialised nations such as the United States of America (US) (Barrett, 2018). Jabali and Jarrar (2018) claim that acceptance rates of electronic healthcare systems are also limited in public hospitals

http://etd.uwc.ac.za/

and clinics in Saudi Arabia. Chen (2003) stated that healthcare personnel often resist the adoption of electronic healthcare information systems. Some of the reasons stated for such resistance have been linked to user perceptions (Kruse et al., 2016). Lack of computer skills, fear of a lack of privacy and security of the information are also claimed to be contributing factors (Ajami and Bagheri-Tadi, 2013). To understand the causes of resistance and assist in addressing such low adoption and use of the PHCIS, this study investigated the factors that hinder the adoption and use of the PHCIS by healthcare workers in public healthcare facilities in the Khayelitsha sub-district, Western Cape, South Africa. This study also put forward a model that will also assist in understanding the adoption and use of the PHCIS.

1.3 Problem Statement

The PHCIS has been installed in almost all bricks and mortar public healthcare clinics in the Western Cape. However, there is low adoption and use of the PHCIS for recording and reporting information at these facilities (District Health Service, 2017). Moreover, when the system was initially implemented, it was not officiated (District Health Service, 2017). Despite the number of years that the PHCIS has been installed, the system is not used as envisaged by the Department of Health (DoH) for recording and reporting headcounts categories. This problem was confirmed when the National Indicator Dataset (NIDS) required reporting on four (4) headcount age categories as from April 2017 (District Health Service, 2017). The headcount reporting was done manually on a paper-based system and needed to be transferred to the electronic PHCIS system (District Health Service, 2017). It is against this background that this study sought to identify the circumstances that hinder the adoption and use of the PHCIS in the Western Cape's public health clinics.

UNIVERSITY of the WESTERN CAPE

1.4 Primary Research Question

According to Maree (2007:2), regardless of the magnitude of a project, the quality of the research question determines the success or failure of a research project. Zikmund et al. (2010:121) presented an argument to emphasise that research questions must convey the research goals in terms of the problems that can be resolved by analysis of the research data. The following is the key research question for this study:

- What are the factors that affect the adoption and use of the PHCIS in the public health clinics?

1.5 Sub-Questions and Objectives

Research objectives can be accomplished by carrying out research (Zikmund et al., 2010: 63). The Technology Acceptance Model (TAM) was used as a theoretical framework for

http://etd.uwc.ac.za/

investigating and comprehending the factors that affect the adoption and use of the PHCIS. This research study was founded on the following research sub-questions and objectives:

1.5.1 Sub-questions

1. What is the perceived usefulness of the PHCIS?
2. What is the perceived ease of use of the PHCIS?
3. What are the attitudes towards using the PHCIS?
4. What are the behavioural intentions to use the PHCIS?
5. What is the actual use of the PHCIS?

1.5.2 Objectives:

1. To establish the perceived usefulness of the PHCIS.
2. To determine the perceived ease of use of the PHCIS.
3. To explore the attitude towards using the PHCIS.
4. To understand the behavioural intention to use the PHCIS.
5. To establish the actual use of the PHCIS.

UNIVERSITY of the
WESTERN CAPE

1.6 Significance of the Study

The focus of this research was to understand the factors that hinder the adoption and use of the PHCIS. Many research studies have been conducted on e-health. However, not much research has been conducted to understand the factors that hinder the adoption and use of the PHCIS. Thus, the researcher identified this issue as a research gap and hence attempted to add knowledge on the factors that hinder the adoption and use of the PHCIS. The outcome of the study is therefore of importance to the healthcare industry, scholars, system developers, business analysts, policymakers and government to make decisions based on scientific evidence. The outcome of the study will contribute towards enabling an improved utilisation of the PHCIS by delivering insights into the factors that have so far hindered the adoption and use of the PHCIS.

1.7 Layout of the Study

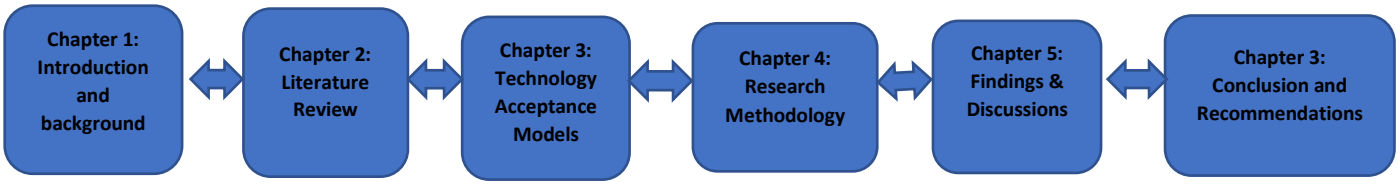


Figure 1: Layout of the study

http://etd.uwc.ac.za/

1.7.1 Chapter 1 – Introduction and background

This chapter outlined the study's background. Thereafter, the problem statement, primary research questions, sub-questions, and objectives were briefly discussed. In addition, the chapter discussed the study's relevance. Finally, the chapter discusses the study's layout.

1.7.2 Chapter 2 – Literature review

This chapter discusses existing literature on healthcare information systems and related topics. Literature was selected that covered the topics of healthcare information system; the adoption of electronic healthcare information systems; the adoption of electronic healthcare systems in developed and developing countries; and the status of electronic healthcare systems' adoption in South Africa. The existing usage and variables influencing acceptance and use were explored, as well as the prospective advantages and challenges to the implementation of an electronic healthcare information system.

1.7.3 Chapter 3 – Technology Acceptance Models

The aim of this chapter is to discuss theories and technology acceptance models and their respective constructs and their relationships. Theories of acceptance models are critiqued, based on the literature review findings. Challenges of the TAMs are also deliberated. Thereafter, this chapter provides a literature support discussion on how these TAMs are applied in the healthcare sector.

UNIVERSITY of the
WESTERN CAPE

1.7.4 Chapter 4 – Research Method

The focus of this chapter is to address the topics related to the research tools used to conduct this research. This chapter commences with a brief introduction, followed by research paradigms. Three research methods are discussed, followed by the location of the study, the unit of analysis, the target population, sampling techniques, data collection, the pilot study, interviews, the interview process, data analysis, content analysis, measure of trustworthiness, ethical considerations, and concluding remarks.

1.7.5 Chapter 5 – Findings and Discussion

In this chapter, the researcher discusses, analyses and critiques in more detail the data collected from all the research interviews. This chapter commences with an introduction, a discussion of the participants' demographics, and is followed by a discussion on analysed themes and sub-themes.

http://etd.uwc.ac.za/

1.7.6 Chapter 6 – Conclusion and Recommendations

This chapter draws conclusions on all the chapters, and especially the chapter that discusses the findings. It commences with a brief introduction, and then answers the research questions.

1.8 Chapter 1 Summary

In summary, this chapter discussed the background of the current study, the problem statement of the study, the primary research question, and the sub-questions. This was followed by a statement of the study's objective and the layout of the current study. The following chapter will focus on the published literature regarding the scientific knowledge in relation to the electronic healthcare system, its adoption, the PHCIS and related topics.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction:

In an academic investigation, a researcher needs to review the previous research to formulate the research problem, inconsistencies in previous findings, and gaps that may prompt further research. According to Bless, Higson-Smith, and Kagee (2006:30-100), literature reviews refer to a continuous phase from which a researcher can recognise or devise various hypotheses and models on the research subject prior to defining a research issue. The analysis of prior articles on the subject also helps to familiarise the researcher with the research conducted around the topic (Ferreira, 2009: 5-12). This chapter examines the literature in the subject of electronic healthcare information systems, including the PHCIS. The chapter goes on to examine the adoption of electronic healthcare information systems in developed and developing nations, with a special focus on South Africa and other countries. Finally, the chapter evaluates the potential benefits and barriers of electronic healthcare information system adoption and related adoption models.

2.2 Healthcare Information Systems (HIS)

Electronic healthcare information systems are defined in a broad and expanding body of literature. However, to date, there is little agreement on a single definition regarding electronic HISs. E-Health differs in its definition, depending on its purpose and the technology required (Pagliari, 2005). In other words, how the electronic HIS is used determines how it will be defined by those users or system developers. E-health is a field that combines digital health procedures with traditional healthcare. Health technology, on the other hand, is defined by Dutot et al. (2019) as a set of applications that deal with organising health data by using smart devices, procedures, and information systems (WHO, 2019). Electronic health, as described by Eysenbach (2001), is the use of information and communication technology (ICT) and the internet to provide quality services and increase information exchange in the public healthcare sector. ICT has assisted healthcare workers in handling information linked to patient care, research, and education throughout the previous few decades (Balsari et al., 2018). Another definition given by Blaya et al. (2010) advocated the view that electronic or e-health encompasses, among others, systems such as electronic health records (EHRs), which are also defined as an automated patient health history or the medical record shared among healthcare worker (Tang et al., 2006). Cline and Luiz (2013) define it as established software applications designed to help administrative and clinical administration, with the collection and the use of knowledge to provide reliable and productive services. This view was supported by Reichertz (2006), who wrote that the common function of administrative ICT tools is efficient

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

data collection, storage and retrieval. There appears to be some agreement among scholars that the HIS embodies a plurality of terms such as e-health, the electronic healthcare system, the health information technology, and the EHRs. To back up this point of view, the phrase electronic HIS include telehealth, telemedicine, mobile e-health, hospital information systems, and electronic medical records (Blaya et al., 2010). Although small differences of opinion existed between the scholars, based on these definitions, there appeared to be some agreement that the electronic HIS was a tool used for administrative and clinical support purposes for managing, processing, and using patient information to provide patients with effective healthcare services (Haux, 2006). Throughout this research, the term electronic health, electronic information system, health information technology, e-health and EHRs will used interchangeably with HIS, and electronic health record. The next section will discuss the adoption of a health[care] information system or HIS.

2.3 Adoption of Health Information System (HIS)

Prince and Lau (2014) describe technology adoption as embracing and using information and communication technologies within an organisational framework. Adoption of digital technology in the healthcare sector leads to enhanced data privacy, quality, and compliance (Tandon et al., 2020). However, despite all the benefits, adoption of e-health services is slow in developing countries, and as a result, few studies had been undertaken in this field (Joshi and Joshi, 2016; Lee, 2019). The term adoption in this research applies to the implementation of health information technology in healthcare facilities (Lluch, 2011). Buntin et al. (2011) maintained that implementation relates to incorporating and leveraging advancement in technologies to ensure fully functional and efficient healthcare systems. Oh et al. (2005) added a definition, explaining the use of technology to expand, assist, and improve human behaviours and procedures, rather than being a substitute.

Over the past decades, researchers have seen a growing need for the deployment of HISs to improve the healthcare delivery in developed and developing countries, where the healthcare sector developed and implemented HISs both on a small and large scale. According to Brown (2008), developed economies such as the US and Europe have accomplished a lot of success in their implementation of HISs in their service delivery. Price and Lau (2014) reinforce this viewpoint, stating that many electronic HISs have been adopted in industrialised nations. This argument was shared by Blaya, Fraser, and Holt (2010), who said that the adoption and usage of electronic HISs was increasing in the healthcare services industry. These studies highlight the growing need to take advantage of the benefits brought about by the latest technologies in the healthcare sector, by automating their healthcare processes using modern technologies.

http://etd.uwc.ac.za/

England et al. (2000) pointed out that while e-health is supported globally by the healthcare sector and the World Health Organization (WHO), the sector remains the lowest to respond to information technology (IT) implementation. According to Alqahtani, Crowder, and Wills (2017), the rate of adoption of an e-health system remains low in various situations. Similarly, the study by Juma et al. (2012) indicates that despite the benefits of electronic health systems, adoption remains low in developing countries. Adebesin et al. (2013) attribute the sluggish or poor adoption of e-health systems in numerous lower-middle-income nations to various socioeconomic, political, and technological infrastructure development, and argue that implementation in low-income countries remains marginal to non-existent. Creswell et al. (2013) advocate the view that the implementation of e-health records is difficult in African countries, because of the socioeconomic underdevelopment challenges. Considering these challenges, Jahad et al. (2009) argued that e-health is not a feasible business model in Africa; however, they did not discourage its adoption. Chang et al. (2013) believe that the healthcare sector is less efficient than other sectors when it comes to implementing electronic information systems. Overall, there seems to be evidence to indicate that the adoption of an e-health system remains low, especially in developing countries, mostly because of socioeconomic challenges, a lack of the relevant infrastructure and development. Following the topic of HIS adoption, the research will now discuss HIS adoption in both developed and developing nations in more detail.

UNIVERSITY of the
WESTERN CAPE

2.4 HIS within Industrialised and Emerging Markets

On 30 January 2020, the WHO proclaimed the new corona virus (Covid-19) outbreak in China a public health emergency, and on 11 March 2020, it designated it a worldwide pandemic (Shiferaw et al., 2021). With the current international Covid-19 pandemic measures, the normal healthcare services were radically modified in a variety of ways (Shiferaw et al., 2021). Attributable to the poor health systems and high number of immunocompromised populations, the economic consequences of Covid-19 are predicted to be severe in lower- and lower-middle income countries (Shiferaw et al., 2021). In such circumstances, technological solutions such as telemedicine, which is defined as the remote delivery of healthcare services using telecommunication technology for the exchange of medical information, diagnosis, consultation and treatment, are critical (Shiferaw et al., 2021). The environment of the healthcare sector is changing, as technology enhances transparency, interoperability, and the utilisation of real-time data for managing healthcare services (Palas and Bunduchi, 2020). In contrast, technological growth has dramatically transformed the business processes of practically all sectors throughout the world, and the health sector is one of the primary areas where technical innovation improves the lives of millions (Shiferaw et al., 2021). In recent years, both industrialised and developing countries have embraced digital healthcare reforms,

http://etd.uwc.ac.za/

utilising technology such as blockchain (BC), cloud computing, and the Internet of Things (IoT) to benefit the common people of their respective economies (Sharma et al., 2020). The use of ICT in healthcare is becoming increasingly popular in both developed and developing nations (Kerr and Norris, 2004). ICT implementation in this sector is growing, as it is seen as a tool that can help close the divide between developing and developed countries (Lall and Wheeler, 2005). Another explanation, according to Ngek and Smit (2013), is the growing acceptance and usage of ICT as a driving force behind progress and sustainability in organisations. Ruxwana (2010) agreed that the healthcare sector is rapidly leveraging ICT to enhance healthcare systems in both developed and developing nations.

Surbhi (2015) describes the developing nations in terms of their growth and level of industrialisation. According to Todaro and Smith (2006), developed countries are countries with high levels of economic and financial prosperity, a better life expectancy, higher levels of education, a higher gross national income, more advanced technology, and stable politics. On the other hand, developing nations are often characterised by extensive rural communities and environments, where the communities have more important healthcare problems to solve, such as the prevalence of emerging infectious diseases, the shortage of properly trained healthcare professionals and healthcare services, and the limited number of healthcare systems (WHO, 2006). It is reported that developing countries experience major challenges regarding the access to healthcare facilities, and poor quality healthcare services, because of the lack of professionally qualified doctors, and rising prices of healthcare services that are unaffordable to most citizens (Currie and Finnegan, 2009). In conclusion, the information presented in this study demonstrates that industrialised nations' healthcare structures and systems are more efficient than those seen in underdeveloped countries and regions.

UNIVERSITY of the
WESTERN CAPE

2.4.1 Health Information System (HIS) in developed countries

During a global pandemic such as Covid-19, an innovative approach to healthcare services delivery is crucial (Shiferaw et al., 2021). A major problem emerged, however, in that physicians/patient interactions had always taken place in person, but suddenly, because of the worldwide pandemic and its lockdown regulations, it became critical to employ tech-based techniques such as telemedicine, which allows routine healthcare services to be provided while being physically inaccessible (Shiferaw et al., 2021). In such challenging circumstances, data suggests that employing telemedicine to improve healthcare outcomes and preserve long-distance healthcare delivery is practical, acceptable, and successful (Shiferaw et al., 2021). In developed countries, the implementation of ICT in the public healthcare sector had already steadily increased in support of providing more efficient healthcare services (Haux, 2006), where funds are readily available to build the necessary infrastructure. In comparison

http://etd.uwc.ac.za/

to the rest of the world, industrialised countries have superior infrastructure and trained labour forces, allowing them to remain robust and shielded against national disasters and pandemics such as Covid-19 (Shiferaw et al., 2021).

Wallis (2012) states that the application of IT is much more advanced in the developed world. This view is supported by Gray (2016), who writes that the United Arab Emirates and the Netherlands are world pioneers in e-health. Through the years of ICT adoption, highly developed countries such as the US have garnered lots of experience and success (Brown, 2008). The HIS in developed countries has also received far more interest and investment, and far more attempts were made by foreign organisations, NGOs, donors, and other development partners to enhance healthcare in the developed countries (Nyella, 2009). There is also an increasing awareness in several European nations, as well as other countries around the world, that strategic investments in advanced clinical information systems as well as other forms of HISs will produce substantial benefits for the whole healthcare system (Kitsiouet et al., 2010). Despite the benefits obtained by developed economies, developed countries are no exceptionand also face some challenges when trying to implement e-health systems. However, despite these challenges, many policymakers in developed countries put a lot of trust in the implementation of e-health records to control healthcare costs or prices, and enhance the standard the access to healthcare (Nyella and Mndeme, 2010).

UNIVERSITY of the
WESTERN CAPE

2.4.2 Health Information System (HIS) in developing countries

In developing countries, adoption of e-health services is slow, and as a result, relatively little research has been undertaken in this field (Lee, 2019). Given the lack of infrastructure and qualified human resources in low-income settings, examining healthcare providers' acceptance of and preference for telemedicine modalities during serious pandemics is critical information for tailoring telemedicine modalities to a specific environment (Shiferaw et al., 2021). Many developing nations are moving towards paperless systems and programs to enhance the coordination of healthcare records and, more broadly, the quality of services rendered (Evans, 2016). Most manual activities in the healthcare industry are being automated to improve healthcare services. African countries, for example, Rwanda, Kenya, Nigeria, South Africa, and others, have rolled out different types of electronic information systems in the healthcare sector (Ogundaini, 2016). According to Chetley (2006), despite the implementation of electronic information systems in some of these developing economies, the systems were not successfully applied, and the implementation of e-health systems in several lower-middle-income countries still ranged from minimal to non-existent. This was often attributed to the challenging socioeconomic, political, and technological circumstances and poor infrastructural development (Adebesin et al., 2013). This view is supported by Cresswell

http://etd.uwc.ac.za/

et al. (2013), who state that the African continent is characterised by socioeconomic underdevelopment challenges, which makes it even more difficult to achieve a successful implementation of electronic information systems, as observed in Rwanda and Kenya. While there has been an improvement in healthcare facilities during the last two decades, emerging countries are facing the additional challenges of an ageing population; in many countries, the median age has grown to 55 from 42 years (Drosatos and Kaldoudi, 2019). Kifle et al. (2008) emphasised that the introduction of e-health record systems in developing countries highlighted various obstacles, some of which include, but are not limited to, inadequate telecommunication networks, limited infrastructure, and a lack of resources such as financial capital. According to Venancio (2005), this resulted in African countries being late ICT adopters in the medical or healthcare sector, while the e-health advances were already seen in Europe and other developed economies. In contrast, Cline and Luiz (2013) report that there is clear evidence that the introduction of e-health has been effective, even in developing countries such as South Africa. Despite variances in adoption, implementation, and usage of contemporary technology in hospitals, the growth in EHRs utilisation is undeniable (Samhan and Joshi, 2017; WHO, 2019) even if it is slow. However, overall, developing nations have monumental obstacles to the universal adoption of these programs (Odekunle, Odekunle, and Shankar, 2017). Despite the clear benefits of e-health systems, there are more challenges that need to be addressed before developing countries will be able to enjoy the benefits of HIS. Following the discussion of HIS in developing countries, the study will now discuss HIS adoption in South Africa.

UNIVERSITY of the
WESTERN CAPE

2.5 Status of HIS Adoption in South Africa

In the healthcare industry, both IT and information management play critical roles in health informatics, which lead to improved health, higher returns, and a better quality of life (Yusif et al., 2020). Currently, there is technology innovation in the healthcare industry that can improve connectivity among e-health stakeholders such as beneficiaries, hospitals, patient health data, and claim settlements (Abu-Elezz et al., 2020; Sharma and Kshetri, 2020). Mutula and Mostert (2010) reported that the South African Government had ambitions to develop the country's ICT infrastructure by launching numerous ICT initiatives with regulatory system policies for quality service delivery. In support of these initiatives, Ntetha and Mostert (2011) stated that by providing a wide range of ICT infrastructure for effective service delivery, the South African Government was promising effective service delivery in all sectors, especially the health sector. Burger (2010) confirmed the need for an adequate ICT infrastructure for effective healthcare delivery, specifically by providing evidence-based medicine, and cost reduction through an investment in ICT infrastructure growth, which contributes to economic development and healthcare sector transformation (National Integrated ICT Policy Green

http://etd.uwc.ac.za/

Paper, 2014). As a result, there are many project initiatives, companies, and donor agencies working together in South Africa to promote ICT in the delivery of an effective and efficient healthcare delivery (Gray and Varda, 2014).

Several studies on electronic information systems were conducted to understand HIS in the South African context (Buntin et al., 2011). Braa and Hedberg (2000) conducted research on the methodologies, applications, and processes for building a District Health Information System in Cape Town. In 2003, in Limpopo, South Africa, Littlejohns et al. (2003) performed assessment experiments on a computerised electronic hospital information system. Ruxwana, Herselman, and Conradie (2010) investigated the factors influencing the acceptance and utilisation of ICT for e-health solutions. To avoid duplication, the information garnered in that research, the benefits accrued, and challenges experienced will be included in the discussions that will follow. Researchers such as Buntin et al. (2011) published multiple studies on the advantages, development, expansion, productivity, and trade income regarding e-health. Overall, these studies highlighted the need for more studies on the field of e-health adoption, especially in South Africa.

In South Africa, the National Department of Health, and the Provincial Department of Health both support the health information systems program (HISP), which encourages the use of health management information systems in basic healthcare services and other related sectors (Ngoma et al., 2012). The Northern Cape Province of South Africa began implementing an automated computerised medical information system, the patient care information system, in its 42 hospitals in 1998 to improve overall health system management and patient treatment (Mbananga et al., 2002). The Clinicom and Sinjani systems, as well as Meditech, Medicom, and Delta 9, were all introduced in South Africa, for example, in the Western Cape, as improvements to paper-based and manual systems, whereas the primary health information system (PHCIS) is utilised in Western Cape clinics (Mchunu, 2013). The following section will discuss the integration of the HIS with the new concept of the proposed National Health Insurance (NHI) scheme.

Recent trends demonstrate that the South African Government is staring to implement a variety of initiatives to improve the quality and efficiency of public healthcare. One of the investigated options to achieve these aims is the establishment of a National Health Insurance (NHI) scheme (National Department of Health, 2015). According to Katurura and Cilliers (2018), South Africa is intending to adopt a NHI program, which would offer health insurance to all South African people and provide them with access to high-quality healthcare. This is planned to be implemented through an electronic health record (EHR) system, used to register

http://etd.uwc.ac.za/

and track patients visiting different healthcare providers. According to Katurura and Cilliers (2018), the aim of this scheme is to enable patient surveillance, and record-keeping of all medical facilities, where patients present themselves in South Africa, while resolving the problems of lack of interoperability, heterogeneity, and lack of a national patient master index (PMI). The EHR framework has been described as a critical factor in the implementation of the NHI Policy to ensure the quality of care (Katurura and Cilliers, 2016). Katurura and Cilliers (2016) state that South Africa has already begun to introduce the EHR programs in the public health sector, and five of the nine provinces in South Africa currently have some type of EHR system in operation in their public hospitals. However, the limited deployment of EHR systems at the various NHI pilot sites across the country has remained an obstacle to date (National Department of Health, 2015).

2.5.1 Health information system (HIS) in the Western Cape

According to Boulle et al. (2019), the Western Cape had around 7 million citizens in 2019, with three-quarters of them using public services. It is estimated that the Provincial Department of Health manages about 272 primary healthcare clinics, with the City of Cape Town Municipality overseeing about 82 clinics. The latest available research data argues that the Western Cape Province is better resourced than other regions, and the Provincial Department of Health is believed to be a provincial leader in pioneering the latest technology developments (MacGregor et al., 2018). In the same vein, the Western Cape Provincial Department of Health (PDoH) has steadily integrated patient administration systems in all permanent (bricks and mortar) public sector facilities over the last two decades, each of which has a unique health identity or patient master index (PMI) (Beck et al., 2018). Heekes et al. (2018) affirm this, claiming that the Western Cape Government Health (WCGH) Department employs a variety of electronic health delivery systems throughout the Western Cape Province of South Africa. Boulle et al. (2019) also point out that patient registration has been digitalised for more than 40 years in several of the region's largest institutions. According to Heekes et al. (2018), these networks include hospital and primary healthcare administrative systems, pharmacy services, and pre-packaged chronic medication distribution systems and laboratory reports. Below, the study will discuss some of the HISs used in the Western Cape Department of Health.

2.5.1.1 The Sinjani system

SINJANI is an acronym for Structure Information Jointly Assembled via Networked Infrastructure. It is an internal system created by the Department of Health to ensure the accuracy of the Department's official data and statistics. The system has a robust and powerful database and is available to information officers and management via the web services. The

http://etd.uwc.ac.za/

system replaced the national system, District Health Information System (DHIS). DHIS is a national system, which stands for District Health Information System, and it is used by the eight other provinces, excluding the Western Cape. SINJANI is the official data system of the Western Cape DoH, and exports data for the NDoH to the DHIS, which is the national system (Province of the Western Cape, DoH, 2010).

2.5.1.2 Nursing management system (NIMS)

This is an in-house development system that replaced various other systems used by the central hospitals. Information regarding the nursing staff are captured and used for decision-making and planning. The correct placement and scheduling of the nursing staff are improved by the registration of all the staff members according to their academic qualifications and preferences. Leave plans and absentee records are included in the system, allowing the nurse managers to plan for the efficient use of human resources and manage the staff issues in an effective manner (Province of the Western Cape, DoH, 2010).

2.5.1.3 Pharmacy system

This system is used to keep track of pharmaceutical supplies and services. Since 1999, the Department of Health Western Cape has been using an electronic pharmacy system instead of a paper-based one (JAC, 2012). This is supported by Mills (2014:1) who states that the pharmacy system is commonly adopted in the Western Cape. Pharmacy stock control, e-prescription, and medication administration are all included in the pharmacy system. Pharmacists have easier access to medication information using the pharmacy system, which enhances patients' clinical care across all sites (JAC, 2012). The pharmacy system, according to Mills (2014:1), is already in use at more than 30 hospitals in the Western Cape, with plans to expand to big clinics throughout the province (Mills, 2014:1; Province of the Western Cape, DoH, 2010).

2.5.1.4 HIS billing system

This system was created to bill patients based on their income in the public healthcare system (Klein, 2013). This system assists the Department of Health Western Cape in determining how much money is owed and enables them to recover these debts from patients (Klein, 2013). The fees department uses this billing system for debtor account inquiries and debt collection follow-up; it relates to the patient administration system, making it simple for the fees clerk to execute debt collection (Province of the Western Cape, DoH, 2010).

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

2.5.1.5 PACS/RIS (picture archiving and communication system/ Radiology Information System)

This technology innovation is utilised to record and preserve medical pictures such as CT scans, ultrasounds, x-rays, and other types of medical imaging for patients (Guma, 2013). PACS has the advantage of storing x-rays in a centralised system that may be shared by several users in different places at the same time (Carestream, 2013). Consequently, waiting times for x-rays have been reduced, and patients and physicians may now obtain findings almost quickly, which improves the diagnostic and treatment process (Guma, 2013). The Radiography Information System (RIS) is the system that records and stores patients' radiology visits, attendance, and orders (Carestream, 2013). This makes it easy to track down a patient's radiological history, including how long the radiology exam took, who performed it, and why it was sought (Guma, 2013). The RIS also allows management to generate reports and assess the effectiveness of their radiology departments (Guma, 2013; Province of the Western Cape, DoH, 2010).

2.5.1.6 Geographical information system (GIS)

This system is important for management and epidemiology purposes, and the system indicates in geographical format, where services are provided, what kind of services are rendered, and where the burden of disease is incurred. The use of the instrument is meant to enhance the healthcare system and deter the transmission of the disease (Province of the Western Cape, DoH, 2010).

UNIVERSITY of the
WESTERN CAPE

2.5.1.7 eKapa (HIV and Aids management)

This module is part of the PHCIS system, but it focuses on tracking the care and information needed to treat HIV-positive patients and Aids patients. The module integrates therapeutic features that allow the clinician to monitor the success of the procedure. As TB is applicable to nearly all these patients, the treatment of TB is integrated into this module (Province of the Western Cape, DoH, 2010).

2.5.1.8 Clinicom

Clinicom is a device utilised in practically all Western Cape hospitals, according to Wright, O'Mahony, and Cilliers (2017). In the Clinicom system, a patient is assigned a unique patient identification, often known as a patient number, by the system. According to the Western Cape Government (2016: 1), each patient's patient number is unique, and these numbers will be allocated to patients throughout the Western Cape clinics and primary healthcare systems utilising the Western Cape PMI. This number is also used by other systems such as the

http://etd.uwc.ac.za/

ordering of meals, primary healthcare, and the Cradle and the Prehmis system used by the City of Cape Town. The patient information is interfaced with various systems such as the Disa*lab laboratory system enabling the correct identification of the patient (Province of the Western Cape, DoH, 2010). Through an automated outpatient appointment scheduling system, patient information and records will be accessed by facilities in the creation of a single patient record, as well as more effective monitoring of outpatient appointments. The Clinicom system is also linked to the Primary Healthcare Information System (PHCIS), with which it shares a unique patient identity.

2.5.1.9 Primary healthcare information system (PHCIS)

The PHCIS is an information system in use at the primary healthcare level. The PHCIS, according to Scott (2015), comprises software utilised in bigger healthcare institutions. The PHCIS is a system that uses the unique patient number from Clinicom to register the patient on the PHCIS system by means of the web services. The PHCIS is a tool that can be used at community health centres and clinics for the centralised registering of patients and for record-keeping. It is a modular approach to the problem of computerising primary healthcare facilities. According to Chowles (2014: 1) "the PHCIS was introduced in 2006 in primary healthcare facilities throughout the Western Cape region" (Province of the Western Cape, DoH, 2010). For the current research, and since little is known about the current uses of the PHCIS and factors that influence its adoption, the following section will begin with the discussion on the current use of the PHCIS, and then move on to discuss the factors that influence the adoption of the PHCIS by healthcare workers.

UNIVERSITY of the WESTERN CAPE

2.6 Factors Influencing Healthcare Workers' Use of the PHCIS

According to Chowles (2014), without the PHCIS device, healthcare facilities cannot achieve the best healthcare results for their patients. The PHCIS was implemented in 2006; at the time, it connected 176 primary healthcare facilities in both rural and metropolitan areas, and administered e-health records of more than 5.2 million patients (Chowles, 2014:1). The healthcare sector in the Western Cape (2016: 1) states that following the PHCIS introduction, the advantages enjoyed by facilities include:

> "The PHCIS is an information system used at the level of primary healthcare. The PHCIS can also be viewed as a tool that can be used at community health centres and clinics for integrated patient registration and record-keeping. This is supported by the Mchunu thesis (2013), which states that clinics use the Primary Healthcare Information System (PHCIS) for the management and reporting of patient data. In addition,

http://etd.uwc.ac.za/

> Mchunu (2013) notes that the PHCIS is used to successfully collect, capture, archive, exchange and preserve the confidentiality and consistency of patient data."

Scott (2015) reports that during his study, the Metro District Health Services (MDHS) were introducing the new electronic record-based data collection and management system called PHCIS, which involved manual data capture by data clerks, but ultimately became automated, with clinicians using scanners and bar codes to capture individual client patients' records. Scott (2015) also suggests that the MDHS database that the PHCIS provides, optimises resources used on a broader basis for hospitals to make appointments.

Zimri's (2018) study argues that the application of the PHCIS faces several challenges. According to Zimri (2018), the PHCIS collects information on patients attending primary healthcare services and is limited to a few facilities and just a few modules. Zimri's report (2018) concludes that the PHCIS has not been applied in all facilities and that not all datasets have been automated in clinics. Another issue found by Zimri (2018) is that some participants think that the clerks are not gathering data on the PHCIS and indicate that the clerks should be made aware of the value of their jobs, and that the paper-based system should be phased out and replaced by the PHCIS. Mchunu (2013) supports this viewpoint, stating that knowing that the Clinicom and the PHCIS systems may enhance data collecting, storage, and sharing procedures means little to clerks, if they are not qualified or able to utilise these technologies. This opinion is shared by Mchunu (2013). According to Scott (2015), the system programmers were unable to comprehend the changing expectations of the clinics' system users. They wanted to set appointment dates and quotas per appointment slot, while the facility managers needed consistency in deciding which times and intakes worked better to maintain a seamless flow of patients through the facility during the day. For example, the programmers were late to respond to the facility managers' request for consistency (with a period of more than six months), instead of providing one "last chance" to set the "right" time slots (Scott, 2015). Mchunu (2013) further says that data interchange between Clinicom and the PHCIS system is limited, since users of these systems are unable to freely transfer data across their systems.

Mchunu (2013) observes that clinic and hospital users utilise two distinct systems to manage the same sort of data, such as the PHCIS for clinics and Clinicom for hospitals. According to him, this results in data repetition at the central integration stage, compromising the centralisation and integration of data across processes in the healthcare industry. According to previous study findings by Ogundaini (2016), PHCIS users at clinics can only read data and cannot make any changes to the Clinicom system, which implies they cannot upgrade data in the central system. Ogundaini (2016)'s findings are consistent with previous research by

http://etd.uwc.ac.za/

Mchunu (2013), who says that users in the PHCIS system can only make adjustments on their side without being able to update what is in the Clinicom system. Mchuni (2013) confirms this viewpoint by stating that system users at clinics frequently report that they do not have the capacity to enter Clinicom systems, which implies that they cannot modify any patient data in the system. The Mchunu research evaluation reveals that, while this access limitation may be a measure of data privacy, it is damaging to the healthcare system, since data is not updated consistently as patients visit clinics more frequently than hospitals. The implication, according to Mchunu (2013), is that the PHCIS system in clinics and the central Clinicom system in hospitals do not always contain similar data information across updates.

Another result is that data sharing between Clinicom and the PHCIS systems is restricted, since users of these systems are not free to transfer data across their systems (Mchunu, 2013). The most notable finding from the Mchunu (2013) research is that it dynamically upgrades and automatically updates the PHCIS system. This begs the question: Why does Clinicom automatically update the PHCIS, when information is updated on Clinicom, but not PHCIS when information is updated on Clinicom?

Chowles (2014) reports that another challenge is the level of resistance to use the system, based on the misconception that technology replaces jobs. According to Bah et al. (2011), the aversion to change or the fear of change, which is perceived to be the most prevalent cause of resistance in hospitals, has slowed down the adoption of EHR by hospital staff. According to Oh et al. (2005), the implementation of an electronic HIS does not replace human practices and procedures, but rather strengthens the abilities of the workers and the efficiency or accuracy of their work. This viewpoint is reinforced by Chowles (2014), who claims that system installation can have a significant influence on enhancing clinicians' workflow, reducing stress related with past workloads, and resulting in a skills upgrade for various healthcare workers.

Mahomed (2017) lists the following challenges experienced with the PHCIS: Patient Master Index duplicates; PHCIS instability; PHCIS development and support resources; lack of standardisation; reports / access to data; lack of management / staff buying; lack of capacity at facility level; duplicate systems; funding (never had sustainable funding); outsourced human resource functions; support staff; data capturers; training; data lines (dependency on Telkom – wireless). Mchunu (2013) suggests that institutional managers encourage clinical users to update patient data in Clinicom, so that all data in the central healthcare systems may be updated in a timely manner. Another piece of advice is to prioritise interoperability, while ensuring that infrastructure at the national level is robust, durable, and adaptable. The development team must create a strong connection with the 'design reality gap' of end-users,

http://etd.uwc.ac.za/

allowing the system to be tightly tailored to needs and workflow procedures (Chowles, 2014). According to the District Health Management Information System (DHMIS) policy (NDoH, 2011:17), for HIS to be managed effectively, the NDoH must guarantee that a provincial team consists of an information manager, a data analyst with abilities in health statistics, and a DHIS database developer / manager with an IT background. The elements that affect healthcare professionals' adoption of HIS will be discussed in the next section.

2.7 Factors that Influence Healthcare Workers' Adoption of HIS

Alqahtani, Crowder, and Wills (2017) identify a lack of computer expertise, perceived lack of usability, and perceived lack of ease of use of the EHR system as individual or user-level obstacles to the adoption of EHR in Saudi Arabia. It has also been reported that psychological factors have been documented to influence users' emotional response to technology, while behavioural factors have an impact on users' actions in relation to embracing or refusing a device (Najaftorkaman and Ghapanchi, 2014). Alawi et al. (2014) identify computer skills, relevant training, and the initial impression given by the system as individual variables that have an impact on users' interactions with the EHRs system, especially so among physicians. The adoption of an e-health information system is influenced by the benefits of the deployed system as well as by the barriers to implementation or use of the system. Below, the study discusses first the benefits of implementing an e-health system and then the barriers that hinder the effective implementation of the systems within the healthcare sector.

UNIVERSITY of the
WESTERN CAPE

2.7.1 Healthcare information system's potential adoption benefits

2.7.1.1 Improved service delivery

In the healthcare sector, electronic health information systems play a prominent role in improving service delivery. The implementation of ICT capacitation and systems in the public healthcare sector has steadily increased the support of the provision of healthcare services (Haux, 2006). Bhattacherjee and Hikmet (2007) believed that the key reasons for introducing information systems in the healthcare sector were to boost the efficiency of healthcare delivery. In addition, the implementation of healthcare information systems worldwide was seen as an important means of reducing the growing need for overcoming the supply gaps in healthcare (Ludwick and Doucette, 2009). According to Adeleke et al. (2014), healthcare professionals admit the effectiveness of adopting e-health IS tools for improving the delivery of services in the Nigerian public healthcare system. According to Cline and Luiz (2013), automating the administration of patient data maintains the healthcare record and billing information, and thereby improves the quality of healthcare services. Yusof et al. (2006) observed that healthcare provision is largely influenced by the implementation of an effective

http://etd.uwc.ac.za/

and efficient HIS. Eysenbach (2001) believed that the quality of care in the public sector is enhanced by the implementation and use of the e-health information systems. In conclusion, Price and Lau (2014) present the argument that when an e-health information system is successfully implemented, it improves efficiencies in healthcare delivery.

2.7.1.2 Operational efficiency

Among the reasons why an e-health information system is implemented in the healthcare sector is to achieve an enhanced operational efficiency. Safi, Thiessen, and Schmailzl (2018) claim that improved productivity is a fundamental motive as to why users adopt the EHRs. In the same vein, the performance of the EHRs has also been documented, reporting its valuable time saving during the knowledge search (Alqahtani, Crowder, and Wills, 2017). Evans (2016) argues that the EHRs offer ease of accessing recorded data within the shortest time possible by pressing a button with the aid of keywords. Yanamadala et al. (2016) reveal that the increased reliability in the use of EHRs has helped to solve the lengthy period of coordinating knowledge for patients with complicated conditions. Yusof et al. (2006) pointed out that HIS, a community of systems, has aided in increasing the quality and efficacy of healthcare organisations in carrying out their tasks and achieving their targets. Cline and Luiz (2013) hold the view that administrative and clinical tools assist in database collection, analysis and use for effective and efficient service provision. According to Gruber et al. (2009), clinical information systems mediate technology's potential in healthcare by boosting service efficiency and efficacy. Implementing an e-health information system in the healthcare sector has the potential to improve operational efficiency and effectiveness, since healthcare organisations will be better equipped to provide healthcare services to their patients in a productive and cost-effective manner.

UNIVERSITY of the
WESTERN CAPE

2.7.1.3 Improved patient safety

Reducing the potential loss of information and thereby risking the patients' safety, and instead enhancing the patients' wellbeing and overall health outcomes, remain the key goals of the healthcare sector worldwide (Brenner et al., 2016). Yanamadala et al. (2016) observe that the e-health system has been critical in the efforts to improve the healthcare's quality. In support of this view, primary healthcare providers in the US have also reported that the introduction of EHRs programs has increased the overall standard of care (Palabindala, Pamarthy, and Jonnalagadda, 2016). Studies by Sittig and Singh (2012) have found that health practitioners who use the e-health information system are able to produce more reliable data and eventually reduce the risk of adverse effects of treatment on patients. Similarly, Gesulga et al. (2017) state that hospitals with a fully functional electronic health system record the lowest death

http://etd.uwc.ac.za/

rates, re-admission, and complication rates relative to those with only partial e-health record or no EHRs at all. Ovretveit et al. (2007) agreed with Sittig and Singh (2012) that introducing an electronic information system in a healthcare system structure provides significant opportunities for enhancing patients' protection. Likewise, Culler et al. (2011) describe better management of the patients' data as factors for enhancing patient protection inside the healthcare facility. Overall, these studies highlight the benefits of implementing an e-health information system in the medical sector to enhance patient safety and improving the standard of patients' treatment.

2.7.1.4 Reduced healthcare costs

Investing in healthcare information systems has the potential to significantly lower healthcare operating costs. According to research, the use of EHRs has the potential to reduce total healthcare expenses (Hossain et al., 2019). This finding is consistent with the finding of Sebetci (2018), who emphasises that the EHRs system can decrease the direct and indirect healthcare expenses by achieving the following: Performance enhancement; consistency of service delivery; cost reduction of data transmission; reduction of human error; avoidance of data loss or duplication, and the replication of patients' records. Gode et al. (2007) agreed that electronic methods of recording patients' information would lower healthcare costs. This view was also supported by Ovretveit et al. (2007), who stated that implementing e-health information systems in the healthcare environment would reduce costs. Bhattacherjee and Hikmet (2007) also believed that the key motivation for introducing IS in the healthcare sector was to minimise healthcare costs. Currie and Finnegan (2009) suggested that the importance of e-health could be found in its potential to help reduce health sector costs, while also providing quality care through a citizen-centric framework. Nyella and Mndeme (2010) confirmed that to minimise healthcare costs and prices, while also boosting the standard of patients' care, and increase their access to healthcare, many policymakers in developed countries put a lot of trust in EHRs. However, there is some evidence that claims that the ability of EHR to minimise healthcare costs remains contradictory or controversial (Sadoughi et al., 2018). Such controversy and debate about electronic health systems' return on investment continues and is still gaining fresh prominence; hence, it has been the subject of intense debate within the scientific community.

2.7.1.5 Reduced medical errors

Ushie, Salami, and Jegede (2013) report that in the US, as many as 44,000 to 98,000 people died annually from misdiagnosis. In South Africa, 40% of doctors acknowledged that they had made medical mistakes, which they attributed to their lack of access to and use of scientific information in the administration of medications to patients (Labuschagne et al., 2011).

http://etd.uwc.ac.za/

Worldwide, the healthcare sector is still striving to provide error-free healthcare by utilising electronic health information system. Healthcare practitioners have also indicated that the use of EHRs helps them reduce the risk of medical mistakes, while it provides them with the ability to increase their patients' safety and quality of treatment (Baier and Gardner, 2017). Bhattacherjee and Hikmet (2007) claimed that the main reason for introducing IS in the healthcare sector was to reduce the rates of medical errors. Studies have demonstrated that the use of information technologies has brought about changes in healthcare quality and a decline in certain adverse effects (Dünnebeila et al., 2012). Blaya et al. (2010) confirmed that automated healthcare systems such as registration and discharge of patients minimises clinic managements' mistakes. In the same vein, electronic health information system resources such as hospital entry and discharge processes, allow medical personnel to monitor and track the patients' progress from entry to discharge or referral, while reducing errors (Blaya et al., 2010). Thus, the effective implementation of an electronic health information system has the potential to reduce or eliminate medical errors by healthcare professionals.

2.7.1.6 Improved workflow

The emergence of the electronic health information system in the healthcare environment has played a fundamental role in improving the workflow in clinics and hospitals. This view was supported by Ouma and Herselman (2008), who pointed out that hospital management systems enhance the administration process and thereby increase the patients' access to clinical services. However, many healthcare workers feel threatened by the introduction of an EHRs system and feel that if the system were to work efficiently, it could cause many workers to lose their jobs, as they were no longer needed for the manual data entry of the health records. According to Oh et al. (2005), the implementation of an electronic health information system does not replace or make human practices and procedures obsolete, and instead, the system would rather strengthen them and make them more efficient and accurate. This issue has been very controversial and a much-disputed subject in the HIS space. As this misinterpretation by workers, their fear and lack of knowledge of how the system works and how it can help them to gain fresh prominence, there is an urgent need for IT professionals to sensitise the healthcare profession and healthcare workers about what these specific ICT tools can do for them.

Literature has also emerged that offers contradictory findings about the ability of an HIS to improve a clinic or hospital's workflow. Noteboom et al. (2014) indicate that healthcare providers predict their workflow to be interrupted because of the slow response time of some EHRs systems and the vast volume of information, such as hyperlinks and tabs. They also highlight the challenge when the systems are only partially implemented and others remain

http://etd.uwc.ac.za/

on a manual record-capturing basis, or where systems are incompatible with other systems. However, assuming that all systems are in place, can be linked and are applied, then the medical industry could potentially achieve an enhanced efficiency of the workflow processes by effectively implementing electronic health system (Mbananga, Madale, and Becker, 2002).

2.7.1.7 Information storage and retrieval

One of the important reasons for implementing an electronic health information system is to enhance the capability of healthcare professional to effectively, timeously, and with ease store and retrieve accurate patient information. According to El Mahalli (2015), an electronic health system makes it possible for providers to view stored data from anywhere without being restricted by the conventional geographic location of paper files. Bleich and Slack (2010) stated that an e-health IS facilitates the preservation and recovery of information for patients. Reichertz (2006) listed data collection and recovery as important administrative method features. According to Blaya et al. (2010), employing electronic coding to identify, centralise, and store all sorts of data inside one patient record allows many physicians to easily access, utilise, and edit a single file without duplicating the patient record. Such single record dramatically reduces the problem of duplications, omissions, or finger error. The evidence presented in this section suggests that a noteworthy benefit is that an electronic health information system increases the ease of storage and enables medical record recovery (Bleich and Slack, 2010).

UNIVERSITY of the
WESTERN CAPE

2.7.1.8 Information sharing

Based on the potential of electronic patient records, there has been an increasing interest in information sharing, utilising electronic health systems in the healthcare sector. According to Eysenbach (2001), the use of an electronic health information system also enhances the public sector's knowledge exchange. The above finding is consistent with the study by Wentzer and Bygholm (2013), who state that the e-health system provides a tremendous capacity for promoting the sharing of health knowledge. Ojo et al. (2007) believed that the implementation of ICT in the health sectors of the various developed countries would speed up the distribution of data and knowledge, as well as improve the access to health information. Similarly, Cline and Luiz (2013) state that automating the management of patient record processes, the hospital records and billing information enhances the quality of healthcare facilities and knowledge exchange inside and beyond the organisations. There seems to be evidence to indicate that e-health services enhance the information exchange between the various healthcare facilities. Recent evidence from the US confirms that the introduction of EHRs programs results in better interactions between health professionals, and an improved

http://etd.uwc.ac.za/

access to medical records, patient treatment plans, allergy lists, medical histories and reports, which allows full medical information becoming available from one specialist to another (Palabindala, Pamarthy, and Jonnalagadda, 2016).

2.7.1.9 Bridging the digital divide

Previous research has shown that there is an uneven distribution of ICT infrastructure or access to it in most developing countries. To address this challenge, solutions must be found so that ICT can be used as an instrument that can help close the divide between developed countries and those still developing and trying to move into the digital age (Lall and Wheeler, 2005). In addition, health information systems were identified as a potential solution to reduce the gap between rural and urban healthcare provision (Fichman, Kohli, and Krishnan, 2011). Ruxwana et al. (2010) claimed that electronic health information or record systems and services strengthen the electronic link between healthcare providers in urban and rural areas. These views were also supported by Cresswell et al. (2011), who stated that when electronic health information systems are successfully introduced, they enhance and promote the provision of an effective healthcare even to remote access. Collectively, these studies promoted the view that apart from being used to monitor and use data, the electronic health information system also offers the resources for online access and availability of distant healthcare facilities (Cresswell et al., 2011).

UNIVERSITY of the
WESTERN CAPE

2.7.1.10 Improved decision-making

According to Ruxwana et al. (2010), electronic health information systems enhance the capacity of healthcare practitioners to make decisions. According to Gode et al. (2007), electronic technologies lead to successful decision-making. Cresswell and Sheikh (2013) indicate that EHRs could improve the capacity of health practitioners to make better and faster patient-care decisions, based on the availability of correct data. According to Duan, Street, and Xu (2011), in situations where a novice healthcare worker needs to make decisions, these automated resources allow the healthcare worker to reach a consensus and make life-saving choices. In addition, these programs aid nurses in drawing conclusions regarding the degree of wellbeing in effectively conducting ward-rounds and substance administration studies (Duan, Street, and Xu, 2011). In summary, with their successful decision-making procedures, these electronic healthcare services will help medical practitioners make informed decisions (Ayers et al., 2009).

http://etd.uwc.ac.za/

2.7.1.11 Improved data management

In the past two decades, researchers have started to show an increased interest in the importance of data management, regarding the electronic health system as an important asset for an organisation. According to Haux (2006), e-health IS can enhance data processing in the administration of healthcare facilities. Similarly, Van Hoeven et al. (2017) state that the electronic health system offers better quality data than what had been available so far, data that are complete, precise, credible, consistent, effective, and reproducible. Silow-Carroll, Edwards, and Rodin (2012) state that healthcare providers use EHR programs to capture, archive and exchange critical patient records, ranging from patients' medical history to test reports, for the provision of quality care. This helps doctors to produce a more reliable diagnostic opinion for a condition (Sittig and Singh, 2012). It also improves the consistency of patient data and creates workflow reliability, as managers work with current documents to quickly guide patients to acceptable referral points with reduced delays (Mbananga, Madale, and Becker, 2002). Therefore, the evidence presented above suggests that healthcare organisations must implement and make best possible use of their electronic health systems to improve their processes and systems of managing data.

2.7.2 Healthcare information system adoption barriers

This section evaluates the current or potential barriers to healthcare information system (HIS) adoption and its use. The findings are discussed below, and categorised into four groups: individual, organisational, technological, and legal factors.

UNIVERSITY of the
WESTERN CAPE

2.7.2.1 Individual factors

Individual factors play a critical role in the adoption and use of an electronic health information system. If the medical industry does not take these reasons seriously, poor healthcare system adoption may persist in healthcare institutions. Alawi et al. (2014) identify computer skills, relevant training, and the initial impression given by the system as individual variables that have an impact on users' interactions with the EHRs system, especially so among physicians. It has also been reported that psychological factors have been documented to influence users' emotional response to technology, while behavioural factors have an impact on users' actions in relation to embracing or refusing a device (Najaftorkaman and Ghapanchi, 2014). Alqahtani, Crowder, and Wills (2017) identify a lack of computer expertise, perceived lack of usability, and perceived lack of ease of use of the electronic health record (EHR) system as individual or user-level obstacles to the adoption of EHR in Saudi Arabia. Collectively, these studies outline a critical role that human factors play in the adoption of a healthcare system. The next section will deliberate on each of these factors.

http://etd.uwc.ac.za/

a) Age, gender, and experience

Age, gender, and experience are among the major barriers to the adoption of an electronic health system. Muathe, Wawire, and Ofafa (2013) argue that the design and usage of IT choices are affected in each context by specific characteristics of a person, such as age. This is similar with the findings of Simon et al. (2007), who stated that healthcare practitioners with more years of service (and thus older) were more likely to be non-adopters than those with less years of service or tenure. This was supported by DesRoches et al. (2008), who advocated the view that the proportion of electronic medical records adopters among physicians who had worked for 30 or more years was slightly lower. Studies have also found that younger nurses have more positive, adoptive attitudes towards accepting the new systems and devices than their older counterparts (Salameh et al., 2019). These studies conclude that the age of the end-user has an influence on technology adoption. However, these findings are contradicted by the study conducted by Ifinedo (2016), who argues that studies have shown that age has little substantial impact on the approach taken towards the implementation of the information system.

Research to date has indicated that user experience becomes very critical in the adoption of electronic health systems. A research study undertaken by Irani (2000) on the adoption of internet networking tools showed that previous use of technology enhanced the perceived usefulness of the technology. Deducted from these study findings, there seems to be some evidence to confirm that prior user experience (and probably a younger age group) influence the adoption of electronic health information systems (Ludwick and Doucette, 2009). Some scholars state that gender, combined with electronic health record experience, are important predictors of users' perceptions of the usefulness of EHRs among nurses in Jordan (Tubaishat, 2018). Gender has been shown to have a substantial effect on perceived usefulness, perceived ease of usage, behavioural intent, and attitude to use (Venkatesh et al., 2003). However, Brentnall and Briddon (2008) emphasised that the widespread generalisation or assumption that gender would be an essential influence towards the use of ICT, with the less supportive users being female and older, was not shown to be valid. Gender might possibly affect the relationship between intentions to use electronic systems, although not all studies are conclusive on this, and normative values might show that the effect on women is more profound (Huang et al., 2013) when they do not have previous experience with electronic systems.

b) User attitude

Concerns were raised that attitude is among the important individual barriers that prohibits the adoption and use of health information system. Attitude towards information systems relates

http://etd.uwc.ac.za/

to the users' personal level of curiosity, expected value, and excitement in interacting with the system (Castillo et al., 2010). According to Mutingi and Matope (2013), technology implementation is a dynamic process, affected and motivated by several factors. Because of the complexity of the Covid-19 pandemic's transmission, it is plausible to assume that health professionals' attitudes towards utilising telemedicine systems were magnified, resulting in a stronger desire to utilise telemedicine systems (Shiferaw et al., 2021). Young (1984) mentioned the important role of physicians' behaviour, desires, and passion as the key factors why computer systems were not approved. According to Kemper (2006), negative attitudes on the part of healthcare professionals can result from a lack of comprehension of their practices in relation to the perceived benefits of the program. Some experienced healthcare professionals feared that technology could lead to reduced critical thinking and excessive reliance on the technology, in which machines had to make medical decisions on behalf of the doctor (Kossman 2008; Georgiou, 2009). According to research, junior doctors were concerned about negative work outcomes such as limitations on their professional autonomy, intense managerial responsibilities, and growing established professional hierarchies, whereas nurses were more likely to identify positive outcomes that could encourage efficient healthcare administration (Darr, Harrison, Shakked, and Shalom, 2003). These studies provide evidence that end-users of the system must be involved in all the phases of the project to obtain their buy-in and avoid resistance. This was supported by Chisolm et al. (2010), who emphasised that managers who regarded ICT proposals favourably at the outset of the project, were more likely to remain optimistic during the implementation phase. Another study recommended that when preparing for the electronic system's implementation in the healthcare industry, the interaction between individual culture, organisational culture, and attitudes towards clinical information system (CIS) should be considered (Callen et al., 2008). Chisolm et al. (2010) recommended that technology innovation strategies must attempt to promote positive first impressions by conducting proper training for user buy-in. Ward et al. (2008) and Chisolm et al. (2010) confirmed that education and training should be part of the initiative to promote constructive attitudes among healthcare professionals towards the new system.

UNIVERSITY of the WESTERN CAPE

c) Incentives to use system

Maria (2011) identified a lack of incentives as one of the barriers to the implementation of an electronic health system. This was supported by Lluch (2011), who believed that the incentive for end-users inevitably had an impact on the willingness to use the technology. Thus, adoption of a new system requires a holistic approach to the provision of incentives to multiple end-user classes (Lluch, 2011). Bates (2005) claimed that if financial benefits were to be offered and the key obstacles such as costs tackled, doctors may be motivated to make the

http://etd.uwc.ac.za/

move to adopt the system. Healthcare organisations in different countries have started to offer incentives to the healthcare workers to accept the use of electronic healthcare systems. For example, in the United Kingdom, healthcare professionals provide incentives to include ICT in their training (Kouroubali, 2003). To raise the adoption rate of electronic medical records, healthcare providers may have to be given incentives (Vishwanath et al., 2007).

d) Social status

Peer group opinion may have a big effect on others' views and opinions in either positive or negative ways (Greenhalgh et al., 2004). This is consistent with the findings of Doolan, Bates, and James (2003), who indicated that practitioners who supported the use of computerised systems may impose some peer pressure on others. Therefore, if there is a slow rate of adoption among doctors, this may suggest a strong resistance (Boonstra, 2010), possibly based on a lack of peer group acceptance of the system. In view of the evidence presented, one may suggest that the social network or peer group is an important factor in the acceptance of new systems; thus, healthcare provider partnerships and opinion leaders will be essential to the effective adoption of IT programs (Anderson, 2002).

e) ICT skills and user training

In the public healthcare sector, it appears that there are insufficient ICT skills resources, such as IT support employees who can teach health practitioners (Pavalam, Jawahar, and Akorli, 2010). Waithaka et al. (2013) claim that ICT user skills have a substantial impact on the utilisation of health information technology. This is supported by Buabeng-Andoh (2012), who advocates the view that a lack of IT literacy and technological skills has been identified by many experts, such as medical practitioners, as core factors hindering the use of the internet and other forms of ICT. In the same vein, Week (2013) states that the absence of ICT expertise remains a major obstacle for medical doctors and other professionals to use new technology. Omary et al. (2010) attributed poor adoption of e-health to a lack of computing skills by clinicians in developed countries. Other research has confirmed that insufficient human and IT skills obstruct the effective adoption and execution of IT innovation (Lawal, Adio, and Adebisi, 2014). Mchunu (2013) also presents similar findings that an increasing issue in SA's public health institutions has been the challenge of insufficient technical skills and a shortage of professional expertise among healthcare practitioners. Sukums et al. (2014) state that in developing countries such as South Africa, the use of computers by doctors is very limited, because of the lack of computer operational skills. Hogan and Palmer (2005) claimed that certain healthcare workers who lacked the necessary ICT expertise of online health data management, end up wasting time on attempting to manage working with the system. In

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

summary, the studies presented provide evidence that medical doctors' IT skills will need to be improved, because these skills will allow them to manage ICT integration and assimilation into the healthcare field (Ruxwana, Herselman, and Contradie, 2010).

According to Malik et al. (2009), sluggish internet usage among physicians in Pakistan was based on their lack of proper technology and computer training. Reid (2016) states that most primary care physicians in the US rejected the system, because they had not been educated in IT when the new system was launched. This conclusion is similar to the findings of earlier research by Bah et al. (2011), who indicated that the deployment of electronic medical records had been delayed because of a range of social issues, such as a lack of awareness of how to exploit new technology among healthcare workers. In summary, these studies highlight the need to train medical doctors how to use computers, understand basic IT systems, and increase their knowledge relevant to their medical profession so that this will help to increase the quality of the healthcare sector in South Africa (Loveday, Smith, and Monticeli, 2006). Training must be provided to improve their understanding and level of trust, as users can resolve technophobia when linking usage to the anticipated benefits and advantages (Walsham, 2006). Reid (2016) recommends that healthcare institutions should continuously educate their workers on EHRs as a way of overcoming this deployment hurdle. Training would enhance the mastery and trust of healthcare professionals in using the system. Another recommendation is that colleagues with extensive training and knowledge of an electronic health system should be utilised to train the less experienced healthcare professionals (Reid, 2016).

UNIVERSITY of the
WESTERN CAPE

2.7.2.2 Organisational factors

According to Ouheda et al. (2019), seven key organisational factors have been identified to be potentially hindering the adoption of electronic health systems; these include: lacking managerial support; organisational scale; organisational culture such as change recognition; technological preparation; employee awareness; and organisational strategy. Najaftorkaman and Ghapanchi (2014) describe a range of organisational influences, such as managerial support, cultural shifts, and the degree of user engagement, which influence EHRs acceptance in different settings. The section below will discuss organisational factors that are considered barriers to the adoption of health system.

a) User involvement

Although there is an increasing focus on problems related to the functionality of e-health systems, relatively little attention is paid to the ways in which healthcare practitioners are

http://etd.uwc.ac.za/

involved (Mair et al., 2012). This view is supported by Mudaly et al. (2013), who writes that user involvement in technology development and deployment of technology advocates the engagement of health providers, the IT sector, and end-users, leading to the establishment of a shared collection of national priorities. Healthcare professionals must be active in the preparation, growth and deployment and progress of new e-health initiatives (Khoja et al., 2007). Doolan, Bates, and James (2003) contended that doctors who supported the adoption of EHRs may also exert some peer pressure on others. Furthermore, clinical leaders with experience or an interest in informatics may act as liaisons with other healthcare professionals during the adoption and implementation phase to gather feedback and stimulate interest in the new system (Doolan et al., 2003). There seems to be some evidence that a large portion of perceived usefulness and acceptance of e-health can be explained by user involvement (Carayon et al., 2013). According to this research, user engagement helps to encourage others that the system may lead to success and creates a sense of ownership in the system's deployment (Ernstmann et al., 2009).

b) Poor planning

System planning has become a key instrument in successful information system implementation. This is supported by Xu et al. (2013), who state that failure to plan when selecting a new electronic health information system results in limited or non-use of the system. Planning around the system's development has become a norm in some countries. For example, the Australian National e-health Transition Authority remained committed to a continuous plan for the development and deployment of the national e-health IS support infrastructure in Australia (NEHTA Strategic Plan, 2012). Similarly, the Government of Nigeria implemented a five-year development strategic plan to effectively incorporate health information systems like those implemented around the world (Adeleke et al., 2014). Another example is the Federal Ministry of Health (FMoH) that intended to develop an integrated National Health Management Information System (NHMIS) in Nigeria (Adeleke et al., 2014). In South Africa, the NDoH launched an e-health plan in 2012 to improve healthcare service delivery and serve as a blueprint for ICT deployment. It was meant to prepare the transition of healthcare facilities in South Africa, especially for the successful execution of the service delivery agreement of the national health sector (National e-Health Strategy, 2012). According to Anderson (2007), the Australian National e-Health Transition Authority's plans were meant to be achieved through the commitment of the Australian Government through substantial financial investments in the healthcare system. They also concentrated on the creation of frameworks for e-health IS enterprise architecture, which were backed by national and international standards. These studies suggest that healthcare organisations need to have

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

clear strategies and realistic plans for their investments in technology; these plans must be developed together with all the important stakeholders.

c) Top management involvement

The successful execution of an information system can deliver many benefits, while a poorly executed or poorly planned initiative can lead to a loss of reputation, and top leadership deciding against any future IT investments (Leidner et al., 2010). Top management's contribution to the development of the e-health information system is thus critical (Rahimi, 2008). This view was supported by Mehrtens et al. (2001), who claimed that there was a strong correlation between the positive attitude by the CEO towards the adoption of an e-health system and the successful adoption of technology. The acceptance of new IT systems is favourably influenced by the CEO's innovativeness and mindset towards emerging technologies (Damanpour, 1991). Interestingly, Sharma and Rai (2003) concluded that firms with a shorter-term CEO have a higher rate of acceptance of new technology. This may indicate that these CEOs were possibly younger and more technology-savvy. Chan and Ngai (2007) found that CEOs in small organisations tend to lack the fundamental knowledge of IT and have an inadequate understanding of the possible benefits of implementing IT. This view was supported by Abraham et al. (2011), who argued that in the medical sector, the effective use of IT for the transformation of healthcare requires IT knowledge and an awareness of its benefits. Lack of IT knowledge among executives and personnel can lead to misunderstandings about new technologies (Rogers, 1995). Communication fosters trust in new technologies, resulting in technological adoption (Rogers, 1995). These studies outlined the critical role for top management in HIS adoption and continued use. Taking on more complex technology would benefit experienced managers and top leadership (Damanpour and Schneider, 2009). Wooton et al. (2009) concluded that there is a need in developing countries to develop and implement clinical informatics.

UNIVERSITY of the
WESTERN CAPE

d) Financial resources

Adopting and implementing health information systems is an expensive undertaking. Woods et al. (2013) comment that the introduction of a rigorous EHRs system is a lengthy and costly operation. According to Boonstra and Broekhuis (2010), these costs can be accrued at different levels of the EHR's implementation, which include initial, operational and repair costs. Khalifa (2013) argues that the initial training and top-up training increase the cost of implementing the health information system. Previous reports have shown that adequate funding of the healthcare sector remains a major obstacle in developing nations, as it is difficult to raise revenue to boost the healthcare budget (Addae-Korankye, 2013). In most African countries, there is limited investment in ICTs for health (Agbele, Nyongeza, and Adesina,

http://etd.uwc.ac.za/

2010). Hence, healthcare organisation must develop long-term plans and set aside the appropriate budgets to ensure that all necessary processes will become automated. However, evidence confirming the ability of EHRs systems to minimise the healthcare costs remains contradictory (Sadoughi et al., 2018).

As funding of the healthcare sector influences the e-health system implementation, it becomes critical that expanded investment in the healthcare sector is closely associated with the e-health adoption, especially in developing countries (Abdullah, 2012; Yu, 2012). Because of the poor health sector support in Tanzania, Omary et al. (2010) argued that it was difficult to distribute vast sums of money for obtaining the ICT services required in the health sector. In several hospitals in South Africa (Modiba and Kotz, 2011), inadequate financial support and institutional dependence on international agencies for the donation of ICT hardware affect ICT access and use. Several reports indicated a favourable association between the implementation of ICT and the size of the company (Pan and Jang, 2008), as large companies generally have more resources or access to resources than smaller organisations. The Australian Government made major financial investments in the healthcare sector to establish an e-health IS business architecture platform, backed by national and international requirements (Anderson, 2007). It recommended that enough funding be allocated to roll out a healthcare information system (Khalifa, 2013). They recommended that a feasibility review must be conducted by a health facility to assess if the EHRs device being bought will satisfy their requirements in terms of its anticipated benefits versus costs (Khalifa, 2013).

UNIVERSITY of the
WESTERN CAPE

d) Change management

A study by Cho et al. (2008) related resistance to change as being one of the major challenges of implementation. According to Bah et al. (2011), the opposition to reform was regarded as the most prevalent cause of resistance in institutions, which slowed down the acceptance of EHRs by hospital workers. Najaftorkaman and Ghapanchi (2014) state that the acceptance of EHRs by end-users is affected by behavioural change and cultural change. Ouheda et al. (2019) add that corporate culture, such as recognition of transition, had an influence on the implementation of the EHRs system in the Australian context. If transition from a manual or paper-based system is not managed properly through change management principles, chances are that the system might fail, and result in a loss of the IT investment. In turn, this could lead to further future resistance to change, especially among users and top management. The healthcare environments comprise a wide range of healthcare workers, and this creates a further challenge regarding the change efforts that involve innovative and action-oriented leadership (Lorenzi, Kouroubali, and Bloomrosen, 2008). McCullough et al.

http://etd.uwc.ac.za/

(2010) concluded that management and leadership must be the source of making a difference through change management to enable a successful e-health implementation.

e) Disruptive routines

The work-process transition in the medical sector was described by Croll (2009) as one of the other obstacles facing the implementation of health information systems. Workflow intrusion has been reported to contribute to the frustration with new applications (Castillo, Garcia, and Pulido, 2010). Littlejohns, Wyatt, and Garvincan (2003) contended that the failure of e-health IS was due to the complexity of healthcare systems. Adeleke et al. (2014) indicate that there are shortcomings in clinical documentation, which gives rise to hindrances in terms of practical use, making the current e-health IS inadequate for work processes. Khakifa (2013) states that the acceptance and usage of these innovations in the healthcare field have been poor, because these systems are not integrated into the working activities of healthcare practitioners. Studies also indicate that some of these activities have hampered the functioning of healthcare workers in an increasingly overburdened public health sector (Mostert-Phipps et al., 2013).

Concerns have been raised about the impact of electronic health records causing a distortion of the communicative aspect that clinicians have with their patients (Rathert et al., 2017). According to King et al. (2014), this results in the absence of provider-patient relationships. This was supported by Norman, Alkins, and Binka (2011), who held the view that the problem with this application was that alerts were raised about its ability to weaken the relationship between the physician and the patient. Several physicians indicated that e-health could reduce the patient–physician relationship, and this could result in a transfer of the physician's position to one of a data entry clerk (Georgiou, 2009). Healthcare experts have also confirmed that EHRs could reduce the efficiency of provider and patient interactions and lead to increased patient visit times (Palabindala, Pamarthy, and Jonnalagadda, 2016). The evidence presented in this section suggests that the negative impact of workflow interference should be reduced with adequate planning before and during implementation (Castillo et al., 2010). Castillo et al. (2010) stated that the process workflow interruption should be carefully considered during the preparation process to enhance the application of e-health in routine clinical care practices. Mair et al. (2012) stress the need to discuss adequately the effect of e-health on healthcare providers' work routines and obligations during the adoption and deployment period. Fit-for-purpose is critical to market acceptance, since “insufficient fitness-for-purpose can have a negative impact on the time spent with and the quality of patient care” (Ammenwerth et al., 2003). Overall, there seems to be evidence to indicate that the effect of workflow intervention could be reduced with proper preparation and planning (Castillo et al., 2010).

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

f) Organisational size

Organisational size plays a critical role in the acceptance and ultimate use of health information systems. According to Najaftorkaman and Ghapanchi (2014), organisational considerations such as the facility size have also been reported to affect expectations and the acceptance of EHRs. Simon et al. (2007) stated that the size of the facility or organisation was closely correlated with the introduction of the EHRs. According to Pan and Jang (2008), organisational size and financial muscle have an influence on the adoption of IT innovation. Physicians who operate in larger medical practices have greater rates of IT adoption and use of electronic medical record (EMR) than those in smaller practices (Roa et al., 2011). These studies indicated that the bigger the size of the organisation, the higher the chances are that its financial abilities would also be better, and that there would be a higher likelihood of adopting electronic health information systems.

g) Organisational culture

According to Cho et al. (2008), the organisational culture plays a major role in health information system deployment. This view was supported by Callen et al. (2008), who suggested that when preparing for such system's implementation in a healthcare environment, the relationship between organisational culture and attitudes towards clinical information systems should be assessed and considered. In addition, according to Scott et al. (2005), clinical information system implementation may have repercussions for the organisational culture by reducing collaboration, and inhibiting, if not properly planned, constructive feedbacks. These studies emphasised the role of the organisations' leaders in achieving the electronic health benefits and growing their adoption rates by creating a suitable organisational culture for the acceptance of the change to an electronic system (Miller and Sim, 2004). The positions of champions and leaders should be strengthened during this period (Sykes, Venkatesh, and Rai, 2010). For the successful implementation and adoption, the establishment of an EMR-friendly culture is therefore necessary (Boonestra and Broekhuis, 2010). Thus, the implementation process should be led by the leadership to prevent exacerbation of implementation problems and resistance, according to Scott et al. (2005). The following section will discuss the technological factors that influence HIS adoption and use among healthcare workers.

UNIVERSITY of the WESTERN CAPE

2.7.2.3 Technological factors

There are many factors related to technology that affect the adoption and use of health information systems. According to Ouheda et al. (2019), system reliability, system compatibility, communication tools, functional system capabilities, system accessibility,

http://etd.uwc.ac.za/

system protection and costs have all been reported to influence the standards and adoption of electronic health systems. Isemeck et al. (2019) state that technological factors, including insufficient and non-functional electronic health record-based facilities, poor internet access and unstable power supply are strongly related to the degree of EHRs adoption. The following sections will discuss the specific technology factors that affect the adoption of health information system.

a) ICT infrastructure

Lluch (2011) noted that spending on infrastructure ultimately affects technology use. This view was supported by Burger (2010), who confirmed the need for an appropriate ICT infrastructure for efficient healthcare delivery, achieving evidence-based medicine and cost savings. The National Integrated ICT Policy Green Paper (2014) also states that appropriate investment in ICT infrastructure growth leads to economic progress and healthcare sector transition. Katurura and Cilliers (2016) claim that healthcare infrastructure is a crucial success factor in ensuring that EHRs are efficiently integrated throughout all South African health facilities.

MicevskaMaja (2005), commenting on telecommunication technology, said that the development of effective telecommunications networks is critical to public health. Despite the effective implementation of electronic health systems, Wilkerson and Tan (2008) found that underdeveloped nations face a number of challenges, including poor telecommunications connectivity. Benson's (2011) findings mentioned infrastructure underdevelopment, and unpredictable power supplies as contributing to the low adoption of electronic health systems. The finding was consistent with the finding of Coleman et al. (2011), who stated that problems included the lack of basic infrastructure such as electricity and the internet, making it difficult to access electronic health information system solutions. Likewise, the Global e-Health Survey (WHO, 2010) mentioned technological problems such as uncertain sources of electricity, poor communication networks, and poor or ineffective internet access as obstacles for developing countries. Omary et al. (2009) pointed out that because of Tanzania's weak ICT technology and internet penetration, most areas in the country could not support internet rollout, which in turn, hampered the implementation of electronic health systems.

A study conducted by Richards and Jacquet (2012) indicates that insufficient ICT technology has contributed to a decline in the efficiency, connectivity, and poor use of the electronic health information systems. Infrastructure challenges are present, especially in remote rural areas (Burger et al., 2012). This view was supported by Coleman et al. (2011), who stated that ICT was not incorporated across all rural and urban areas to work together with hospitals and healthcare practitioners to achieve the optimal benefits of the implementation of an electronic

http://etd.uwc.ac.za/

health information system. Cresswell et al. (2013) hold the view that the electronic health information systems' implementation mechanisms are complex and faced with socioeconomic underdevelopment problems in African countries. Similarly, Adebesin et al. (2013) contend that adoption of electronic health systems in low-income nations is still inconsistent, ranging from minor to non-existent because of poor socioeconomic conditions, unstable political considerations, and delayed or inadequate technological infrastructure progress. In summary, the evidence presented in this section suggested that developing countries can learn from the extensive expertise in developed economies (Busse et al., 2014). The WHO (2002) advocated assisting developing nations in their attempts to integrate technology with healthcare, bringing healthcare services to impoverished rural regions and addressing a difficult healthcare circumstance.

b) ICT readiness

According to Demiris et al. (2004), a readiness assessment is a pre-implementation prerequisite. Such readiness assessment plays a major role before the system's deployment. This was supported by Brender (2006), who claimed that during the adoption of the EHRs, a lack of readiness assessment represented the organisational inability to undergo change, which ultimately contributed to the system's failure. The study by Adjorlolo and Ellingsen (2013) indicates that pre-evaluation of the institution's ICT applications and a readiness assessment prior to approving and deploying ICT-related projects is crucial to minimise the possibility of failure. These studies provide the evidence that a pre-evaluation of the ICT applications as well as considering the institutions' preparation before the acceptance and execution of ICT-related projects is suggested as vital steps to minimise the possibility of failure (Adjorlolo and Ellingsen, 2013).

c) System integration

Previous studies have reported challenges with the system integration and a low adoption level of the electronic health systems. This view is supported by Mchunu (2013) who indicates that there are interoperability issues during the implementation of the electronic health information system in the medical sector. Katurura and Cilliers (2016) concur by stating that every EHRs system seemed to run in isolation, running in separate databases that struggle to interact and transmit information efficiently. Regardless of the milestones of electronic health information system implementation in Australia, difficulties are also recorded there, with system interoperability problems being faced by physicians, resulting in low system utilisation (Sorwar and Croll, 2013). Research findings by Adebesin et al. (2013) state that a lack of commitment to design the requirements, coupled with the system's interoperability has led to

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

a lack of integration, restricted data entry, replication, loss of essential knowledge, and lost opportunities to make informed decisions. Non-adherence to design standards and the electronic health information system's interoperability guide were correlated with these problems (Adebesin et al., 2013). According to Were et al. (2011), there was no adherence to the issued guidelines, and this was coupled with inconsistencies and a lack of incorporation of the electronic health information system, and information communication technology laws. Heeks (2006) cited the public health facilities' information system that failed in the Philippines, because it was designed to a Western standard without considering the local context.

Johnson (2010) revealed that poor interoperability was the key factor leading to low system use in the UK's public health sector, which had made it impossible for devices to be used for clinical assistance purposes. In some instances, implemented systems were not configured to easily transfer information or data from one device to another (Jawahar and Akorli, 2010). In South Africa, data sharing between Clinicom and the PHCIS systems in the Western Cape is limited, because users of such systems cannot freely exchange data between their systems (Mchunu, 2013). Mchunu (2013) also explains that the primary healthcare information systems' (PHCIS') users can only read data in public clinics, but they cannot make any changes to the Clinicom public hospital system, which means that central system data cannot be updated. Consequently, the heterogeneity of the applied e-health IS having hindered interoperability and triggered a decline in the systems' efficiencies, based on conflicting operational requirements (Adebesin et al., 2013). The evidence presented in this section suggested that such connectivity inadequacies impede the entry, coordination and, eventually, the success rate of implementing any electronic health information technology in the public health facilities in SA (Pottas and Korpela, 2013). Evidence also indicated counter-digital division initiatives marked by the demands for more organised, streamlined, and integrated implementations of e-health IS, mainly for the benefit of the population that is underserved and difficult to access (Crowe et al., 2010).

d) System complexity

System complexity in the heath sector is increasingly recognised as a serious concern. This was supported by Blumenthal and Tavenner (2010), who argued that complex systems were regarded as a barrier to adoption by many healthcare practitioners. Yanamadala et al. (2016) agree that the successful execution of health information systems has been adversely affected by the complexity of EHRs programs. According to Makori, MiphMusoke, and Gilbert (2013), a lack of coherent electronic health information being used by numerous practitioners hinders faster and more reliable access to and exchange of knowledge. Yanamadala et al. (2016) state that this dilemma is typically faced by more sophisticated systems during the initial

http://etd.uwc.ac.za/

process of adoption, which results in counter-productivity. The study by Croll (2009) advocated that usability is essential for health information systems' adoption. Coleman (2013) acknowledges that despite the availability of ICT facilities in hospitals, many South African medical doctors are unable to use them. Kushniruk and Borycki (2008) argued that a significant impediment to the implementation of such systems was the lack of ease of use of the health information system. Overall, evidence suggested that usability of a standardised health information system was a major factor in the successful adoption of any EHR system (Zhang, 2005). Studies have shown that user-friendly or less complex technologies have been more readily embraced (Lluch and Abadie, 2013). Overall, these studies highlighted the need to ensure that the developers work closely with the users of the electronic health system and that the system had to be user-friendly and not overly complex.

e) System functionality

Isemeck et al. (2019) report that insufficient and non-functional electronic health systems, poor internet access, and unreliable power supply are directly linked to the extent of EHRs adoption. Waterson (2014) contends that design flaws in implemented systems in the UK meant that the systems could not be utilised for all intended purposes, resulting in low overall utilisation. System functionality in technology innovation such as Clinicom in South Africa has also been shown to be ineffective, mainly because of computer network congestion, system slowness and technological failures (Mchunu, 2013). Al-Harbi (2011) stated that if the information system was down on a regular basis, it posed a major obstacle to the acceptance of EHRs by healthcare professionals in Saudi Arabia. According to Mostert-Phipps et al. (2013), down-time is seen to deteriorate reliability, with the users having negative reactions towards the technology innovation.

Kuo, Liu, and Ma (2013) report that the lack of efficiency of EHRs in transmitting outcomes to patients and practitioners translates into the system being seen as unreliable and facing immense technological challenges. In such a case, healthcare professionals assume that they have no choice but to use paper-based structures to execute their clinical tasks (Cline and Luiz, 2013). Therefore, the devices are not used for clinical duties by healthcare practitioners such as physicians and nurses (Coleman et al., 2011). According to Black et al. (2011), system down-time often disrupts interactions and emergency communications between physicians and radiologists, and the laboratories from which the samples are obtained are sometimes delayed because of the system's down-time. These studies outlined that system functioning challenges such as system down-time, long response time, and computer network congestion hampered the system's reliability and resulted in users rejecting the system or replacing it with paper-based systems.

http://etd.uwc.ac.za/

f) Technical support

Many technology innovations have failed because of a lack of technical support. Yusof et al. (2008) stated that technical support was one of the users' major factors that had adversely affected the adoption of the system. Ludwick et al. (2009) found that most of the vendors were not able to provide the technical support needed. According to Alghamdi (2015), one of the reasons for the vendors being unable to provide technical support is that there is insufficient computer knowledge. This hadsbeen recognised as a major problem in developing countries, where there is insufficient technical support. Another reason cited was that in the public healthcare sector, there seemed to be insufficient ICT-skilled workers, such as IT maintenance staff who could train health practitioners (Pavalam, Jawahar, and Akorli, 2010). Therefore, the lack of technical support after rollout, according to Cresswell et al. (2013), can result in unexpected down-times, faults, and failures in the system's implementation. These studies provide important insights into the fact that effective implementation of the technology innovation and transition will be unsuccessful in the absence of technical support, and adoption will be negatively affected (Asua et al., 2012). Simon et al. (2005) found that two-thirds of physicians quoted a lack of technical support as an obstacle to the adoption of EMRs and justified that one of the reasons for the high adoption rates in the larger hospitals or clinics was the availability of more robust program and system support and training available for clinicians.

UNIVERSITY of the
WESTERN CAPE

g) System fears

According to Croll (2009), one of the obstacles facing health information systems' adoption was fear of the unknown. Khan et al. (2012), when discussing the aspirations and fears of adopting Bangladesh's EHRs, state that most people are still afraid to use ICT in the health sector, based on their incorrect assumptions and not being technically up to date. According to Hollis (2016), one of their fears is that the technical innovation does not guarantee data protection. There was also concern among physicians in many research studies (Boonstra and Broekhuis, 2010) regarding the risk of record destruction because of technical faults resulting from computer failures, viruses, and power failure. According to Caine and Tierney (2015), computer hacking, phishing, spamming, and logging are among the primary fears about the use of EHRs. However, some authors also state that access to and use of ICT in the delivery of healthcare can promote consistency, openness and build trust in the minds of doctors, patients and the end-users (Coleman, 2013).

h) Security and privacy

Health patient files contain intensely sensitive information about patients, such as their demographics, mental care problems, sexual history, and current chronic illness diagnosis

http://etd.uwc.ac.za/

(Heart et al., 2017). According to Anderson and Agarwal (2011), privacy and confidentiality of medical records were among the concerns faced by both developed and developing countries. Analysis by Alqahtani, Crowder, and Wills (2017), however, reveals that only 9% of their participants were concerned about the e-health record programs in terms of their ability to ensure security of medical information. Previous studies report that it is critical to note that the implementation of e-health is severely influenced by safety, privacy, and security issues (Juma et al., 2012). This is supported by Berger and Adedeji (2013), who confirm that in the public health sector, challenges such as confidentiality and protection measures for protecting patient records and data are known, and there is no protocol or guideline on how to maintain patient confidentiality when using these systems, and when it comes to patient information through electronic health system applications (Cline and Luiz, 2013). McLeod and Dolezel (2018) observe that violations of data confidentiality threaten the leakage of personal information to unintended parties, thereby limiting the adoption of the EHRs system. For example, in research focused on Tanzania, ICTs were subject to violations of protection and privacy that adversely impacted their acceptance of IT innovations in the health sector (Omary et al., 2009). In South Africa, loopholes in access management restrictions on the Clinicom system have been often cited as dangerous protection threats (Mchunu, 2013). Mchunu (2013) further notes that users swap their login accounts, while some still hold their passwords and privileges, although their access profiles have not been updated, depending on their previous roles. Healthcare workers are often reported to be hesitant to disclose their patients' medical information, because they fear that the system does not promise data protection (Hollis, 2016). In line with the recently promulgated POPI Act, policymakers and other legal agencies might need to analyse the applicability of the POPIA to the use of EHRs to protect patient records (McLeod and Dolezel, 2018). End-users of the electronic health systems must be properly capacitated on system security measures to prevent regulatory issues (Perera et al., 2011).

i) System resistance

Despite well-documented studies on the benefits of electronic health systems, acceptance remains poor, especially in developing countries (Juma et al., 2012). Alghamdi (2015) adds that resistance to emerging technology, or technical innovations is an obstacle mentioned by healthcare providers in adopting EHRs in hospitals in Saudi Arabia. This was supported by Gillespie (2002), who indicated that nurses might often resist the use IT innovation, because of the risk of being diverted from patient treatment. Reid (2016) states that healthcare workers' reluctance may also be linked to other technology issues, such as costs and decreased productivity. Ouma and Herselman (2008) supported the view that the cost of software and the lack of computers in rural hospitals have been found to hinder the introduction of e-health

http://etd.uwc.ac.za/

(Ouma and Herselman, 2008). In some instances, the end-users may oppose the device altogether, or indulge in disruption or aggressive resistance, or they might use its capabilities only partly, or they might fully accept the technology and the possibilities it presents, but not be sufficiently trained to benefit (Agarwal, 2000). It has been estimated that workers' involvement with sabotage accounted for the loss of nearly half of the ICT programs (Bonnie et al., 2009). In summary, the evidence presented in this section suggested that there is a need for better knowledge and preparation for early adopters of technologies (Mutula, 2001). Blumenthal and Tavenner (2010) concluded that there was a need for IT professionals to pay due diligence when it comes to the principles and best practices of system design, development, and implementation.

j) Paper-based system

In the healthcare sector, the over-dependence on paper-based or manual systems has a major bearing on the adoption and full utilisation of IT innovation (Adio and Adebisi, 2014). According to Mchunu (2013), a paper-based system is an old system, one that became obsolete at the beginning of the 21st century. However, the medical sector largely still uses paper-based or manual systems to conduct business. For certain organisations, their IT applications cannot accommodate all their service areas, meaning that for certain service points, processes are automated, while for others, they utilise a manual system. This then means that the devices are not fully utilised for the clinical roles by healthcare practitioners such as physicians and nurses (Coleman et al., 2011). In that case, healthcare practitioners have no choice but to use paper-based systems to achieve their clinical tasks (Cline and Luiz, 2013). According to Mostert-Phipps et al. (2013), this has resulted in a decline in stable information, with the users reporting a negative impact on the system. The significant findings to emerge from these studies is the evidence that a parallel system duplicates procedures (paper-based and electronic systems) and this can cause medical failures that endanger patients' safety (Cresswell et al., 2013). However, both the electronic health information system and paper-based programs have been distinguished by persistent problems with data errors (Mullins, 2009). Many practitioners believed it to have more benefits to using a paperless system to minimise the risk of missing sensitive care records, and to make it easier to reconcile the patient's entire health information (Al-Harbi, 2011). However, Al-Harbi (2011) stated that electronic health systems reduced paperwork, filing, the risk of losing patient data, and instead, enabled data storage.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

k) Data errors

An examination of South Africa's health information systems revealed that national-level monitoring reports were neither timely nor full, raising concerns about the quality of data in the South African healthcare system (Statistics South Africa, 2009). According to Snyders (2013), the e-health information system falls short of achieving its goal, with detrimental impacts on data accuracy in the healthcare sector. For example, it was discovered that 50% of the data items in the routine health data for PMTCT (prevention of mother-to-child HIV transmission) reported to the DHIS in three districts of KwaZulu-Natal were incomplete, and 87% were inaccurate (Snyders, 2013). Frasier et al. (2008) noted that the lack of data accuracy resulted in the suspension of the IT innovation being used. In addition, because of a lack of data quality, inadequate reporting and clinical resources, the introduction and application of the IT innovation had to be halted in 2007 (Frasier et al., 2008). As a result, data had to be imported manually from different levels, because of inadequate computer units to produce a less than precise national report (Snyders, 2013). This indicated that the healthcare sector must pay due diligence by making sure that their electronic health information systems have built-in data cleaning or quality reports, and ensure their algorithms are functional at all time to ensure high-quality data that leads to accurate decision-making and a better healthcare system.

l) Increased workload

A perceived increased workload is one the most highlighted challenges in the lack of adoption of health information systems. Physicians' burnout has recently been declared a public health issue. It is further stated that their frustration with the usefulness of electronic record systems for practical usage further exacerbates the burnout rates among physicians (Jha et al., 2019). According to Ward et al. (2008), General Practitioners (GPs) were obsessed with technical difficulties relating to machine usage, while pharmacists raised the workload as a central obstacle. According to Boonestra and Broekhuis (2010), the healthcare providers' problem regarding the use of IT innovations during patient treatment was the extra time needed to learn new skills, which consumed a lot of time and resulted in additional time spent on technology, which was then seen as increasing their workload. Middleton et al. (2013) confirm that electronic health systems create additional workloads, because of the additional task of having to enter data into the system. Evidence suggested that physicians who performed clerical and administrative duties such as order entry, coding, and billing on the EHRs system in addition to their outpatient treatment, spent about twice as much time on these tasks than they spent on face-to-face encounters with the patient (Sinsky et al., 2016). Kuo, Liu, and Ma (2013) recommend that healthcare institutions should adjust to modern workflow methods to avoid overloading the healthcare professionals. The following section will focus on legal issues to HIS adoption and use.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

2.7.2.4 Legal factors

a) Policies, legislation, and regulations

Adio and Adebisi (2014) assert that a lack of government policy on e-health adoption has a significant influence on the adoption of an electronic health information system. Kathryn (2011) stated that inadequate electronic regulation (e-legislation) and e-health requirements have adversely affected, for example, the implementation of e-health in Kenya, as was also the case in Ghana. It was said that Ghana did not seem to have a strong and broad-based national policy on the primary and secondary use of electronic personal information to individuals (Norman, Alkins, and Binka, 2011). Despite the challenge created by the lack of electronic health information system policies or legislations in the medical sector, promising initiatives to develop and implement IT policies, especially in developing countries, have taken place. Kenya's Government and the private sector have partnered to implement regulatory policies to create a democratic healthcare structure in the country (Makori, MiphMusoke, and Gilbert, 2013). According to Juma et al. (2012), these policy reforms have been matched with national e-health and national ICT regulations, as well as a total collaboration with healthcare workers and customers, to develop a viable client-centred health system that is accessible to all Kenyans. The Nigerian government, through the Federal Ministry of Health (FMoH), aspired to design, legislate, and enforce policies that would improve the national healthcare system for efficient, dependable, and sustainable service delivery in collaboration with a variety of partners (Federal Ministry of Health, 2013). Mutula and Mostert (2010) reported that the Government of South Africa had plans to support ICT infrastructure in the country through the implementation of numerous ICT quality service delivery programs and regulatory system policies. The adoption of an electronic health information system requires the formulation of policies that essentially affect the use of technology in a systematic way (Lluch, 2011). Urgent compliance with the Act on the Security of Personal Information (POPI) No 4 of 2013 is intensifying within the framework of South Africa (Kandeh, Botha, and Futcher, 2018). McLeod and Dolezel (2018) propose that policymakers and other legal agencies develop national regulations regulating the use of EHRs to protect patient records.

UNIVERSITY of the
WESTERN CAPE

2.8 Chapter 2 Summary

In summary, this chapter discussed the health information system and its adoption. It discussed HIS implementatiom in industrialised, developed and emerging markets, including the status of HIS adoption in South Africa. The PHCIS was discussed with special emphasis on the factors that affect the level of the PHCIS's adoption and use, the benefits and barriers to adoption.

http://etd.uwc.ac.za/

CHAPTER 3: TECHNOLOGY ADOPTION MODELS

3.1 Introduction

To understand how people embrace a technology, different technology adoption models have been used (Oye et al., 2014). Understanding why consumers embrace or reject IT is a critical topic of information system study (Venkatesh, Davis, and Morris, 2007). Models of technology adoption have been created to better understand how people comprehend, accept, and apply technology (Venkatesh et al., 2003). According to Venkatesh (2000), most of these models have their roots in sociology, psychology, and IT. Rasimah et al. (2011) concurred with Venkatesh by saying that these models had their roots in the fields of psychology, knowledge management and sociology. The topic had been researched in the discipline of Computer Science since the 1970s, where investigating the adoption, acceptability, and usage of information systems was a topic of study in the software engineering field (Momani and Jamous, 2017). The technology adoption theories included the Theory of Reasonable Action (TRA), the Theory of Planned Behaviour (TPB), the Theory of Diffusion of Innovations (DIT), the Theory of Task-Technology Fit (TTF), the Technology Acceptance Model (TAM), and the Technology Acceptance Model 2 (TAM2) (Fishbein et al., 1975). The relationship between the research objectives and the used models for this study is that different technology adoption models have been developed to understand how individuals accept a technology (Oye et al., 2014). The study attempted to address the study objectives through the technology adoption models presented in this study. In addition, all these TAMs are applicable to all the e-health studies, including the current study on factors that hinder the adoption and use of PHCIS in the Western Cape's public health clinics. Their applicability stems from the fact that technology acceptance models aim to explain why individuals adopt or reject technology. Models of technology adoption have been developed to help researchers understand how individuals perceive, accept, and utilise technology (Venkatesh et al., 2003).

UNIVERSITY of the
WESTERN CAPE

3.1.1 Theory of Reasoned Action (TRA)

The TRA was the first theoretical viewpoint to acquire general acceptance in technology adoption research (Fishbein and Ajzen, 1975). The TRA was based on social psychology, with the goal of "developing a theory that might predict, explain, and affect human behaviour" in their social environment (Harvey and Lawson, 2009). Because it was based on social psychology, this theory is considered as a basic theory for learning human attitudes and behaviours (Oye, Iahad, and Rahim et al., 2014). According to Magee (2002), the TRA was strengthened for use in academia and business and had demonstrated its relevance in the literature on IT (Fishbein and Ajzen, 1975). The theoretical model's focus is on understanding

http://etd.uwc.ac.za/

the reasons of specific human behaviour by investigating the unique motivational elements that contribute to the behaviour under consideration (Glanz, Rimer, and Viswanath, 2015). This concept proposed that people should examine the consequences of their actions before making any decisions (Ajzen and Fishbein, 1980).

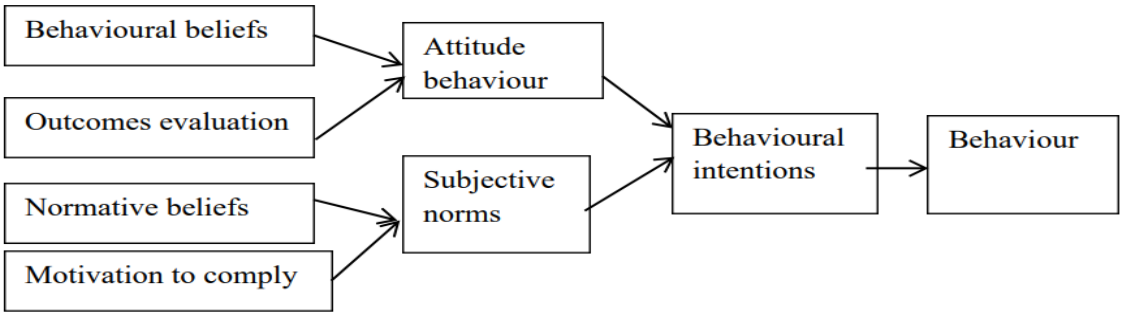


Figure 2: **Theory of Reasoned Action (Fishbein et al. (1991)**

The TRA is made up of three main constructs: behavioural intention, attitude, and subjective norms. When developing the TRA, the main premise is that the greatest predictor of behaviour is behavioural intention, which is defined as the mix of an individual's attitudes towards a behaviour and the inputs they get from society (Glanz, Rimer, and Viswanath, 2015). In the TRA model, the main drivers of a specific action performed by an individual is first, the intent; second, attitude; and last, the subjective norms (Lippert and Davis, 2006). The below section will discuss the three main constructs of the TRA.

UNIVERSITY of the
WESTERN CAPE

3.1.1.1 Behavioural intention

The TRA is a useful paradigm for anticipating behaviours while studying behaviour (Ajzen and Fishbein, 1980). According to George (2004), intentions imply prospective behaviour, whereas actual behaviour shows what happened before. Behavioural intention (BI) was defined as “a person’s subjective probability that he will perform some behaviours” (Fishbein and Azjen, 1975: 288). The authors of the model posited that an individual’s belief was solely dependent on the intent on how the individual behaved (Ajzen, 1985). Khanh and Gim (2014) agree that an individual who believes in the possibility of transformation is more inclined to embrace and employ technology. Moreover, higher levels of commitment are more likely to result in behaviour (Fishbein and Ajzen, 1975). According to the TRA model, the key drivers of a certain action performed by an individual are first, intent; second, attitude; and last, subjective norms (Lippert and Davis, 2006). Knowledge and intent to adopt information is a necessary condition for the acceptance of new technologies (Lambrecht et al., 2014). The choice to continue using an accepted technology is made prior to a period of learning how to utilise it (Marra et al., 2002). Goal-directed behaviours can boost a person's likelihood of engaging in a certain

http://etd.uwc.ac.za/

behaviour (Korzilius et al., 2007). In any scenario, an individual's behavioural intention is defined by their desire to change, attitude towards the change, and subjective criteria (Ajzen and Fishbein, 1980). The attitudes that influence conduct, according to the concept of BI, reflect an individual's willingness to participate in activity (Fishbein and Ajzen, 1975). This is affected by attitudinal variables, which describe how individuals engage in the desired behaviour, based on their behavioural beliefs and capacity to appraise the results of their actions or behaviours (Ajzen, 1991).

3.1.1.2 Attitude

Attitudes are typically favourable or negative perceptions of a person, place, object, or event (Bagherian et al., 2009: 252). A person's attitude towards behaviour (A) "refers to the extent to which a person has a favourable or unfavourable opinion or appraisal of the behaviour in issue" (Ajzen, 1991: 188). The attitude of a person towards a technology has a big impact on the decision to accept it or not (Robinson, 2009). Certain attitudes that connect to a specific goal, time, and context should be investigated to predict a specific behaviour targeted at a specific target in each context and time (Ajzen 1988; Fishbein and Ajzen, 1979). According to Glanz, Rimer, and Viswanath (2015), for an attitude to be a stronger predictor of behaviour, it must be more relevant to the context or behaviour. There was evidence that users' attitudes were positively associated with computer usage, according to Fishbein and Ajzen (1975), since users' attitudes played an essential role in moulding their behaviour. Similarly, Otieno et al. (2016) reveal that attitude and subjective norms are important indicators of people's intentions to carry out an action such as adopting and using new technology. When a person's aggregate or average behaviour is examined, rather than individual actions, then their attitude towards a certain behaviour becomes more obvious (Myers, 2010). Because attitudes may be moulded as norms and vice versa, this paradigm has a high potential of misunderstanding between attitudes and norms.

UNIVERSITY of the
WESTERN CAPE

3.1.1.3 Subjective norms

Social pressure or perceived expectations from relevant persons to engage in this behaviour are examples of subjective norms (Fishbein and Ajzen, 1975). Subjective norms are a mix of the relevant persons' normative views and drive to conform to such ideas or expectations (Ajzen and Fishbein, 1975). The theory suggests that human behaviour can be predicted or influenced by (1) a person’s attitude towards a specific behaviour; (2) and the influence of others on a specific behaviour – meaning if people important to an individual are of the opinion that they should act out certain behaviour (subjective norm), the resultant effect would be that they might act out the behaviour (Azjen and Fishbein, 1980). Subjective norm refers to an individual's judgement of societal effects (pressures) on behaviour, whereas perceived

http://etd.uwc.ac.za/

behavioural control refers to their personal estimate of their capacity to effectively conduct the behaviour of interest (Workman, 2005).

TRA is thus a predictive model used in a diverse discipline to anticipate the behaviour of persons, based on specific criteria (Mishra et al., 2014). According to Han (2003), information systems researchers have used the idea of reasoned action to analyse IT-related innovations. Liker and Sindi (1997) established and tested a model based on the TRA to comprehend the challenges posed by communication technologies on the performance of management teams in research that utilised the TRA to analyse technology adoption.

The TRA theory's limitations have been recognised. The disadvantages of this approach, according to Ajzen (1991), included a high possibility of misunderstanding between attitudes and norms, because attitudes may also be moulded as norms and vice versa. Irrational actions and attitudes that are not predetermined are among the problems confronting this model (Conner and Armitage, 1998; Sutton, 1998). The model fails to address the role of habit and cognitive deliberation (Taherdoost, 2018). The model's failure to explore alternate possibilities was discovered as a significant flaw (Sheppard et al., 1988). Among these were complaints that the theory ignored other elements that may be utilised to predict individual behaviour in real life (Grandon and Mykytyn, 2004). Essentially, the Theory of Reasoned Action does not assert that beliefs are necessary in a "context such as IT adoption" (Ducey, 2016). In the TRA, intention does not necessarily result in action, since other elements such as other people's cooperation, talents, and resources can all have an impact on the outcome (Harvey and Lawson, 2009). To overcome this gap, the TRA was enlarged to include a third antecedent, Perceived Behavioural Control (PBC). To address the inadequacies of the TRA, Ajzen (1985) incorporated a new component, perceived behavioural control, in his Theory of Planned Behaviour.

Based on the constraints indicated in the preceding paragraph, the TRA as TAM only made the following contribution to this study: TRA had been strengthened for use in academia and business and had demonstrated its relevance in the literature on IT (Fishbein and Ajzen, 1975). So, the TRA was only used in this study to understand how individuals accept or reject technology. TRA is a theory that might predict, explain, and affect human behaviour" in their social environment (Harvey and Lawson, 2009). In the current study, the TRA assisted the researcher to understand, explain, and predict user behaviours towards the PHCIS. The TRA was helpful in anticipating and explaining the aspects that influence user behaviour regarding the PHCIS uptake and use, because the TRA's focus is on understanding the reasons of specific human behaviour by investigating the unique motivational elements that contribute to

http://etd.uwc.ac.za/

the behaviour under consideration (Glanz, Rimer, and Viswanath, 2015). This theory is considered as a basic theory for learning human attitudes and behaviours (Oye, Iahad, and Rahim et al., 2014). One of the contributions of the TRA model to this study was that the TRA's greatest predictor of behaviour is behavioural intention, which is defined as the mix of an individual's attitude towards a behaviour and the inputs they get from society (Glanz, Rimer, and Viswanath, 2015). In the TRA model, the main drivers of a specific action performed by an individual is first, the intent; second, attitude; and last, the subjective norms (Lippert and Davis, 2006). All these are considered critical when predicting or explaining factors that affect user behaviour in technology acceptance.

3.1.2 Theory of Planned Behaviour (TPB)

Ajzen's (1988) concept of planned behaviour is an extension of the Theory of Reasoned Action (Fishbein and Ajzen, 1975). The TPB is a sequel to the TRA, and Ajzen (1991) defined this component as "the perceived ease or difficulty of performing behaviour". The TPB describes a person's assessment of the amount of effort when undertaking an interesting behaviour (Chestnutt, 2016). Ajzen (1991) added new constructs to the TRA, which was known as the "perceived behaviour control (PBC)". The TPB is a TRA derivation that overcomes the TRA's weakness "in dealing with behaviours over which persons have little volitional control" (Ajzen, 1991: 181). The following adjustment to Azjen's concept of reasoned action derived from Azjen's belief that an individual's perceived control over specific behaviour determines the result of that behaviour (Azjen, 1991). The degree to which individual think that the decision to act or not perform is under their control was referred to as the TRA (Ajzen, 1991). The TPB was introduced since the Theory of Reasoned Action was unable to deal with behaviours involving "incomplete volitional controls" in persons (Fishbein and Ajzen, 1975).

UNIVERSITY of the WESTERN CAPE

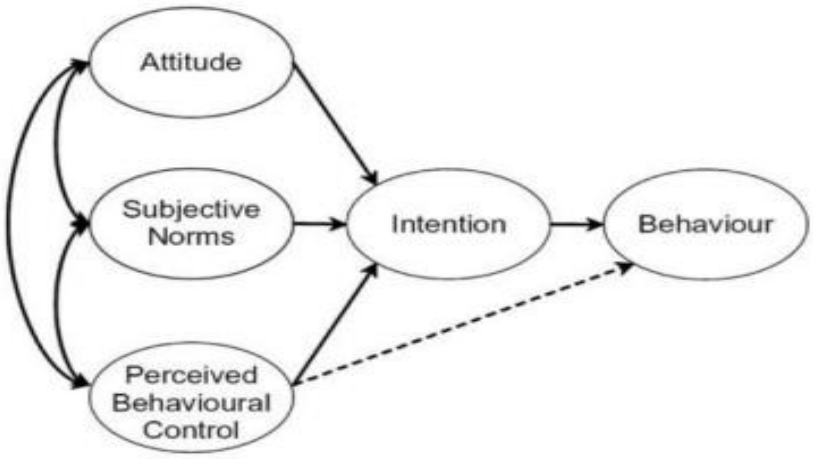


Figure 3: The Theory of Planned Behaviour (Ajzen, 1991)

http://etd.uwc.ac.za/

The authors discovered that the TPB model's three core components are all drivers of BI (Petersen, Pather, and Tucker, 2019). TPB illustrates the relationships between attitudes towards reasoned behaviour (A), subjective norm (SN), and perceived behavioural control (PBC) of performing the questioned behaviour (B) (Workman, 2005). According to Lee, Cerreto, and Leffor (2010), the extent to which a person may regard a certain behaviour in a favourable light (attitude), feels that important individuals want them to adopt a specific behaviour (subjective norm), and finally believes that they can adopt the behaviour (perceived behavioural control) was explained by the TPB.

3.1.2.1 Perceived behavioural control (PBC)

The Theory of Planned Behaviour (TPB), which was based on the work of Ajzen (1991), was similar to the TRA, in that it focused on attitudes towards behaviour and subjective standards. Perceived behavioural control had a direct impact on a user's desire to accept and utilise technology, according to Liao et al. (2007) and Hsu et al. (2006). According to the TPB, all moral impacts on decisions to adopt a specific perceived new technology were supposed to be mediated by measurements of attitudes, subjective norms, and perceived behavioural control (Ajzen and Fishbein, 1980). The Theory of Premeditated Behaviour (Ajzen, 1991) or TPB, predicted deliberate behaviour, because human behaviour may be planned. This hypothesis had two critical components. First, behavioural control has a motivating goal; second, there is the potential of a direct relationship between perceived behavioural control and behaviour (Ajzen, 1988). Perceived behavioural control (Taylor and Todd, 1995) referred to perceptions of internal and external behavioural restrictions, where internal behavioural constraints included personal skills and knowledge (or an individual's self-confidence) required to perform the desired behaviour. The TPB, similar to the TRA, revealed crucial links connecting attitude, subjective standards, and perceived behavioural control when describing the effect of technology on behaviour intent and use behaviour (Chuttur, 2009). According to Azjen (1991), in the TPB, human behaviour is regulated by an individual's attitude as well as behavioural intention, and behavioural intents are characterised by societal norms and the individual's perception of how simple the behaviour may be performed (Martin, 2017). In the TPB, “Control beliefs include the perceived availability of skills, resources, and opportunities, whereas perceived facilitation or influence of control beliefs (Ajzen, 1991) is the individual’s assessment of available resources to the achievement of a given set of outcomes” (Chuttur, 2009: 12).

According to Taylor and Todd (1995), the TPB had since been commonly used to explain the human adoption and application of new technologies. The TPB, created by Ajzen (1985), was similar to the TRA in that it explained how behaviour (such as technology adoption) was a

http://etd.uwc.ac.za/

consequence of intention. In contrast, the Theory of Planned Behaviour was created to explain human behaviour in a social psychology context and not to explain user technology adoption (Mishra, 2014).

The TPB model has numerous drawbacks, including that it ignores the variations in human behaviour as well as the culture's ability to predict human behaviour (Zhang, 2018). The author further states that it is limited to individual rational behaviour that does not provide a clear justification for individual emotional behaviour (Zhang, 2018). Ajzen (1991) acknowledged the idea that, at least in certain cases, decisions about technology use must consider not only perceived societal pressure, but also a personal feeling of moral obligation or responsibility (whether it is morally right to use such a technology). Despite the TPB's broad and effective use in adoption behaviour research, the theory was later criticised for failing to account for moral views' effects on adoption (Arvola et al., 2008). The idea of planned behaviour was criticised for failing to explain elements that can predict or influence behaviour, leaving it susceptible to prejudice (Taylor and Todd, 1995).

The researcher did not adopt or adapt the TPB model for this investigation due to the constraints indicated in the preceding paragraph. It is important to note that the Theory of Planned Behaviour was created to explain human behaviour in social psychology context and not to explain user technology adoption (Mishra, 2014). However, due to its constructs and their relationships with the factors that affect behaviour in technology adoption or rejection, the TPB was used in the field of IT. According to Taylor and Todd (1995), the TPB has since been commonly used to explain the human adoption and application of new technologies.

UNIVERSITY of the
WESTERN CAPE

The contribution made by this model in e-health and the current study is that the TPB describes a person's assessment of the amount of effort when undertaking an interesting behaviour (Chestnutt, 2016). The TPB, created by Ajzen (1985), explains how behaviour (such as technology adoption) is a consequence of intention. According to this model, the individual's perceived control over specific behaviour determines the result of that behaviour (Azjen, 1991). The TPB deals with behaviours over which persons have little volitional control" (Ajzen, 1991: 181). In the TPB, perceived behavioural control has a direct impact on a user's desire to accept and utilise technology (Liao et al., 2007; Hsu et al., 2006). The Theory of Planned Behaviour revealed crucial links connecting attitude, subjective standards, and perceived behavioural control when describing the effect of technology on behaviour intent and use behaviour (Chuttur, 2009). TPB illustrates the relationships between attitudes towards reasoned behaviour (A), subjective norm (SN), and perceived behavioural control (PBC) of performing the questioned behaviour (B) (Workman, 2005).

http://etd.uwc.ac.za/

3.1.3 Theory of Diffusion of Innovations (DOI)

In 1962, Rogers (2003) developed the DOI. According to Rogers (1995), the Theory of Innovation Diffusion (DIT), which was used interchangeably with the term DOI, was utilised to study a wide range of innovations. The DIT is the mechanism through which a new idea or practice is transmitted over time between the participants of the social system through a variety of networks created (Rogers, 2003: 5, 12). Rogers' DOI theory or IDT or Rogers' Theory was established by meta-analysis of innovations in a variety of contexts, although it was largely used in agriculture to study the diffusion of technology and other farming approaches (Rogers, 2003). The innovation diffusion model (Rogers, 2010) outlined the social system's adoption of an invention through time. It was also described as the process through which individuals embraced a new concept, product, practice or ideology (Kaminski, 2011: 1). The diffusion process is divided into five stages: knowledge, persuasion, choice, execution, and communication.

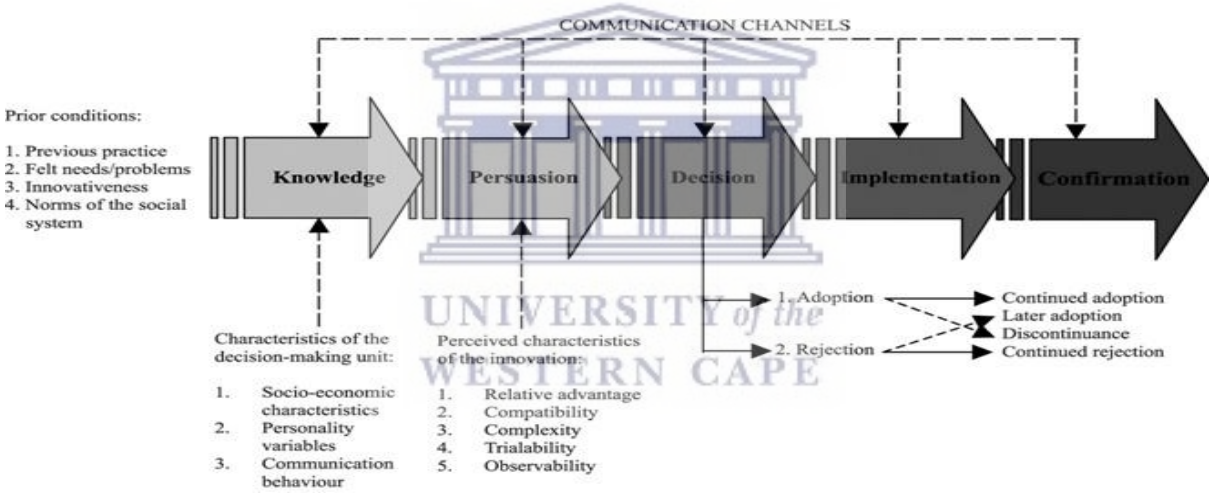


Figure 4: Innovation Diffusion Model (Rogers, 2003)

Knowledge phase: Individuals are introduced to innovation and then instructed on how to use it (Rogers, 2003). **Persuasion phase:** Individuals acquire either a favourable or negative opinion about the invention during the persuasion phase (Rogers, 2003). During **the decision-making** process, the individual (or unit) may be influenced by factors that support or oppose the innovation, affecting the choice to embrace or reject the innovation (Rogers, 2003). Individuals or groups opt to employ innovation at the **implementation phase** (Rogers, 2003). The choice to continue adopting or rejecting innovation is achieved at the **confirmation** step (Rogers, 2003). Rogers' (1995) diffusion of innovation theory states that innovation and adoption occur after a series of stages such as understanding, persuasion, decision, implementation, and confirmation, resulting in the development of Rogers' (1995) S-shaped

http://etd.uwc.ac.za/

adoption curve of innovators, early adopters, early majority, late majority, and laggards.

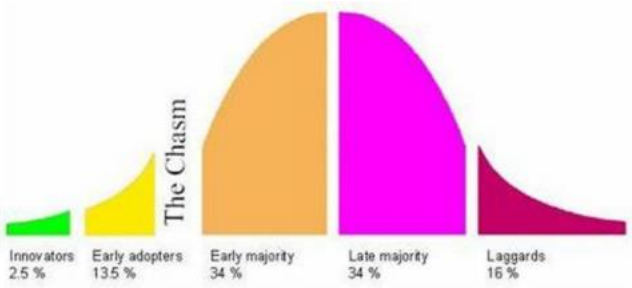


Figure 5: Innovation Adoption curve (Rogers, 1995)

Innovators are considered risk takers, enterprising and willing to change. These adopters are known to invest significant time and effort when they have embraced the technology innovation (Rogers, 2003). Individuals who have already adopted the new behaviour and invested a substantial amount of time and effort in it are examples of innovators (Rogers, 2003). **Early adopters,** according to Rogers (2003), operate in a very strategic manner, always searching for inventive methods to do business better, accept new ideas, and are rapid on the uptake. The **early majority** adopter group will not accept technology innovation if there is no apparent return on investment. Among the early majority, it is only peer pressure that drives people to embrace new technologies (Rogers, 2003). The l**ate majority** group is not comfortable with new ideas; they are risk averse and known to adopt the innovation later only once they have seen it being successful in other businesses. **Laggards** are often sceptical of innovators and change agents; hence, they are the last to accept technology innovation, if at all.

According to several studies, adoption and sustained usage are influenced by a variety of factors (Kijima et al., 2011). Furthermore, for healthcare innovation to reach the patients who need it the most, adoption obstacles must be addressed prior to a launch (Dearing and Cox, 2018). According to Rogers (1995), all users of technology were part of social structures and so played an important role in the dissemination of a new technology. According to Rogers (1995), these structures impacted human perceptions when it came to decision-making and were thus accountable for behaviour that was regarded as being appropriate inside these structures. According to Hang et al. (2015) and Zhang et al. (2015), insufficient knowledge, a lack of e-skills, and limited access to ICT all contribute to a low level of adoption. The rate at which an invention is adopted is also affected by the mobility and diffusion of knowledge about it throughout the social system (Rogers, 2003). The invention itself, how information about the innovation is transmitted, and time are the major variables driving the dissemination process (Rogers, 2003). As a result, while determining whether to embrace or reject a technology,

http://etd.uwc.ac.za/

opinion leaders had an impact on both collective and individual judgements (Manueli et al., 2007). The social dynamics provided punishments or incentives that may have a substantial impact on the adoption process's result (Teichler, 2006). The features of the adopters and their impressions of the innovation are crucial to the time-of-adoption theory (Wejnert, 2002). Organisations that are planning to implement new systems must look at the importance of identifying key players in the diffusion process, as well as the influence of institutional regimes and models that take team behaviour into account (Lyytinen and Damsgaard, 2001). The change agency necessary for innovation acceptance is frequently formed by opinion leaders (Rogers, 2003). The availability and diffusion of important information about a technology, which informs the level of information campaigns and extension activities, are crucial in increasing awareness, but the demand for such information also plays a role (Lambrecht et al., 2014).

According to Lean et al. (2009), the DOI theory was beneficial for conceptualising technology adoption in conjunction with other models such as the Technology Adoption Model, which considered the factors of user technology adoption. This model was used in a primary care clinic to investigate the characteristics that influence patient acceptance and use of consumer e-health technologies (Zhang et al., 2015).

UNIVERSITY of the
WESTERN CAPE

The DOI framework had been criticised for being overly literal, making it impossible to discern between its premises and conclusions, among other things (Bass, 1969). The DOI did not handle innovations that were adopted in cycles, stages, or because of a causal process (Mustonen-Ollola and Lyytinen, 2003). Diffusion models had been criticised for lacking empirical validity, especially in “delineating the complex, context-sensitive character of the phenomena itself, in much greater depth” (Fitzgerald et al., 2002: 1429).

Because of the constraints indicated in the preceding paragraph, the researcher did not apply or alter the DOI model for this investigation. The DIT is the method through which a new idea or practice is transferred over time among social system members via several networks (Rogers, 2003: 5, 12), even though it was primarily employed in agriculture to examine the spread of technology and other farming practices (Rogers, 2003). According to Lean et al. (2009), the DOI theory was beneficial for conceptualising technology adoption in conjunction with other models such as the Technology Adoption Model, which considers the factors of user technology adoption. Implementers must consider the significance of identifying important participants in the diffusion process, as well as the impact of institutional regimes and models that account for team behaviour (Lyytinen and Damsgaard, 2001). In this study, the process through which individuals embraced the concept or the idea of PHCIS was rather

http://etd.uwc.ac.za/

challenging because of a lack communication and involvement of the relevant stakeholders for some clinics. However, this model provided insights into the processes of how technology is diffused within the individuals in the organisation.

3.1.4 Theory of Task-Technology Fit (TTF)

Task-Technology Fit is the extent to which a technology is appropriate for accomplishing a given activity, and was referred to as the TTF (Goodhue and Thompson, 1995). A task is a deliberate activity performed by a human to accomplish a specified goal, whereas technology is a tool used to carry out tasks (Isaac et al., 2017). The TTF emphasises individual impact (Goodhue et al., 1995). The TTF model, according to Goodhue et al. (1995), can be employed if the IT capabilities meet the tasks that the user must do. According to Goodhue et al. (1995), a strong fit between task and technology increases the likelihood of usage and improves performance impact, because the technology better realises the task demands and wishes of users. The purpose of the Task-Technology Fit Theory (TTFT) was stated to be to investigate the links between information systems (IS) and individual performance (Goodhue and Thompson, 1995).

UNIVERSITY of the WESTERN CAPE

Figure 5: Task-Technology Fit (Goodhue and Thomson, 1995)

The TTF's components included task factors, technological features, performance implications, and use (Goodhue and Thomson, 1995). Performance impact refers to "improved efficiency, effectiveness, and/or higher quality" (Lai, 2017: 23). According to Irick (2008), it was impossible to directly assess the performance impact; therefore, user ratings are used. If the job and technology were well-matched, it was expected that use and performance would also rise as the technology became more tailored to the user's demands (Goodhue and Thompson, 1995). The extent of a user's perception of a technology's suitability to enable tasks would increase utilisation of the technology with an overall performance impact (Howard and Rose, 2019). The TTF can be used to predict technology usage in relation to how well it enables a user to perform and complete a specific work activity (Lai, 2017). According to Lai (2017), this

http://etd.uwc.ac.za/

approach is excellent for evaluating existing apps in the market, such as those found on the Google Play Store or the Apple Store, because it may get feedback while researching the real usage of new technology. It should also be mentioned that culturally influenced communication behaviours can either facilitate or obstruct the use of technology (Massey et al., 2001). As a result, while utilising the TTF to evaluate ISs, it is critical to include cultural orientation (Irick, 2008). To combine the most widely used rival user acceptance models, Venkatesh et al. (2003) created the Unified Theory of Acceptance and the Use of Technology (UTAUT) paradigm.

This study did not adopt or adapt the TTF model. However, the contribution of this model to the e-health and current study was that it assisted the researcher to identify the importance of matching IT capabilities with the tasks that the user must do (Goodhue et al., 1995). In other words, linkages between ISs and individual performance must exist (Goodhue and Thompson, 1995). The TTF may be used to forecast technology utilisation based on how well it enables a user to accomplish and complete a certain job activity (Lai, 2017). The current study also assessed how the users' capabilities fit the PHCIS. The study's findings indicated a gap in the introduction of new features, where certain users were not informed. In some cases, the PHCIS will fall short of user expectations, since additional data gathering forms and aspects were not accommodated by the system. As a result, there was a mismatch between IT capabilities and user capabilities. A strong match between task and technology, according to Goodhue et al. (1995), enhances the likelihood of utilisation and improves performance impact, because the technology better satisfies the task needs and wants of users. If the job and technology are well-matched, it is expected that use and performance will rise as the technology becomes more tailored to the user's demands (Goodhue and Thompson, 1995).

UNIVERSITY of the
WESTERN CAPE

3.1.5 Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) model was developed by Venkatesh et al. (2003) to bring together the most widely utilised rival user acceptance frameworks. Venkatesh et al. (2003) synthesised the constructs from all eight acceptance theories. Venkatesh et al. (2003) discovered that when researchers in IT-related studies were presented with a choice of models and theories, they frequently chose a favoured model, but ignored the contributions of others. Venkatesh et al. (2003) believed that by combining the most dominant theories and models (at that time), it would present a more unified approach to studies concerning technology acceptance. The UTAUT model integrates eight theories that anticipate events that cause an individual's or organisation's purpose and behaviour into a more holistic model to comprehend variables that either facilitate or impede technology adoption and usage (Hennington and Janz, 2007). The eight ideas were based on research

http://etd.uwc.ac.za/

that showed how consumer attitudes and habits had an impact on technology adoption and use (Aggelidis and Chatzoglou, 2009). The UTAUT was thought to be a comprehensive model for forecasting IT acceptance (Martins, Oliveira, and Popovi, 2014). According to Cao, Bi, and Wang (2013), the UTAUT model integrates psychology, behavioural science, sociology, information systems, and other fields, making it the most complete theory of technology adoption to date.

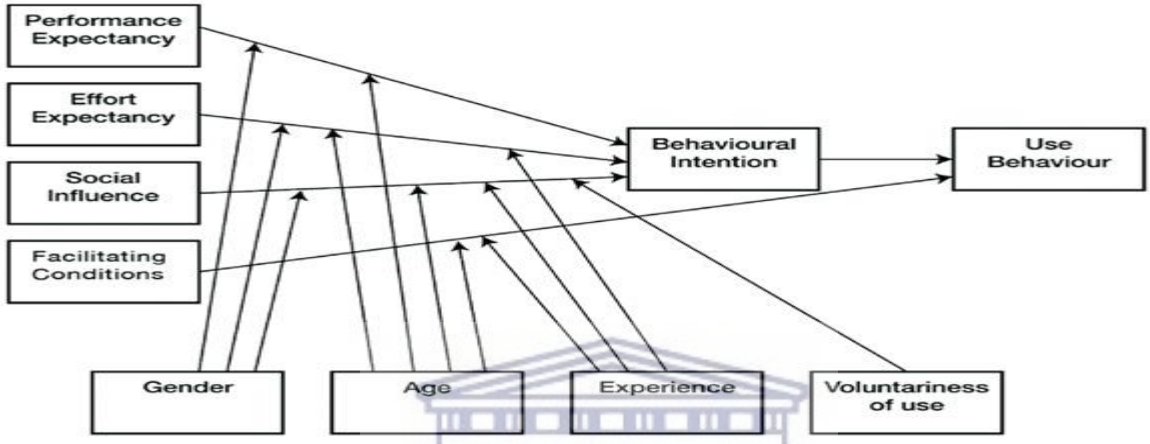


Figure 6: Theory of Acceptance and Use of Technology (Venkatesh et al. 2003)

UNIVERSITY of the
WESTERN CAPE

Venkatesh et al. (2003) showed through testing that user intention and usage behaviour could be anticipated, using four essential components. The theory described four fundamental components as drivers of IT acceptance and usage: performance expectancy, social influence, effort expectancy, and facilitating condition (Cohen, Bancilhon, and Jones, 2013). According to Menachemi (2006) and Venkatesh et al. (2003), performance expectancy, effort expectancy and social influence were direct factors of behaviour. **Performance expectancy** was referred to as the degree to which an individual believes that adopting a system will help them speed up their job, accomplish their assignment, increase productivity, and improve their decision-making process (Venkatesh et al., 2003; Hennington and Janz, 2007). When a technology innovation is suitable for work processes, the performance expectation from the end-users tends to increase (Ifinedo, 2012). The main components of performance expectation include perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectancies (Venkatesh et al., 2003). **Effort expectancy** referred to the amount of comfort associated with using a system (Venkatesh et al., 2003). The underlying components of effort expectation were perceived as being ease of use and complexity (Hennington and Janz, 2007). **Social influence** referred to the degree to which a person thought that important individuals believed they should utilise the new system (Venkatesh et al., 2003). **Facilitating conditions** referred to the extent to which a person believed that an “organisational and

http://etd.uwc.ac.za/

technological infrastructure existed to facilitate the system's use" (Venkatesh et al., 2003). The direct determiners for behaviour intention (BI) was the first three constructs, while the fourth direct determiner was Utilise Behaviour (UB), which assessed an individual's ability to use technology (Venkatesh et al., 2003). Performance expectancy, effort expectancy, and social influence were the three fundamental dimensions recognised by the UTAUT modle to affect behavioural intention, whereas enabling conditions and behavioural intention directly influenced the use of technology (Hennington and Janz, 2007).

This model includes four basic independent constructs: performance acceptance, effort acceptance, social influence, enabling circumstances, and four moderating factors: gender, age, experience, and voluntariness of usage (Venkatesh et al., 2003). The model considers experience, age, and gender, as well as voluntariness of usage, to be important in understanding acceptance (Cohen et al., 2013). Gender, which has a strong and persistent basic psychology, age, and experience, according to Venkatesh, Morris, Davis, and Davis (2003), lessened the effect of the four primary components on behaviour intention. Gender and age were seen to be moderating factors that influenced the link between performance expectancy and behavioural intention (Venkatesh et al., 2003). Gender, age, experience, and voluntariness of usage were all moderating variables that affected these essential dimensions (Venkatesh et al., 2011). Gender, age, and experience were the moderating elements in the UTAUT model that had an impact on the relationship between effort expectation and behavioural intention (Venkatesh et al., 2003). Age, gender, voluntariness, and experience all moderated social influence, whereas age and experience both moderated enabling situations (Venkatesh et al., 2003). Venkatesh et al. (2003) argued that if the four key drivers were moderated based on age, gender, experience, and voluntariness, then researchers would be able to gauge the strength of the relationship between the key drivers and the aforementioned moderators, and thus able to explain the intention to use, and subsequent use behaviour of new technology. According to Venkatesh et al. (2003), if one characterises user adoption based on the previously described drivers of behavioural intention and use behaviour, one would be more likely to exert influence over the deployment and acceptance of a new technology. It is also emphasised that the behavioural desire to utilise a technology influences these four key components, and therefore the behavioural intention as well as the enabling conditions are decided by technology utilisation (Venkatesh, Thong, and Xu, 2016).

The UTAUT was employed in a variety of situations over the years, with varying outcomes (Venkatesh et al., 2003). It had also been used in several studies on mobile phones and health uptake (Hoque and Sorwar, 2017). In Cameroon, the model has also been used as a theoretical framework to examine clinicians' adoption of health information systems (Bawack

http://etd.uwc.ac.za/

and Kala Kamdjoug, 2018). This model has also been used in e-health and m-health (Nuq and Aubert, 2013), as well as in comparison to other technological models (Venkatesh, Thong, and Xu, 2016). According to Hoque and Sorwar (2017), the notions of performance expectation, effort expectancy, and social influences affect users' behavioural intention to use m-health services. According to Gupta, Dasgupta, and Gupta (2008), the UTAUT model may be used to develop appropriate features to enable new technology adoption by users as well as to study variables influencing acceptance of new technology. Cillers, Viljoen, and Chinyamurindi (2017) investigated students' acceptability of using mobile phones to access healthcare information using the UTAUT model. According to Venkatesh et al. (2003), the UTAUT model is a valuable research framework for explaining technology acceptance behaviour, as well as an experimental tool for managers and company owners to evaluate the likelihood of success when introducing new technology. UTAUT model assists managers in comprehending the different types of behaviour associated with individuals' acceptance of technology, therefore creating a chance for individuals to consent to utilise the new technology (Lee et al., 2010). In support of the argument, Akbar (2013) maintains that the UTAUT paradigm has been commonly used in an IT adoption analysis, since it has been validated in a variety of cultures and organisational contexts. The model aids in identifying acceptance variables so that proactive interventions such as training and targeting customers, who are less likely to embrace and use developing technologies, may be developed (Liebenberg et al., 2018). Venkatesh, Morris, Davis, and Davis (2003) added that UTAUT, in outperforming the eight individual models, was the dominating model to analyse user intention to use IS and determine the acceptance of new technologies.

UNIVERSITY of the
WESTERN CAPE

Even though the UTAUT model provides a complete model for technology acceptance and use, it has significant shortcomings (Negahban and Chung, 2014). Despite being used in studies related to technology adoption in healthcare, its capability in forecasting technology adoption in healthcare is doubtful, especially in developing countries (Venkatesh, Thong, and Xu, 2012). Venkatesh, Thong, and Xu (2012) discovered that technology adoption models from an organisational standpoint mostly focused on user acceptance of required information systems and lacked explanations for user technology adoption. According to Bagozzi (2007), the UTAUT model could be a powerful model because of its “parsimonious design and higher predictive ability”. However, the model did not evaluate direct effects that may reveal new associations, as well as important variables in the study left out by subsuming only defined predictors. It was also shown that concentrating on a specific issue, such as a community, nation, or culture, is regarded as the most critical restriction of the UTAUT model (Alam et al., 2020). This approach fails to consider elements such as settings and scenarios that may influence usage (Venkatesh et al., 2003). These gaps in the literature prompted the

http://etd.uwc.ac.za/

development of the UTAUT2 model, which highlights the importance of understanding customer behaviour when organisations construct commercially priced technology (Venkatesh et al., 2012).

The UTAUT model is relevant and applicable to e-health studies and the current study in the following ways. In Cameroon, the model has been used as a theoretical framework to examine clinicians' adoption of health information systems (Bawack and Kala Kamdjoug, 2018). It has also been used in a variety of research and situations, including e-health and m-health (Nuq and Aubert, 2013), as well as in comparison to other technological acceptance models (Venkatesh, Thong, and Xu, 2016). According to Gupta, Dasgupta, and Gupta (2008), the UTAUT model may be used to develop appropriate features to enable new technology adoption by users as well as to study variables influencing the acceptance of new technology. Cillers, Viljoen, and Chinyamurindi (2017) investigated students' acceptance of using mobile phones to access healthcare information using the UTAUT.

The UTAUT made several contributions to the e-health and the current study in the following ways. UTAUT is a valuable research framework for explaining technology acceptance behaviour, and it is an experimental tool for managers and company owners to evaluate the likelihood of success when introducing new technology (Venkatesh et al., 2003). The UTAUT model assists managers in comprehending the different types of behaviour associated with individuals' acceptance of technology, therefore creating a chance for individuals to consent to utilise the new technology (Lee et al., 2010). The UTAUT paradigm tends to be used in an IT adoption analysis, since it has been validated in a variety of cultures and organisational contexts (Akbar, 2013). The model aids in identifying acceptance variables so that proactive interventions such as training and targeting customers, who are less likely to embrace and use developing technologies, may be developed (Liebenberg et al., 2018). The theory describes four fundamental components as drivers of IT acceptance and usage: performance expectancy, social influence, effort expectancy, and facilitating condition (Cohen, Bancilhon, and Jones, 2013). **Performance expectancy** – is the degree to which an individual believes that adopting a system will help them speed up their job, accomplish their assignment, increase productivity, and improve their decision-making process (Venkatesh et al., 2003; Hennington and Janz, 2007). In the current study, despite the PHCIS challenges, the research participants are of the view that PHCIS is assisting them to speed up their job, increase productivity, and improve the overall decision-making process in the clinics. **Effort expectancy** is the amount of comfort associated with using a system is described as effort expectancy (Venkatesh et al., 2003). The underlying components of effort expectation are the perceived ease of use and complexity (Hennington and Janz, 2007). The findings of the

http://etd.uwc.ac.za/

current study revealed that the PHCIS is a user-friendly system, not overly complex and very easy to use as long as the users are well trained and given refresher training. **Social influence** is the degree to which people think that important individuals believe they should utilise the new system (Venkatesh et al., 2003). In the case of the current research, the research participants stated that social influence, and especially that of high-ranking officials within the clinics, played a major role in users accepting or rejecting the PHCIS system. **Facilitating conditions** is the extent to which a person believes that an "organisational and technological infrastructure exists to facilitate the system's use" (Venkatesh et al., 2003). In the current study, facilitating conditions are not a problem. The research participants stated that before the PHCIS was installed in a clinic, system managers conducted clinic system readiness assessments, where they identified issues and corrected them. On the other hand, they also suggested that facilitating conditions must be monitored on a quarterly or annual basis to ensure that they were still functioning as intended.

3.1.6 Unified Theory of Acceptance and Use of Technology (UTAUT) 2

The Unified Theory of Adoption and Use of Technology (UTAUT) was regarded to be a comprehensive model for predicting IT adoption until Martins, Oliveira, and Popovi (2014) developed the Unified Theory of Acceptance and Use of Technology 2. Venkatesh et al. (2012) claim that the UTAUT2 model delivers a substantial advance regarding the behavioural intention and technology usage field of study when compared to previous models. The UTAUT2 model is an expansion of the Unified Theory of Acceptance and Use of Technology model that focused on individuals' views of technology adoption (Venkatesh, Thong, and Xu, 2012). The UTAUT2 includes three additional moderators: hedonic motivation, price value and habit. The previous studies confirmed that these newly added components are important contributing elements for users' technology adoption (Huang and Kao, 2015).

UNIVERSITY of the
WESTERN CAPE

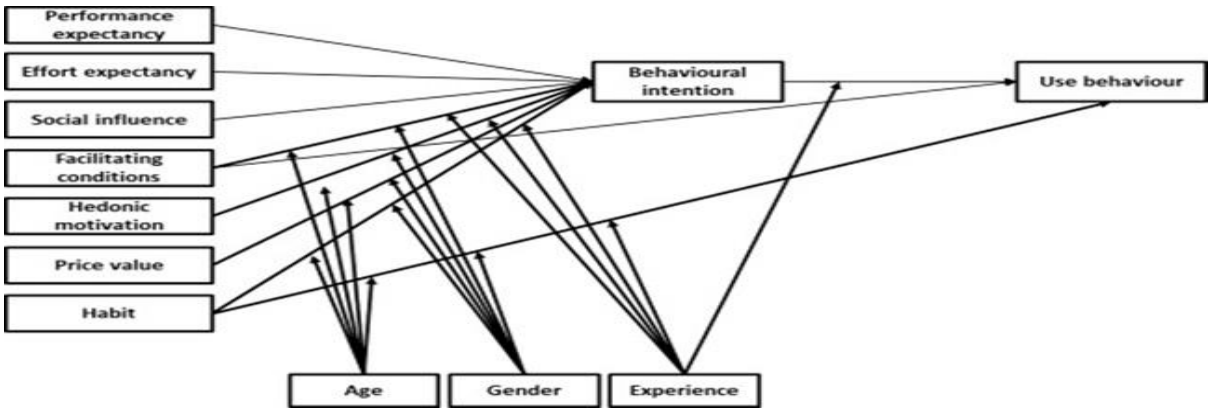


Figure 7: The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) (Venkatesh, Thong, and Xu (2012: 160)

http://etd.uwc.ac.za/

These three new variables were then added to the original UTAUT model: hedonic motivation, price value, and habit (Venkatesh, Thong, and Xu, 2012). The goal was to apply the concept to a consumer setting rather than an organisational environment (Venkatesh et al., 2003), because user behaviour is voluntary, as opposed to an organisational environment, where use is most frequently forced (Tamilmani, Nripendra, and Dwivedi, 2017).

Hedonic motivation is "the fun or pleasure derived from using a technology" (Venkatesh et al., 2012:161). According to research, hedonic motivation is an important component in technological acceptability (Venkatesh and Davis, 2000). The PHCIS aided users in speeding up their work, completing their assignments, increasing productivity, and improving their decision-making process. However, there was dissatisfaction among the PHCIS users that they attributed to some functionalities not working properly, other forms not being catered for in the system, the system being slow during pick times, and the lack of confidentiality of patient information in some PHCIS modules such as HIV and anti-retroviral treatment (ART).

Price value is "consumers' cognitive trade-off between the perceived benefits of the applications and cost for using them" (Venkatesh et al., 2012: 161). The price value construct was introduced in the UTAUT2 model, because the quality of the product, cost and utility compared with the price will in turn, influence adoption decisions (Hennigs, Wiedmann, and Klarmann, 2013). Current PHCIS users noted the following benefits: faster work completion, increased productivity, and improved decision-making process. However, when the system is down during peak hours or the network is unavailable, the cost of time wasted is a significant consideration in disfavour of the system.

Habit has appeared to be the strongest determining factor of individual technology use (Tamilmani, Rana, and Dwivedi, 2020) and is assumed to directly influence both behavioural intention and use behaviour (Hwang, Al-Arabiat, and Shin, 2016). Habit is "the extent to which people tend to perform behaviours automatically because of learning" (Venkatesh et al., 2012:161). According to the research participants in the current study, before an official may utilise a PHCIS system, they must be trained and certified. However, not all users receive training and refresher courses. Based on the study findings, one can conclude that PHCIS users are generally competent to utilise the system, and as a result, they execute specific behaviours automatically in relation to the PHCIS.

The UTAUT2 model incorporates the three UTAUT moderators – age, gender, and experience – but does not include the voluntary nature of usage (Venkatesh, Thong and Xu, 2012). The

http://etd.uwc.ac.za/

authors found that the four key constructs of the UTAUT model, as well as price value and hedonic motivation, are significant factors influencing behavioural intention leading to m-health adoption behaviour (Dwivedi et al., 2016). Even though the UTAUT2 was created to better assess consumer technology adoption, it has received criticism. The UTAUT2 model has been criticised for failing to include cultural factors and for failing to promote cultural awareness in non-Western nations (Khan and Qudrat-Ullah, 2021).

3.1.7 Technology Acceptance Model (TAM)

The Technology Acceptance Model originated from the Theory of Reasoned Action, which was a useful technique for describing user intention towards a technology as well as its usage behaviour (Davis et al., 1989). According to the critical evaluation and meta-analysis, TAM was believed to be a valuable model (Legris et al., 2003). Chau (2001) considered TAM as one of the most influential technology acceptance models. A previous study also found that a greater degree of variation in technology usage was described by the TAM model than by the TRA, TPB and the decomposed TPB models (Lee, Kozar, and Larsen, 2003). TAM's basic assumption was that perceived usefulness and perceived ease of use affect people's decision to embrace or reject new technology (Davis 1989).

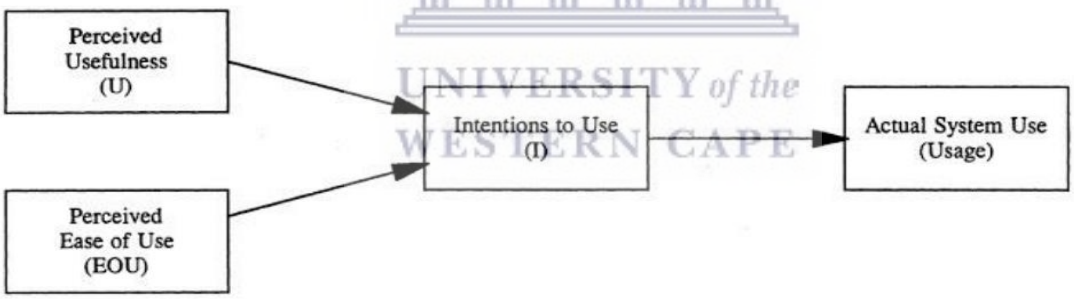


Figure 8: Technology Acceptance Model (Davis, 1989).

The TAM was created with the objective of identifying causal ties between an individual user's attitudes and perceptions regarding technology and its actual adoption (Vishwanath and Goldhaber, 2003). The TAM was based on research that indicated that technology was dependent on human acceptability and utilisation (Ngai et al., 2007). The Technology Adoption Model arose as a powerful model, reflecting the context of the usage of technology by attitudes linked to a technology's perceived utility and perceived ease of use (Yousafzai et al., 2007). It also represents an important theoretical contribution to understanding the behaviours of ICT use and acceptance (Chen and Li, 2011). The next section will discuss the TAM variables, its use, and criticism levelled at the TAM.

http://etd.uwc.ac.za/

3.1.7.1 Actual use

System usage is defined as the frequency, length, and strength of the interactions of an employee with a system (Venkatesh et al., 2003). According to the literature, there was no empirical evidence found by Lucas and Spitler (1999) to support the connection between perceived ease of use and actual use. However, the current study's findings imply that users at the clinic level have a high frequency and strength of engagement with the PHCIS, especially during peak times (reporting period). According to the participants in the study, they rely on the PHCIS, since they do not have another system to handle primary healthcare activities in their clinics. The PHCIS can help users speed up their work, complete their assignments, boost productivity, and improve their decision-making process.

3.1.7.2 Intention to use

Behavioural intention was defined as the subjective possibility of a person committing certain behaviour (Fishbein and Azjen, 1975). Chau (1996) stated that there was no clear link between the perceived ease of use and the decision to use the technology. Lucas and Spitler (1999) also did not see any correlation between the perceived ease of use and the behaviour intention. The behavioural intention of an individual to conduct the action were believed to be mutually decided by the mindset of the individual and the social expectation about the questioned behaviour (Lippert and Davis, 2006). The TAM proposed that an individual's behavioural intentions to utilise technology were determined by the individual's attitude towards the technology (Davis, 1989). In the current study, research participants claimed that social influence, and especially that by high-ranking officials inside the clinics, played a significant role in users adopting or rejecting the PHCIS system. Users' intentions to use or not utilise the PHCIS played a part in the technological adoption model. On the other hand, Vitari and Ologeanu-Taddei (2018) describe the perceived usefulness and ease of use as strong predictors of the intention to use electronic health system. According to the research findings, users perceive the PHCIS as an easy-to-use system and a beneficial system that serves its purpose in the absence of alternative systems, despite the mentioned challenges.

3.1.7.3 Attitude towards using

The attitude towards using technology refers to the general affective response of a person to using a device (Venkatesh et al., 2003). Furthermore, two concepts were stated to influence attitudes towards utilising a system: perceived usefulness and perceived ease of use (Vishwanath and Goldhaber, 2003). The TAM also states that attitudes will have a beneficial impact on one's thinking and direct people towards the usage of technology (Bagozzi, 2007: 2). The TAM explains how external circumstances may influence one's belief system, attitude,

http://etd.uwc.ac.za/

and desire to utilise a certain technology (Nasri and Charfeddine, 2012). The TAM was created with the objective of identifying causal ties between an individual user's attitudes and perceptions regarding technology and its actual adoption (Vishwanath and Goldhaber, 2003). Similar findings were published by Aggelidis and Chatzoglou (2008: 124) and Pai and Huang (2010: 658), who found that when users' perceptions regarding the quality of information were good overall, they were more inclined to utilise the system. In previous social experiments (Ajzen, 1988), attitude was found to be a major determinant of behavioural intention. In addition, two values collectively decided attitudes towards using a system: perceived utility, and perceived ease of use (Vishwanath and Goldhaber, 2003). Taylor and Todd (1995) did not find any scientific evidence for the relationship between attitude and behaviour intention. Hu et al. (1999) also did not find data to support the perceived ease of use (PEOU) attitude relationship either. On the other hand, Bahadori et al. (2017) describes perceived usefulness and ease of use as having a major positive effect on physicians' attitudes towards the introduction of electronic health record (EHR) in Iran. The TAM indicates that perceived usefulness and perceived ease of use influence individuals' decision-making based on the motivations for using and adopting technology (Ahlan and Ahmad, 2014). Furthermore, external variables profoundly influence attitudes about the use of a given technology and, ultimately, the use of the technology (Venkatesh and Davis, 2000). Chow et al. (2011: 1687) utilised the original TAM to demonstrate that PU and PEOU had a positive influence on nurses' attitudes. According to the TAM, two belief factors have an impact on a person's behavioural intention to embrace technology: perceived utility (PU) and perceived ease of use (PEOU) (Aharony, 2015). Perceived usefulness and perceived ease of use (Vishwanath and Goldhaber, 2003) have an impact on attitudes regarding the adoption and usage of the PHCIS in the current study. Users of the systems utilise the PHCIS, because it is simple to use. However, the functional issues resulted in late and poor uptake, with some users terminating their use of the PHCIS.

UNIVERSITY of the
WESTERN CAPE

3.1.7.4 Perceived usefulness (PU)

Perceived usefulness is derived from the TAM and C-TAM-TPB and is defined as the degree to which an individual feels that implementing a certain system will improve their efficiency and job performance by using a certain system (Davis, 1989). For a system to be regarded as advantageous, the user can presume that it positively influences the user's performance (Bagozzi and Warshaw, 1989). The TAM's claim is that perceived usefulness is the best indicator of the intention of a person to use IT (Venkatesh et al., 2003). No correlation between perceived usefulness and attitude was discovered by Jackson et al. (1997), who did not find any scientific data to support the association between perceived usefulness and behaviour intention. No empirical evidence was found by Lucas and Spitler (1999) for the relationship

http://etd.uwc.ac.za/

between perceived usefulness and actual use. The perceived usefulness of the healthcare system is driving the expanding usage of EHRs in healthcare systems in many nations, especially emerging countries such as Saudi Arabia (Vallmuur and Clark, 2015). Gender and electronic health experience have shown to be significant predictors of users' comprehension of the benefits of EHRs' usefulness among nurses in Jordan (Tubaishat, 2018). Abdekhoda et al. (2015) show a strong and important association between the implementation and usage of the EHR system and its perceived usefulness and ease of use. The perceived ease of use has also been found to be strongly associated with encouragement by management and participation of physicians, whereas physician autonomy and physician-patient partnerships significantly affect the perceived usefulness (Bahadori et al., 2017). According to Davis (1989: 320), both the PU and the PEOU have an impact on perceptions that influence the adoption of ICT advances and are evocative of user intents to develop new skills. Both inner and extrinsic motives can have a major impact on the amount of skill acquisition (Davis, 1989: 320). When a user feels that the system will save them time and energy, their perceived ease of use rises (Juhriyansyah, 2010). Venkatesh et al. (2000) suggested that when the user acquires more experience with the new system, the impacts of a change in the determinants of perceived usefulness and use intent must be addressed over time. The link between perceived usefulness and intention to use (behavioural intention) was found to be quite strong (Lee, Kozar, and Larsen, 2003). Hu et al. (1999) discovered that perceived usefulness was a major driver of attitude and intention when analysing the technological acceptance model by utilising physician acceptance of telemedicine technology, but perceived ease of use was not a driver (Sun et al., 2013). Another study found that perceived usefulness positively influenced the intention to utilise m-health services among young patients in Bangladesh, but perceived ease of use was shown to be a less relevant component (Hoque et al., 2015). Despite challenges such as power outages, slow network speeds, and a lack of training for some users, as well as a lack of functionality for some system functions, the PHCIS has assisted users in increasing their productivity. Based on the current study's findings, participants believed that the PHCIS was valuable, despite the challenges that must be addressed.

UNIVERSITY of the
WESTERN CAPE

3.1.7.5 Ease of use (PEOU)

Perceived ease of use is the degree to which a user assumes that it will be free of difficulty to use a specific device (Davis, 1989). The easier a behaviour is to complete, the less time it takes to do so, and the more chance that it may be transferred to other behaviours that affect the important action in improving work performance (Venkatesh, 2002). The easier the technology, the greater the probability of its adoption (Berkun, 2007). However, some scholars discovered no scientific evidence to substantiate the link between perceived ease of use and perceived usefulness (Chau and Hu, 2001). Venkatesh (1999) claimed that it could not be

http://etd.uwc.ac.za/

proven that perceived ease of use had any major impact on perceived usefulness or attitude. No empirical evidence was found by Agarwal and Prasad (1997) to support the connection between perceived ease of use and actual use. In the post training phase, Davis et al. (1989) found no evidence to support the association between perceived ease of use and attitude. Chau (1996), however, saw a correlation between perceived ease of use and behaviour intention. Keil et al. (1995) concluded that "no quantity of ease of use can make up for poor usefulness". Tubaishat (2018) shows that the level of status and computer capabilities of nurses are favourably linked to perceived usefulness of technology and its ease of use, as well as to the acceptance of the EHRs. According to Wen and Kwon (2010: 255), perceived ease of use is based on the belief that acquiring a certain skill will be simple and painless. According to research, if a technology is seen to be difficult to use, potential users are less likely to utilise it, even if they feel the technology is helpful (Ozturk et al., 2016). That is, the easier a activity is to conduct, the less effort is necessary to complete it, and the more effort may be spent to completing other activities, which has an impact on job performance enhancement by the behaviour of interest (Venkatesh, 2002; Davis, 1989). Davis (1989) claimed that PEOU has a substantial impact on an individual's attitude via two key mechanisms: instrumentality and self-efficacy. Based on the findings of the current study, participants were of the view that due to the system user interface design, training, refresher training and technical support had contributed to making the PHCIS system easy to use.

UNIVERSITY of the
WESTERN CAPE

In a pilot study, Mathai et al. (2018) used TAM (Davis, 1989) to analyse factors influencing the market's understanding of the acceptance of EHRs in Australia. Helia et al. (2018) analysed the factors that affect the adoption by users of an updated TAM hospital information system and consider the perceived usefulness to be a core element of the seven variables. Abdekhoda et al. (2015) use the TAM's conceptual pathway model to research the effect of organisational influences on physicians' attitudes towards EHR adoption in Iran. Dutta, Peng, and Sun (2018) use an expanded gender-based TAM and healthcare technology self-efficacy as external variables to analyse the intent of individuals to use a health information-sharing method known as the Personal Health Record (PHR). The TAM has been so influential that it has been quoted in much of the literature that deals with user acceptance of technology (Lee, Kozar, and Larsen, 2003). The TAM has been frequently utilised to analyse the adoption of technology in the healthcare sector (Zayyad and Toycan, 2018). Albar and Hoque (2019) performed a study on patient acceptability of e-health services in Saudi Arabia. Mohamed, Tawfik, Norton, and Al-Jumeily (2011) evaluated the applicability of the TAM in the e-health sector "e-TAM." The TAM was developed by Straub, Keil, and Brenner (1997) to characterise the link between numerous cultural aspects and an individual's IT adoption behaviour. Hoque and Bao (2015) studied the impact of cultural variables on e-health uptake and use. The

http://etd.uwc.ac.za/

advantage of using the TAM is that it enables a researcher to investigate external influences once they are discovered (Hong, Thong, Wong, and Tam, 2001).

Despite its frequent use, the TAM has often been overlooked. Chuttur (2009) challenged TAM's heuristic importance, minimum explanatory ability, and lack of application. Bagozzi (2007) consistently criticised TAM's theoretical basis and believed that the model was not sufficient to assess an information system's suitability or acceptability. The weak theoretical relationship formed between the various constructs proposed in TAM was also highlighted by Bagozzi (2007), who argued that the TAM was too easy and left out major considerations. Taylor and Todd (2001) held the view that none of the hurdles were considered by the TAM that would prohibit the user from implementing a new technology. The TAM was also criticised for failing to explain how individual characteristics such as age and gender affect a user's attitude towards technology, factors that may influence the intention to utilise a technology (Straub, 2009). The TAM, according to Davis, Bagozzi, and Warshaw (1989), Bagozzi et al. (1992) and Davis (1996), might be seen as being too random in forecasting user intention, as there may be other restrictions that prevent a user from utilising a system/technology. The TAM also failed to consider social factors or pressures when it came to technology adoption (especially when there are social consequences to the use of technology), which was recognised as a major problem among academics (Tarutė and Gatautis, 2014). By limiting its components to perceived usefulness (PU) and perceived ease of use (PEOU), the TAM model provides less meaningful information about a user's opinion about implementing certain technologies (Awa and Ukoha, 2012). The TAM does not describe how the usage of technology may be improved by employing variables, and it does not incorporate an organisation's external elements that contribute to the acceptability of technology, other from perceived ease of use (Venkatesh et al., 2003). Another drawback of the TAM is that it is limited to studying one information system with a comparable set of people on a task at a certain moment, which raises the generalisation problem of each unique research (Lee, Kozar, and Larsen, 2003). Oye et al. (2014) discovered a weakness of the TAM, namely the inability to account for hurdles that prohibit a user from adopting a certain technology. Lee et al. (2003) pointed out that it was based on self-reported usage and on a single subject, that it had measurement issues, did not explain causality, and overall, that it relied on attitude as the primary element that drives adoption. According to Venkatesh et al. (2003), the TAM provided little guidance on how to affect technology use behaviour during the design and implementation of a technology. The TAM was frequently criticised in the literature for relying on users' self-reports of use behaviour and so missing a consistent measurement of real technology usage (Legris et al., 2003).

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

According to Lai (2016), many extensions to the TAM have been suggested and evaluated. Even though the TAM forecasted a significant percentage of health IT adoption and acceptability, it may benefit from adjustments and additions (Ducey and Coovert, 2016). As a result, TAM2 and TAM3 were created. Many scientists, however, have sought to expand on the TAM, which has only created confusion (Baenbasat and Barki, 2007). Overall, there seems to be some evidence to indicate that several researchers' independent attempts to broaden TAM and adapt it, and the continuously evolving IT environments have led to a state of theoretical uncertainty and misunderstanding (Benbasat and Barki, 2007). Overall, the limits of the TAM identified by numerous studies have prompted the development of an expanded model to compensate for its shortcomings (Chuttur, 2009). It is worth noting that the initial TAM from 1989 was expanded to TAM2, with the inclusion of subjective norm as a predictor, especially where system usage was required (Venkatesh and Davis, 2000). TAM2 integrated research by Venkatesh and Davis (1996) that focused on the drivers of perceived usefulness, which were neglected in the proposal, to enable organisations to design appropriate interventions that would encourage user acceptance and usage of a new system. TAM2, modified to create a suggested model of health IT acceptability in developing countries, aimed to investigate the elements that might have an impact on diabetes patients' adoption of clinical decision support systems in developing countries (Ahlan and Ahmad, 2014). To analyse the impact on perceived usefulness, TAM2 considered social influence processes (image, voluntariness, and subjective norm) as well as cognitive instrumental processes (perceived ease of use, output quality, result demonstrability, and task relevance) (Venkatesh and Davis, 2000). TAM2 and other similar technology adoption models and theories contributed to a better understanding of why employees made specific judgements about adopting and utilising information technologies in the workplace (Legris, Ingham, and Collerette, 2003). TAM focused on perceived usefulness and simplicity of use, whereas TAM2 contained additional factors that enabled its use in both voluntary and required settings (Venkatesh and Davis, 2000). Despite the model's improvements, TAM2 has been criticised, since it does not determine the elements that affect perceived ease of use (Hasani et al., 2017). TAM 2 was then expanded to TAM3 in 2008 to incorporate trust and perceived risk on system utilisation (Lee et al., 2012).

Prior to the creation of TAM3, Venkatesh et al. (2003) created the the UTAUT model, which integrated eight major models and theories to describe behaviour intent and use behaviour related to obligatory information system adoption. However, Venkatesh and Bala (2008) claimed that the development of TAM3 was motivated by a vacuum in the research, since the literature lacked information supporting management actions to encourage the adoption and use of information technologies, therefore increasing their utilisation. Venkatesh and Bala

http://etd.uwc.ac.za/

(2008) argued that TAM3 was not intended to be a replacement for its predecessors (TAM and TAM2), but rather to assist organisations in advancing employees' adoption of costly technologies by providing a practical model that could be implemented at various stages of such technology implementation.

The Technology Adoption Model arose as a powerful model, reflecting the context of the usage of technology by attitudes linked to a technology's perceived usefulness and perceived ease of use (Yousafzai et al., 2007). Previous studies also found that a greater degree of variation in technology usage was described by the TAM than by the TRA, TPB and the decomposed TPB (Lee, Kozar, and Larsen, 2003).

The research adopted and adapted TAM as theoretical framework to explore and comprehend the factors that hinder the adoption and use of the PHCIS guided by the following TAM contracts: perceived usefulness, perceived ease of use, attitude towards use, behavioural intentions, and the actual use of the PHCIS system. The contribution of this model to the current research was that the TAM was based on research that indicated that technology was dependent on human acceptability and utilisation (Ngai et al., 2007). In addition, it represented an important theoretical contribution to understanding the behaviours of ICT use and acceptance (Chen and Li, 2011). The TAM's basic assumption was that perceived usefulness and perceived ease of use affect people's decision to embrace or reject new technology (Davis 1989). The TAM was created with the objective of identifying causal ties between an individual user's attitudes and perceptions regarding technology and its actual adoption (Vishwanath and Goldhaber, 2003).

UNIVERSITY of the
WESTERN CAPE

3.2 Chapter 3 Summary

In summary, the chapter discussed the technology adoption models, framework and the constructs as follows: The Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Theory of Diffusion of Innovations (DOI), the TTF, the Theory of Acceptance and Use of Technology (UTAUT) and the TAM. The researcher's methodological technique for conducting this study will be discussed in the next chapter.

http://etd.uwc.ac.za/

CHAPTER 4: RESEARCH METHOD

4.1 Introduction:

According to Tswane (2012), one of the most difficult and intimidating tasks for researchersis deciding which technique to apply in their research. This chapter will discuss the types of research, research paradigms, research methods, study location, unit of analysis, target population, sampling, sample size, sampling criteria, method of data collection, pilot interview, interviews, data analysis, content analysis, measure of trustworthiness, and ethical considerations. At the social level of research, there are numerous types of paradigms that may help guide researchers on how to conduct their studies.

4.2 Research Paradigm

Creswell et al. (2011) defined a paradigm as the tradition of research regarded as authoritative by a specific community. A paradigm is a basis for a scientific process and a point of reference for the operational process of doing research (Krauss and Putra, 2005). It considers social world entities from a variety of perspectives, including reality, scientific truth, understanding nature, and abstract phenomenon logic (Uddin and Hamiduzzaman, 2009). Its goal is to gain a thorough grasp and comprehension of a certain topic or phenomenon (Burke, 2007). Positivism, interpretivism, and critical theory are the most common perspectives. **Positivism** claims that empirical observations, measurements, and logical analysis of the phenomena being viewed may be used to verify scientific truths or facts in accordance with the realist's ontology (Creswell, 2003). Positivists think that science is only certain when it is exposed to repeated verification through experimentation, measurement, and observation (Bhattacherjee, 2012). Therefore, positivism was not appropriate for this study, as the current research focused on the socially constructed healthcare information systems. The positivism paradigm is more appropriate for scientific research requiring direct measurements, statistics, and associated quantitative approaches such as experiments, surveys, and statistical analysis (Voce, 2004).

Critical theory focuses on enabling people to overcome societal limits such as gender, age, ethnicity, and socioeconomic status (Creswell, 2003). The critical theory paradigm aims to analyse conflicts produced by cultural, social, political, and economic variables and critiques other paradigms' approaches (Neuman, 2011). The purpose of this paradigm is to reform society and bring about change in situations by dispelling misconceptions and exposing reality (Burke, 2007). While this thesis drew on this paradigm, a more contextual and interpretative approach was sought. **Interpretivism** is the most acceptable method of researching reality, according to interpretivists, by subjective interpretation of individuals' ideas, notably through interviews, and then integrating the commonality among their responses (Bhattacherjee,

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

2012). A study methodology that may be used in this paradigm is the qualitative approach, which focuses on analysing social behaviours via the collection, analysis, and interpretation of text (Murtonen, 2005). The interpretivist technique utilises observations, interviews, and a review of current literature to arrive at a meaningful reality (Myers, 2009). Because this study was concerned with the interaction of social actors and the phenomenon, observing people's behaviours towards the primary healthcare information system (PHCIS), with the goal of understanding factors that impede the adoption and use of the PHCIS, the interpretivist paradigm was chosen as the most appropriate paradigm in this study. This paradigm aided the researcher in gathering detailed information and developing subjective interpretations on the investigated topic. The employed research methodology was a scientific framework to guide the research project in this study, with an emphasis on the techniques used to generate the research findings (Babbie and Mouton, 2001).

4.3 Research Methodology

Ruxwana (2010: 114a) described research methodology as an organised approach of managing and executing a research process, comprising sequences, processes, and systems. The primary goal of research methodology is to emphasise the methodologies and tools used during the research process (Leedy and Ormord, 2001). Lindsay (1995) advocated a research technique that "provides enough details to experienced colleagues to redo the same study in a different context and receive almost identical findings. The findings of this study emphasised the importance of research method and instruments used during the research process. Creswell (2003) listed three research methods, namely, quantitative, mixed, and qualitative research.

UNIVERSITY of the
WESTERN CAPE

4.3.1 Quantitative research

Quantitative research, according to Welman et al. (2005), refers to study methods that deliver numerical or quantitative results. Harwell (2011) provided an additional definition, defining quantitative research as measuring numerical amounts and including methodologies and procedures required to conduct a scientific inquiry. One challenge researchers face with quantitative research is that while this method is ideal for numerically quantifiable data types, it is inadequate for the processing of textual representations and in-depth explanatory types (Neuman, 2006). Therefore, because of the exploratory nature of the present research, the quantitative method was not suitable.

http://etd.uwc.ac.za/

4.3.2 Mixed research

Brannen (2005) stated that mixed-method research is a research approach that uses more than one form of research method. Creswell (2005) described the mixed-method research methodology as a method of combining or incorporating qualitative and quantitative approaches, data collection, and interpretation into a single sample to better explain the research problem. A mixed-method research study allows for a detailed view of the phenomenon being explored (Sale, Lohfeld, and Brazil, 2002). Mixed-methods research is useful in offering new ways of thinking about the environment from a social science research perspective (Morgan, 2007). According to Buzeley (2002), readers could be biased towards their favoured approach when interpreting a mixed-method approach-based analysis. However, the advantage of the mixed-method analysis is its potential to produce findings greater than the sum of the quantitative and qualitative methods (Venkatesh et al., 2013). The challenges of mixed-method studies are that they will increase the amount of time and costs needed to perform the research (Creswell, 2003). For that reason, this research method was not employed.

UNIVERSITY of the
WESTERN CAPE

4.3.3 Qualitative research

Struwig and Stead (2007) defined qualitative research as the non-numerical review and interpretation of findings, used for exploring fundamental findings and dynamics of relationships. It is an approach that offers detailed and in-depth knowledge (Cooper and Schindler, 2013). Myers (2009) stated that a qualitative approach is concerned with the scope of knowledge needed to make sense of a person's behaviour and perceptions. According to Maree (2007), "strong descriptive data" is obtained about a phenomenon or comprehension of what is observed to give meaning to the observations and produce an explanation of the investigated phenomenon. Naicker (2010) stated that researchers need to concentrate their attention on addressing two important questions, regardless of their intended form of research method: The methodologies and procedures must be able to be used in analysis; and the researcher must be able to explain the use of this option and procedures. This research used the qualitative research approach to explain the social processes in terms of their suitability for textual data (Williams, 2007). According to Mlitwa (2011), qualitative research is guided by the study problem, its goals, and the main research query. The investigator attempts to find the significance of a phenomenon from the experiences of individuals in the research (Creswell, 2003). In qualitative methods, participants and the topic cannot be isolated (Creswell, 2007), because the researcher needs to consider the ways in which a problem is discussed by participants in a study. Mack (2005) justified the strength of qualitative research by its ability to provide complicated descriptive accounts of how individuals perceive a specific research topic. There are inherent obstacles to the qualitative and the quantitative approach,

http://etd.uwc.ac.za/

but the single solution of qualitative research being used in the present study was appropriate (Tashakkori and Teddlie, 2003).

A range of challenges are part of the qualitative research approach. The qualitative analysis of data appears to be more contextual in nature and can be affected at times by the prejudices of the researcher (Leedy and Ormrod, 2001). Given the difficulty in the data collection phase, the researcher needs to put a lot of effort to eradicate bias, including gathering more than one kind of data, obtaining several different kinds of viewpoints on the activities being analysed, and deliberately searching for conflicting evidence, and identifying, where possible, the biases relevant to the study report (Leedy and Ormrod, 2001). Another problem is that the interpretation of qualitative data is time-consuming and complicated, so it is important to produce a lot of knowledge that is valuable (Leedy and Ormrod, 2001). Another drawback of qualitative research analysis is its difficulty of generalising the results because of the limited scale of the study, and the bias in evaluating the research (Venkatesh et al., 2013). Creswell et al. (2011) validated that the use of only qualitative methods can result in a lack of generalisation capabilities, while the use of only quantitative methods can result in a lack of understanding the individuals' responses.

4.4 Study Location

This research study was conducted in the Khayelitsha district. Khayelitsha is part of the Cape Town Metropolitan District, which comprises the Southern and Western sub-districts, Northern and Tygerberg sub-districts, Mitchell's Plain and Klipfontein sub-districts, and Khayelitsha and Eastern sub-districts. The research took place in three (3) clinics situated in the Khayelitsha sub-district. The selected public clinics for this study were the Khayelitsha (Site B) Community Healthcare Centre (CHC); the Michael Mapongwana (Harare) Community Day Centre (CDC); and the Nolungile (Site C) Community Day Centre (CDC). The CHC is the facility that offers a wide range of primary healthcare services, which are not limited to accident, emergency, midwifery care within 24 hours a day, seven days a week. CDCs also provide accident and emergency care, but neither midwifery nor surgery under general anaesthetic and they are open 24 hours a day, seven days a week. These specific public health clinics were selected because they were among the first to roll out the primary health information system (PHCIS) in the Western Cape, South Africa.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Figure 9: Khayelitsha healthcare centre facilities (Google map)

4.5 Unit of Analysis

According to Monette et al. (2014), the determination about the unit of study to be investigated is an important factor in the testing process. Mitchell (2007) stated that the review unit is the main single individual in the research sample that is being studied. The following are categories of units of analysis widely used in research on human care, according to Monette et al. (2014): individuals, groups, organisations, programmes, and social artefacts. Neuman (2011) confirmed that individuals, communities, associations, campaigns, objects, organisations, and countries were included. Similarly, Terre Blanche et al. (2006) offered reasons that emphasised that the organisation, an individual or a group of persons being analysed should be referred to by a unit of study. The unit of analysis for this study comprised different groups of healthcare workers that are currently using or have used the primary healthcare information system. These groups were doctors, professional nurses, enrolled nurses, professional clinical nurses, information clerks, heads of reception, administration clerks, administration officers and pharmacists. For this research, only information clerks, heads of reception, administration clerks, and administration officers participated in the study, because they were using the PHCIS.

4.6 Target Population

Welman et al. (2005) identified a population as a group of prospective subjects to which the investigator wished to generalise or infer the findings of the analysis. Population is often described as a set of persons, events, or artefacts to be investigated by the investigator who share similar actions or characteristics (Mouton and Marais, 1996). The target population for this study was healthcare professionals from the three (3) Khayelitsha healthcare institutions, namely, the Khayelitsha (Site B) Community Healthcare Centre (CHC), the Michael Mapongwana (Harare) Community Day Centre (CDC), and the Nolungile (Site C) Community

http://etd.uwc.ac.za/

Day Centre (CDC). The inclusion criterion was six (6) healthcare workers in each of the three (3) identified clinics that are currently or have a history of using the PHCIS, irrespective of gender, age, education, and years of experience. A reason for exclusion was if the healthcare worker was not currently using the PHCIS or had never used the PHCIS.

4.7 Sampling Criteria

A sample, according to Cormack (2000), is a group of individuals chosen by the researcher from a specific population. Neuman (2011) defined sampling as a way of selecting a small and practical representative number of samples from a vast population of samples. A sample, as defined by Copper and Schindler (2003), is a well selected representative subset of the target population. These definitions speak of choosing or selecting a workable representation in each population. According to Goodwin (2002), a study must be representative of the findings to be accurate. According to Mouton (1996), due to the large size of the research population, it might be challenging to cover all units or cases. Therefore, researchers choose representative research sample units to enable them to achieve the selected research sample generalisations (Melville and Goddard, 1996). A purposive sampling method was applied to select seven (7) healthcare workers (Table 2: Study participants) in the three (3) clinics selected with whom in-depth face-to-face, semi-structured individual interviews were conducted. Purposive sampling is a method of selecting a workable sample from the test population according to the purpose of the study, and according to the discretion of the researcher (Babbie and Mouton, 2004). It is also referred to as judgemental sampling and based on the researcher's preference on whether subjects would be most reflective of the study population, only a few cases were chosen (Babbie, 2011). A total of seven (7) healthcare employees who currently work or have previously worked on the primary healthcare information system, irrespective of ethnicity, age, qualifications, and years of experience, were qualified to participate in the research. The value of purposeful sampling is that the researcher can pick participants and informants that have an abundant knowledge (Devers and Frankel, 2000). However, in the absence of representation and authenticity, purposeful sampling is frequently criticised (Creswell, 2003).

UNIVERSITY of the
WESTERN CAPE

4.8 Data Collection

The collection of data can be described as a method of collecting data from participants during a research investigation cycle (Bhattacherjee, 2012). According to Creswell (2003), qualitative data collecting methods are offered through observation interviews (including unstructured and semi-structured interviews, focus groups, by audio as well as visual resources, and by paper reviews). Neuman (2011) believed that qualitative data collection uses one of the following techniques: focus groups, analysis of literature, observations, and interviews. For

http://etd.uwc.ac.za/

this study, face-to-face, semi-structured interviews were employed to collect the data (Appendix 8).

4.8.1 Pilot interviews

Before the actual engagement with research participants, it is critical to conduct a pilot study. For this study, the researcher conducted a pilot study in all three clinics selected. The reason for conducting the pilot interviews was to improve the research tool and thereby ensure the validity of the research results (Burns and Grove, 2011). Grove et al. (2015) state that a pilot interview is a limited portion of a researcher's interview taken from a reflection of a study sample conducted prior to a key interview to optimise the method of the interview, evaluate time frames, and find shortcomings in the interview guidance questions. Ham (2007) stated that pilot testing is undertaken in the context of the analysis to see whether participants can comprehend the questions and classify the questions participants are unable to address. Naicker (2010) stated that conducting a pilot interview decreases the risk of erroneous data capture and allows the identification of configuration and measurement instrument limitations. Through this pilot study, the researcher was able to refine the interview process, time frames, correct flaws in the interview questions, and reduce the number interview questions. The researcher piloted the interview questionnaire in the three (3) selected clinics, with the research participants that will take part in the actual interviews. The difficulties encountered in these clinics were identified and documented in the form of a feedback report (Appendices 5, 6, and 7), and a plan for corrective action was developed in advance of the real interviews. In Khayelitsha Site CHC, the researcher was requested to present the research proposal to the top management of the clinic for their acknowledgement and approval. Following the pilot study, the researcher conducted the interviews, which are discussed in the next section.

UNIVERSITY of the
WESTERN CAPE

4.8.2 Interviews

An interview can be described as a purposeful conversation between two or more individuals, conducted to gain accurate knowledge about a topic, such as performing qualitative science analysis (Saunders et al., 2009). Throughout the interview, the investigator requests that the research participant have direct personal communication with the interviewer, and they also agree that during data collection, the research participant will answer any questions presented by the investigator (Bless and Smith, 1995). According to Creswell (2003), these interviews can be performed by the interviewer, face-to-face with a subject, or by phone, and/or in a group of people. For this study, face-to-face, semi-structured interviews were conducted with the selected research participants. In a qualitative study, there are three types of interviews, namely, unstructured, semi-structured, and structured (Oates, 2006). A semi-structured

http://etd.uwc.ac.za/

interview was found the most relevant for the purpose of this study, because it involves contextual examination and perception, and helps the researcher gain in-depth knowledge on the attitudes, interpretations, and perspectives of the study's participants (Ahern, 2007). The following section will discuss the process the researcher followed to conduct this study.

4.8.2.1 Interview process

An email requesting the approval to conduct research in specified clinics was sent by the researcher to the District Office Research Coordinating Committee. Within approximately a month, approval letters were obtained via the Health Researcher at the Department of Health's District Office. Thereafter, the researcher was allocated a contact person in each clinic to arrange the interviews. Appointments were made at least two months in advance with the allocated contact person identified by the facility managers of the respective facilities. Telephone calls were conducted with the identified contact persons, where appropriate, for the purpose of building trust and relationships (Hannabus, 1996). The interview guide was also added to the email invitation to allow the research participants to see the subjects to be explored (Carruthers, 2007). An email reminding the identified contact persons was then sent with an attachment of the interview guide, the approval letter and consent forms at least two weeks in advance. Access to the building, parking lot and interview room/boardroom was arranged three days in advance by the researcher. The interviews began with a brief introduction by the researcher, confirming the research title and research theme, the time allocated for the interview, and informing them that the researcher was the timekeeper. The interview questions were crafted by the researcher utilising the TAM constructs (usefulness; ease of use; attitude towards; intention to use; and actual usage) (Appendix 8). The interview questions were reviewed by the research supervisor and feedback was provided. After the pilot study was conducted, consent forms (Appendix 9) were sent to the potential study participants before the actual interviews took place. With the consent having been granted by the research participants, the interviews were audio recorded and transcribed. The average duration of each interview was 30 minutes. The interview questions were customised for the healthcare workers selected, because they were found to be the officials who currently work with the PHCIS or previously used the PHCIS. The researcher targeted to interview at least four healthcare workers in each clinic, but ended up interviewing two or three healthcare workers from each of the three (3) clinics. Two (2) interviews were the lowest number the researcher was offered by the facility manager, because of service pressures, and because of the smaller number of information clerks, heads of reception, administration clerks or administration officers working in the clinics. The research participants who took part in this study were information clerks, heads of reception, administration clerks, or administration officers who are currently working with or previously used the PHCIS, irrespective of their age,

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

gender, education, or years of experience. For this study, the most important consideration was that the participants had to be currently using or must have used the PHCIS.

All selected participants are isiXhosa speaking officials, most of them staying in Khayelitsha and the surrounding areas. Although they can speak English, they were more comfortable to be interviewed in their home language isiXhosa. The interview questions were first asked in English, and during the interviews, the researcher had to translate some of the questions or words in a question into isiXhosa for the research participants. Each research participant was given the freedom to choose a day and time of the interview to take place. The researcher conducted one appointment or interview per day. The researcher also took notes during the interview to supplement the audio recordings, and not only recorded the participants' responses to the interview questions, but also noted their behaviour and attitudes expressed by their facial expressions or other non-verbal messages by the research participants. At the time of transcription, this method aided the researcher in interpreting the data (Elliott and Lazenbatt, 2005). After each interview, the researcher listened to the recording, and started the transcription and analysis. During the analysis stage, recurring themes were documented. To ensure the confidentiality of the information, the researcher copied the audio recordings and pasted them on the researcher's personal computer, protected by a password.

Creswell (2009) noted that the online or paper-based interview method has many benefits. The first benefit of the interview method is that the participants can engage without the researcher or interviewer requiring any personal or physical availability. This study did not follow this method, because the researcher opted to be present during the research to also study and observe the behaviour and emotions of the participants during the face-to-face interviews. Creswell (2009) reported that through a personal interviewing process, the interviewer acquires a lot of information on the subject, and is in a better position to add follow-up questions and channel the interviewing style. Being present in person at the place of the interview during the questioning assisted the researcher to be able to probe fully to gather more information. Bless and Smith (2000) stated that if the study participants do not clearly understand the questions, they can ask for more explanations from the interviewer in a personal interview. The authors added that an interview has the benefit that the interviewer is present to explore more relevant replies, explain difficult queries, and promote engagement, partnership, and trust-building (Leedy and Ormrod, 2013). The other benefits are that, unlike mailed or online questionnaires, it is more difficult for participants to refuse involvement in the interview when the interviewer is present, as the interviewer can engage participants and has the potential to automatically examine answers (Leedy and Ormrod, 2013; Bernard, 2013). Brewerton and Millward (2001) emphasised that an interview offers rich evidence, because

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

the interviewer is in the position to extract the exact interpretation from the subjects. Interviewing can be used at any point of the research, and alongside other techniques such as observation and similar techniques in multi-methods (Brewerton and Millward, 2001). Babbie and Mouton (2001) and Bernard (2013) stressed that participants who are illiterate or only partially literate, blind, bedridden, or elderly can still engage without any barriers to their participation via a personal interview.

However, interviews also have several disadvantages. Creswell (2009) noted that the drawback of an interview method is that it may be skewed, because it is focused on the researcher's participation, and participants do not always communicate their perceptions openly. They can even offer information based on what they think the interviewer is expecting to hear rather than their actual emotions or actions regarding the topic. Participants may be embarrassed by certain questions, especially those that focus on private and sensitive issues (Bless and Smith, 2000). According to Leedy and Ormrod (2013), in some instances, participants can also avoid an interview altogether by claiming to be too busy all the time. An interview is time-consuming and expensive, since participants must be questioned one by one in diverse geographical regions (Bless and Smith, 2000; Oppenheim, 1992). Brewerton and Millward (2001) also emphasised that the other drawback of personal interviews was that they are more expensive to conduct, because interviewers need to be educated. They require more logistical equipment and transport, and they take more time to evaluate and conduct detailed data. It is often inconvenient to reach participants, because of dispersed geographical areas, and it can lead to skewed responses from the participants. However, none of these arguments were a challenge for the researcher, because the researcher stays in Khayelitsha, and all the clinics selected are also situated in the Khayelitsha sub-district. The researcher travelled with his own car to the facilities and the facilities were situated in a 2 to 3-kilometre radius from the researcher's home. The interviews were conducted in those clinics, and one day was dedicated to each clinic.

UNIVERSITY of the
WESTERN CAPE

4.9 Data Analysis

Data analysis is the way of ordering, structuring, and extracting meaning from the gathered knowledge (Marshall and Rossman, 2006). Numerous scholars have stated that the method of data processing involves breaking down the gathered data into small parts to enable assessment, add understanding and change the information into usable and valuable material, which is then gradually converted into new insights (Saunders et al., 2009; Babbie, 2011). Brink (1996) supported the view that the method of data processing is designed to break down the data to allow the information to be understood. The aim of the data analysis of this study was to analyse, classify and turn the gathered qualitative data into usable knowledge that

http://etd.uwc.ac.za/

answers the research questions and satisfies the goals of the research as answered by the participants (Creswell, 2003). For this research, data analysis commenced subsequently to the data collection and transcription. The data analysis was conducted to extract meaning from the research findings, making use of content analysis deriving at themes and sub-themes.

4.9.1 Content analysis

For this study, the researcher employed content analysis. The choice to use content analysis is motivated by a desire to grasp the phenomenon under inquiry and derive meaningful information from text data transcripts (Hsieh and Shannon, 2005). Content analysis refers to the methodology of evaluating subjective text data interpretation by a structured method of coding and defining arrays or patterns through grouping (Hsieh and Shannon, 2005). The aim of using content analysis was focused on the need to explain the phenomena under investigation and include meaningful transcripts of text data with meaningful details (Hsieh et al., 2005). Because of the textual data acquired through the observation reports and semi-structured interviews, content analysis was employed in the qualitative interpretive research. The earliest use of content analysis, according to Shank (2006), was during the well-known period when statisticians used word frequency analysis to classify the Federalist Papers' previously unknown publishers. According to Krippendorf (2004: 3), content analysis has been characterised as systematic text data analysis. Weber (1990), based on explicit coding principles, described content analysis as a formal, replicable approach for compressing multiple words of text into smaller categories of content. Weber (1990) also stressed that the most common words, phrases, and statements with identical meanings are clustered together and used as the base of the content analysis. Textual data is classified into manageable phrases and expressions in content analysis, and the acquired data is analysed as similarly as feasible. Palmquist (1993) stated that content analysis is used to analyse terms or phrases from multiple references, for example, literature, interviews, and questionnaires. The key drawback of the study of material is the rigour associated with it (Bryman and Bell, 2011). The research approach of content analysis will lead to simplistic and naively realistic conclusions that, through the eyes of the observer, capture what is believed to be the 'true world' in a simple, clear way (Henning et al., 2004).

Content analysis was used in this study to conduct systematic text data analysis to contextualise, simplify, and analyse text data transcripts. In this study, the researcher used content analysis to compress multiple words of text into smaller categories of content. Since this study was subjective in nature, Content analysis was used as a technique for analysing subjective interpretations of text data by using a systematic classification process of coding

http://etd.uwc.ac.za/

and detecting arrays or themes (Hsieh and Shannon, 2005). Content analysis was utilised in this study with the aim of discovering patterns, themes, or biases (Leedy and Ormrod, 2001). Content analysis is suited for qualitative interpretive research studies that use textual data collected from observation notes and semi-structured interviews (Kondracki, Wellman, and Amundson, 2003).

In this study, the researcher transcribed the interview sessions into text data, which was then conceptualised into smaller components. During the conceptualisation step, the terms for the predefined research issues were formed, and variables were determined. The researcher found possible features, which were words that determined the variables, in the selected variables (Creswell, 2003). The research established categories and themes, interconnections or relationships between these categories and subcategories (Leedy and Ormrod, 2001). The researcher did the sorting, analysing, and extensively reviewing data in respect to the themes under discussion (Saunders et al., 2009). In this study, coding and theme identification were used to analyse and interpret text data (Creswell, 2007). Coding is a procedure within data analysis that happens prior to data interpretation (Bhattacherjee, 2012). The attributes are then allocated descriptive codes for simple identification via a process known as coding. Open coding was the most appropriate and relevant to the study's objectives. Categories, subjects, and their linkages were regularly modified as new data was acquired (Welman et al., 2005).

UNIVERSITY of the
WESTERN CAPE

4.10 Trustworthiness

Ensuring trustworthiness, honesty and reputation is critical in all research (Creswell, 2014: 201). Oates (2008:294) suggested that trustworthiness is about how much conviction can be invested in the findings of the study. According to Creswell (2014), in both qualitative and quantitative data, and especially for data collection tools, validity must be tested. Mavodza (2010) and Brewerton and Millward (2001) stressed that a study's conclusions should be relevant for it to be accepted, and by excluding any mistake, it should be reliable. Taking all necessary steps, including tasks such as examining and cleaning the raw data (audio recording), having accurate verbatim transcripts and additional procedure notes (Golafshani, 2003), reliability will be enhanced. The analysis of observations made regarding the behaviour and emotions expressed by participants was used not only to check the results, but to affirm that the data collected was accurate (Graneheim and Lundman, 2004) to ensure reliability. To test validity in this study, the researcher utilised face-to-face interview data together with multiple theoretical findings and analysis for the purpose of supporting or refuting findings from different theories in ensuring trustworthiness, reliability, validity, honesty, reputation, conviction and to confirm the conclusions on the findings in this study. The findings were cross-checked with scientific evidence to ensure reliability, validity, and confirmation of the study's

http://etd.uwc.ac.za/

findings. This is supported by Hussain (2015), who advocates the view that many methods can be utilised in a research study to achieve trustworthiness and authenticity such as data triangulation, theoretical triangulation, investigator triangulation, analysis triangulation, and methodical triangulation. In this study, the researcher utilised both data and theoretical triangulation.

4.11 Ethical Considerations

According to Cooper and Emory (2007), every study participant has the right to be treated ethically during the research. Ethics are the measures taken to shield study subjects (Schnell and Heinritz, 2006). According to Polonsky (2004), the study must be mindful of fundamental research ethics and adhere to the ethics standards as set by the University. According to Saunders, Lewes, and Thornhill (2009), ethics are concerned with the acceptability of research actions regarding the rights of individuals, who are the target of the research analysis and who can also be affected by it (2009). Schnell and Heinritz (2006) added that research ethics address the question that it is possible to anticipate ethically related difficulties created by the intervention of researchers to influence the individuals they are studying. According to Leedy and Ormrod (2001), informed consent must be read and signed, the right to privacy must be ensured before and after the investigation, and the researcher must be honest with the research participant when conducting a study. The researcher clarified the study's advantages, the participants' rights, and privileges, and presented Cooper and Schindler's (2008) informed consent. The researcher explained the ethics application that ensured that the researcher performed the research in the most appropriate manner; respected the participants; and avoided any harm for the participants. The researcher explained the purpose of the study to the participants regarding the research goals, the participants' rights, and roles (Henning, Van Rensburg, and Smit, 2004). The researcher also spelled out all the ethics aspects to the research participants and that they had the right to opt out of the study at any time without any penalties, and that they were ensured of protection regarding their information before, during and after the interview process.

UNIVERSITY of the
WESTERN CAPE

4.12 Chapter 4 Summary

This chapter discussed the research paradigms, research methodology, the study location, unit of analysis, target population, sampling, sample size, sampling criteria, method of data collection, pilot interview, the actual interview process, data analysis, content analysis, measure of trustworthiness and ethical considerations. The following chapter presents the findings of the qualitative study.

http://etd.uwc.ac.za/

CHAPTER 5: FINDINGS AND DISCUSSION

5.1 Introduction

Pope and Mays (2006) stated the importance of good data management to provide the researcher with a holistic overview of the whole research process and the results. In this study, qualitative content analysis was employed to derive at themes from the interviews. The researcher had employed the TAM to craft the interview questions and the TAM theoretical model to understand the factors that hinder the adoption and use of the PHCIS. This chapter explains the study's findings in relation to the scientific evidence gathered in the literature review chapter. The chapter commences with a description of the study participants, and then moves on to discuss the themes identified from the interviews. Given the research findings, literature and challenges facing the TAM, this section of the chapter will also propose an extension to the TAM to improve the understanding of adoption and use of the PHCIS.

5.2 Study Participants

At the initial conceptualisation of the study, the researcher intended to interview doctors, certified nurse practitioners, pharmacists, administration clerks, information clerks, administration officers and heads of reception. During the preparation of interviews with the selected three clinics, the researcher discovered that only information officers, information clerks, administration clerks, administration officers, and heads of reception used the primary healthcare information system (PHCIS) at these three clinics. Only seven of the twelve chosen individuals agreed to be interviewed, while five declined. All seven (7) research participants are black Africans (see Table 2); five (5) are males and two (2) are females; two (2) have completed their university education and five (5) have completed high school / Matric; three (3) have advanced computer skills, three (3) have intermediate computer skills, and one (1) has basic computer skills. Two (2) have 0-5 years of work experience, two (2) have 6-10 years of work experience, and three (3) have 11-15 years of work experience.

UNIVERSITY of the
WESTERN CAPE

Table 2 Interviewed sample

Health Professionals	Selected	Responded	Declined
Information Clerks	**3**	**2**	**1**
Head of Reception	**3**	**1**	**2**
Administration Clerk	**3**	**4**	**0**
Administration Officer	**3**	**0**	**3**
TOTAL	**12**	**7**	**5**

http://etd.uwc.ac.za/

5.3 Themes and Sub-themes

Several topics and sub-themes emerged throughout the researcher's interactions with the research participants. This led to the researcher generating themes by applying a content analysis approach to contextualise, simplify, and analyse text data transcripts. The choice to use content analysis was motivated by a desire to grasp the phenomenon under inquiry and derive meaningful information from text data transcripts (Hsieh and Shannon, 2005). Content analysis is a technique for analysing subjective interpretations of text data by using a systematic classification process of coding and detecting arrays or themes (Hsieh and Shannon, 2005). According to Leedy and Ormrod (2001), content analysis is the careful and systematic investigation of the contents of a specific body of material for the aim of discovering patterns, themes, or biases. Content analysis is appropriate for new qualitative interpretative research investigations with textual data derived from observation notes and semi-structured interviews (Kondracki, Wellman, and Amundson, 2003).

The procedures employed to analyse and interpret text data in this study were coding and theme identification (Creswell, 2007). Coding is a procedure within data analysis that happens prior to data interpretation (Bhattacherjee, 2012). According to Saunders et al. (2009), coding is the process of sorting, analysing, and thoroughly evaluating data in relation to the topics under consideration. Following the establishment of categories and themes, interconnections or relationships between these categories and subcategories are found based on the context (Leedy and Ormrod, 2001). The researcher transcribed the interview sessions into text data, which was subsequently conceptualised into smaller components. In the conceptualisation phase, words of the predetermined problems of research were established and variables were determined. In the identified variables, the researcher identified potential characteristics or words that determine the variables (Creswell, 2003).

UNIVERSITY of the
WESTERN CAPE

The attributes are then allocated descriptive codes for simple identification via a process known as coding. According to Neuman (2006), there are three (3) types of coding: open coding, axial coding, and selective coding. According to Myers and Avison (2000), open coding is the process of categorising data into ideas suggested by the data. The open coding method entails uncovering essential concepts hiding within textual data that are ostensibly linked to the phenomena (Bhattacherjee, 2012). Open coding was judged to be the most appropriate and relevant to the study's objectives. Categories, subjects, and their linkages were regularly modified as new data was acquired (Welman et al., 2005). To complete the data analysis process, the researcher used the content analysis approach to determine the frequency of the qualities to form categories and describe the study findings.

http://etd.uwc.ac.za/

5.3.1 Human factors

5.3.1.1 ICT skills and user training

According to the findings of this research, not all PHCIS users obtained the requisite training, and they claim that they would prefer refresher training classes because of the system's ongoing growth, while others state that training is no longer available. Other participants state that they do not need training, because the system is very simple, and the training provided to them was adequate.

> **Participant 1** – "Yes, I can appreciate a refresher training" … "they no longer provide training now, but there are one or two guys coming from UCT, they usually give support if needed."
>
> **Participant 2** – "I do not think so, what I think … the system is very simple. Most of the things, you learn them along the way, main ones are to register, search and merge duplicate**s."**
>
> **Participant 3** – "Yes, I would appreciate refresher training. There are still applications that I cannot utilise …one cannot say I am an expert to it, because they keep introducing some other new applications".
>
> **Participant 4** – "Yes, I would appreciate refresher training. Yes, it was adequate, because it actual teaches us what we are supposed to do."
>
> **Participant 5** – "No, I do not need a refresher training. Yes, training was enough."
>
> **Participant 6** - "I would appreciate it, because every month or every 5 or 6 months there are new things. With me, I was there before they first implemented PHCIS, I also train everyone on the system in the facility. I understand it better than others."
>
> **Participant 7** – "Yes, I do require refresher training. Yes, it is adequate."

Participants largely reflect that there is not enough refresher training provided to all users of the PHCIS, and this finding is consistent with Lawal, Adio, and Adebisi (2014), who state that insufficient human and IT skills obstruct the effective adoption and execution of IT innovation. In the same vein, the connection between ICT skills and e-health adoption is addressed by Juma et al. (2012), who point out that the low adoption of e-health is often based on insufficient ICT skills. Omary et al. (2010) linked the poor adoption of e-health to a lack of computing skills by clinicians in developing countries. Malik et al. (2009) stated that sluggish internet usage among physicians in Pakistan was based on a lack of proper technology and computer training. Walsham (2006) indicated that training increases comprehension and confidence, as users can overcome their technophobia by connecting usage to expected benefits. Overall, there seems to be some evidence to indicate that ongoing or at least refresher training must be provided to improve the level of understanding and the level of trust among users, so that they can resolve their technophobia when linking usage to the anticipated advantages

http://etd.uwc.ac.za/

(Walsham, 2006). Reid (2016) recommends that healthcare institutions should continuously educate their workers on EHRs as a way of overcoming the deployment hurdle, as training can enhance the mastery and trust of healthcare professional in using the system.

5.3.1.2 System fear

The literature stated that one of the obstacles facing healthcare information system adoption is fear (Croll, 2009). The finding to emerge from this study is that when the PHCIS was initially rolled out, users were fearful, but that seems to change as they gained more exposure to and experience working with the system. The study results also show that the users had been afraid of making mistakes on the system and feared that the inexperienced users such as interns and new staff would make mistakes when trying to work with the system.

> **Participant 1** – "I think, before I was an admin clerk, sometimes the fear is doing duplicate. I am no longer fearful. I am worried about others, the new ones, especially in OPD, there are lots of interns working there, the dates of training will be far … they are even sharing their passwords. You do not know if they were trained or not."
>
> **Participant 2** – "It is worrying, even patients have duplicate folders, errors in spelling, patients having different identity documents. You will find that one patient would have six different folders in different facilities. As much as they do merge folders, funny enough, people who are matching are the Clinicom guys."
>
> **Participant 3** – "In all honesty, my only fear is on the interns and the people who are newly employed, they are bound to make mistakes. Standing policy states that they must be trained before using system. They cannot even have username and password before they are trained. Another worry is that I sometimes leave my computer open, sometimes they will work on it and commit mistakes under your profile/password. They do use my profile when I am doing something else. Look, before we were using a system called iKapa-NGO. When they were talks about incorporating Ikapa and PHCIS, I was sceptical that … whether all the applications that were on Ikapa will be on this incorporated system. It was the only fear I had when the system was first implemented. The scepticism changed when I began using the system, and I am pleased with the system as far as admissions are concerned. In the end … I ended up enjoying … because everybody in the Western Cape … we can use one number with PHCIS unlike Ikapa and … was limited to few sites. With this one, you are able to pick up a patient from anywhere. Yes, you are always concerned with making errors, once you make an error, you cannot rectify it, my password and my username does not allow me to correct the mistake. There is a person with a super-user, who can correct it. Once you make a mistake on the site, you will have to report it to somebody else that can correct it outside the site."

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Participant 4 – "When I started working, they were already using PHCIS, so it was not such a big deal, it was a new thing, so I was eager to learn. I was interested; it was interesting too, because I did not know what PHCIS was all about. Yes, it has a lot, because there are always new features being added to PHCIS, it changes. As I said before, every six months, there is something new being added onto PHCIS. So, it has changed. Yes, my initial reaction … it has changed based on flaws like network and staff. Yes, because I am the information management officer, when I do errors, it affects my job. Yes, because our job is mainly on stats, so if we do errors, I mess up the stats. I must be efficient."

Participant 5 - "I was happy. No, I am still happy. Yes, sometimes I get worried".

Participant 6 - "You become scared and fearful, because you do not know what is going to happen. Yes, it has changed. Yes, because if you do duplicate, you have to delete it.

Participant 7 - "No worries. For me, there was not much of difficulty or changes, because I used to work the iKapa system, which is now part of the PHCIS. No, if you are collecting stats … automatically … if you click the same patient twice, the system does not allow you (system kicks you out or blocks you) to add a patient twice. You cannot scan a patient until you have rectified the error and it is very clear that you can make errors."

UNIVERSITY of the
WESTERN CAPE

Similarly, Khan et al. (2012) states that some people are still afraid to use ICT in the health sector, based on their assumptions that it would be difficult to use. According to Hollis (2016), the fear is also that the technical innovation will not guarantee data protection. There has also been concern among physicians in some of the other research studies (Boonstra and Broekhuis, 2010) regarding the risk of record destruction due to technical faults resulting from computer failures, viruses, and power failure. In addition, according to Caine and Tierney (2015), hacking, phishing, spamming, and logging are among the primary fears regarding the use of EHRs. Coleman (2013) states that there is evidence to suggest that in the delivery of healthcare, the more end-users have access to and are using the system, the sooner the fear of the unknown and unfamiliar will disappear, especially if the users are properly and regularly trained.

5.3.1.3 Incentives

The participants in this study feel that if the users of PHCIS can be incentivised, there is a possibility that incentives could encourage the faster adoption and use of PHCIS.

Participant 1 – "I doubt … there is no motivation when it comes to the Western Cape Department of Health".

http://etd.uwc.ac.za/

Participant 2 – “There is no such thing as getting incentives for using the PHCIS”.

Participant 3 – “My observation is … they do not know the system, most of the managers, so it is not easy to get motivation from them.”

Participant 4 – “No, not that I am aware of. The incentives given for using PHCIS … we do not get incentives, you do your job, because you are supposed to use the system and PHCIS is part of our job”.

Participant 5 – “Yes, they do motivate us.”

Participant 6 – “No, we do not get incentives for using the PHCIS”.

Participant 7 – “Yes, I do get motivation”.

Many of the participants seem to receive motivation, but not necessarily incentives to use the PHCIS. One of the barriers to adopting a new system, according to Maria (2011), is the lack of incentives. Lluch (2011) noted that incentives being offered to end-users inevitably has an impact on the use of technology. The author also states that adoption, thus, requires the provision of incentives to multiple end-user classes. In the UK, healthcare professionals tend to provide incentives and implement ICT into their training (Kouroubali, 2003). If financial incentives are provided and major barriers such as expenses are overcome, doctors may be persuaded to embrace the system (Bates, 2005). In view of the findings both in literature and the study, and to raise the adoption rate of EMRs, it might be necessary to offer healthcare providers extra motivation to adopt and implement the system and even to provide some incentives (Vishwanath et al., 2007).

UNIVERSITY of the
WESTERN CAPE

5.3.1.4 Disrupted routines

The finding from this study reflects that participants do not view the PHCIS as being disruptive to their normal workflow. However, they express that working with the PHCIS has changed their roles, and they are now doing more verifications than before. One participant expresses the view that any change is normally disruptive, so they were also disrupted by changing to the PHCIS.

Participant 1 – “Yes, it has changed my role since I am coming from the admin side. Information management is different, I am doing more verifications.”

Participant 2 – “The implementation was good, there were no destruction/interruptions, it was a very smooth one, I remember they used to work even weekends to assist us in capturing and migration from the old to the new.”

Participant 3 – “Yes, indeed it has.”

Participant 4 – “As I said before, when I fill the job, I look at JD, my JD is aligned with what I do on PHCIS. No disruptions, because the PHCIS is part of my routine.”

Participant 5 – “Not really.”

http://etd.uwc.ac.za/

Participant 6 – “Any change is very disruptive, because at the time, you are not confident enough about the system and there is that fear that you do not want to press the wrong button.”

Participant 7 – “None.”

Previous research stated that workflow intrusion had been reported to contribute to frustration with new applications (Castillo, Garcia, and Pulido, 2010). Croll (2009) described workflow-process transition as one of the obstacles facing the adoption of an electronic health information system. Some researchers reported that the problem with the introduction of the new information system was not the technological design, but the development of new work practices that were enabled by the new IT innovation (De Mul et al., 2004). According to Khakifa (2013), the acceptance and usage of these innovations in the healthcare field has been poor, because these methods are not integrated into the working activities of healthcare practitioners. Littlejohns, Wyatt, and Garvincan (2003) found the reasons why e-health IS was failing, was related to the complexity of the healthcare processes, and the system’s ability to weaken the sanctity of the physician-patient partnership (Norman, Alkins, and Binka, 2011). Some physicians indicated that e-health could minimise the patient-physicist relationship and could result in a transfer of the physician's position to one of a data entry clerk (Georgiou, 2009). This suggests that the impact of workflow interference could be drastically reduced with adequate planning and implementation (Castillo et al., 2010). Castillo et al. (2010) stated that workflow interruptions should be considered during the preparation process to enhance the application of e-health in routine clinical care practices. Fit-between-the-task and the preferred technologies is crucial for a broader acceptance, as inadequate fitness for use can have a detrimental effect on the time spent and the quality of patient care (Ammenwerth et al., 2003). There are some signs in the literature, notably among physicians and professional nurses that utilising the system interfered with their workflow, as they were often not involved with technology for their record-keeping. There seems to be very little workflow interference felt among the administration staff who are used to having to enter data into computer systems.

UNIVERSITY of the WESTERN CAPE

5.3.1.5 Increased workload

Most research participants feel that the PHCIS has increased their workload rather than reduced it, especially so because of the new features that were added on the system and the new elements they must report on. However, one participant states that the PHCIS does not increase their workload, instead it seems to be burdened by absenteeism and power failures.

Participant 1 – “It does, for example, sometimes when you calculate manual vs capturing entire tally sheet.”

Participant 2 – “Many staff … they are actually … is a very resourceful system.”

http://etd.uwc.ac.za/

Participant 3 – "I am trying to think back when we implemented the system, when we used a paper register, where you take the folder and write on it … it was quicker, because you would not have the situation where the system is down and all those things, it does increase the workload when it is down or slow … the data capturers will then have backlog. If the system is not down, then the opposite is true."

Participant 4 – "I would say management has increased my workload, as I told you … new features being added increases the workload, now there is … like a lot to do. It does, as I said before, there is always something new being added into our workload, the PHCIS helps in that regard, almost every six months, there are new features being added on the PHCIS … always being upgraded … and staff."

Participant 5 – "No, it has not increased my workload."

Participant 6 – "I would not say that the system increases my workload, I would say absenteeism does, and power failures, but the system did not add more work."

Participant 7 – "It increases the workload due to the benefits we are looking for."

Ward et al. (2008) suggested that general practitioners (GPs) were concerned about technological difficulties relating to machine usage, while pharmacists raised the workload as a central obstacle to learning how to use a new system. In the same vein, the problems of healthcare providers about the use of IT innovation during patient treatment are the extra time needed to learn new skills, resulting in additional time spent on technology (Boonestra and Broekhuis, 2010), which may then be seen as increasing workload. Evidence also suggests that physicians in outpatient treatment who performed clerical and administrative duties such as order entry, coding and billing on the EHRs system, spent about twice as much time on these tasks than they spent on face-to-face encounters with the patient (Sinsky et al., 2016). Middleton et al. (2013) confirm that using an electronic health system creates an additional workload through the task of having to enter data into the system. Physician burnout has recently been declared a public health issue, and their frustration with the electronic record system seems to have exacerbated the burnout rates among physicians (Jha et al., 2019). System down-time and power failures (typical for South Africa with its frequent loadshedding) also add to the workload, because it means the facility will have to go back to manual processes of entering the patient data, which leads to patients' increased waiting time. Lober et al. (2008) and Tierney et al. (2002) indicated that an unreliable energy supply was one of the major factors that impeded on the operation of the electronic medical record (EMR) systems. The authors recommended increased expenditure on the back-up mechanisms for an uninterrupted power supply. Blank (2013) and Douglas (2010) further recommended that where there was a shortage of reliable electricity, solar power will have to provide an alternative. Kuo, Liu, and Ma (2013) recommend that healthcare institutions should update not

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

only their record systems, but also ensure their independent power supply, so that they will be able to adjust to modern workflow methods.

5.3.1.6 User involvement

The result of this study indicates that very few users were or are involved in the design, development, and implementation of the PHCIS, and research participants express their displeasure about this fact and add that they are also not involved in any of the improvements that are taking place in the system. User involvement in technology development and deployment of technology advocates the engagement of health providers, the IT sector, and end-users, leading to the establishment of a shared collection of national priorities (Mudaly et al., 2013). When participants were asked if they were involved in the design, development, and implementation of PHCIS, they indicate that more than half of them had been involved at the development stage of the system:

> **Participant 1** – "Yes, at the beginning, even last year, developers do."
> **Participant 2** – "Yes, they were involved, and also the users."
> **Participant 3** – "No. The developers are not on site; we do not get to give any input."
> **Participant 4 –** "PHCIS has their own team in head office, and I was not involved in the development of PHCIS."
> **Participant 5** – "No. I was not involved."
> **Participant 6** – "Yes, I was involved."
> **Participant 7** – "Yes."

UNIVERSITY of the WESTERN CAPE

According to Mair et al. (2012), little attention is paid to the ways in which healthcare practitioners are involved. Khoja et al. (2007) stated that healthcare professionals must be active in the preparation, growth, and deployment of and progress of new e-health initiatives. The clinical leaders with expertise or interest in informatics might serve as liaisons with other healthcare professionals during the adoption and implementation process to give input and promote an interest in the new system (Doolan et al., 2003). Mudaly et al. (2013) write that user involvement in technology development and deployment of technology advocates the engagement of health providers, the IT sector, and end-users, leading to the establishment of a shared collection of priorities. Overall, there seems to be some evidence to indicate that a large portion of perceived usefulness and acceptance of the e-health system (Carayon et al., 2013) can be explained by users' involvement during the planning stages. This confirms that user involvement might lead to an easier adoption of such system and help create a sense of ownership of the implementation of the system (Ernstmann et al., 2009).

http://etd.uwc.ac.za/

5.3.1.8 Social status

Some users of the PHCIS feel that their use of the PHCIS does not enhance their social status. Participants see themselves as normal beings and that the PHCIS is used by most healthcare facilities, so there is no added or raised status in that regard. One participant states that using the PHCIS improves their image in their social system, because they always assist their colleagues in the system and that the system is on good standing with the official at the facility.

Participant 1 – "I doubt so much."

Participant 2 – (laughing) "I think I am just normal."

Participant 3 – "Personally, I do, because most of the time I always assist … they always come and ask how to do this."

Participant 4 – "No, because most of the facilities around here use the PHCIS, Clinicom and PHCIS is more less the same. So, we are not having a higher status, it is just the same."

Participant 5 – "Yes!" (laughing)

Participant 6 – "They think that the system is good."

Participant 7 – "Yes, they do."

Moore and Benbasat (1991) described image as "the degree to which use of an innovation is perceived to enhance one's status in one's social system." This conclusion is congruent with the findings of Doolan, Bates and James (2003), who suggested that doctors who favoured the strategy may exert a certain degree of peer pressure on others, so elevating their own standing by being perceived to be well-informed. This may suggest that social network research could be used to analyse healthcare provider partnerships and classify prominent people, who could become the opinion leaders and encourage the effective adoption of IT programs (Anderson, 2002).

UNIVERSITY of the WESTERN CAPE

5.3.1.9 User attitude

A specific user attitude towards information systems relates to the curiosity, expected value, and excitement of the consumer in interacting with it (Castillo et al., 2010). Out of five participants who respond to this question, only one states not being positive about using the PHCIS, because of a lack of confidentiality or security, and passwords tending to be shared especially at night-time, while all other participants are positive regarding using PHCIS.

Participant 1 – "Positive, to my side … I am doing more reports than capturing."

Participant 2 – "… I am not that positive, because they share passwords, trying to help each other, especially at night, then they share, and many things happen."

Participant 3 – "Positive about the system."

Participant 5 – "Positive."

http://etd.uwc.ac.za/

Participant 6 - “Positive.”

According to Mutingi and Matope (2013), technology implementation is a dynamic process, affected and motivated by several factors. Kemper (2006) found that negative attitudes on the part of healthcare professionals can result from a lack of comprehension of the perceived benefits of the program, which agrees with the results of the present study. Young (1984) mentioned physician's more traditional behaviour, desires, and passion for the doctor-patient relationship as the key factors why computer systems were not approved. Junior physicians were concerned about negative work consequences such as constraints on professional autonomy, severe administrative obligations, and growing established professional hierarchies, whereas nurses saw good effects that may stimulate healthcare administration (Darr, Harrison, Shakked, and Shalom, 2003). Managers who regarded ICT proposals favourably at the outset of the project were more likely to remain optimistic during the implementation phase (Chisolm et al., 2010). Callen et al. (2008) claimed that when preparing for a new system’s implementation in the healthcare industry, the interaction between culture and attitudes towards CIS should be considered. Some seasoned healthcare professionals believed that technology could also lead to reduced critical thinking and excessive reliance on technology, in which machines made medical decisions on behalf of the doctor (Kossman, 2008; Georgiou, 2009).

UNIVERSITY of the
WESTERN CAPE

5.3.1.10 Age and experience

The present study included the following research participants: Three (3) are between 50 and 64 years old, two (2) between 30 and 49 years, and two (2) between 18 and 29 years. While two (2) participants have only up to 5 years of experience, two (2) have 6 to 10 years of experience, and two (2) have 11 to 15 years of experience. In this study, the participants’ age and years of experience could have influenced the study results, because the researcher identified that young healthcare officials were less resistant to the system than older officials. Accordingly, the older, more experienced officials are more reluctant to learn new skills or change their work routines. This finding agrees with the findings by Muathe, Wawire, and Ofafa (2013), who advocate that the design and usage of information technology choices are affected in each context by the characteristics of a person, such as age. Other studies also state that younger nurses have more positive outlooks on life and are open to change than their older counterparts (Salameh et al., 2019). Eley et al. (2008) discovered that Australian nurses, who had been in the profession for more than ten years had a considerably higher average Likert-scale rating for perceived impediments to change. According to Simon et al. (2007), DesRoches et al. (2008), and Eley et al. (2010), the study's findings are similar with prior research, which revealed that healthcare professionals with longer years of service were

http://etd.uwc.ac.za/

more likely to be non-adopters than those with shorter service periods (2008). Irani (2000) showed that previous usage also enhanced the perceived usefulness of the technology and the adoption of internet networking tools. Moreover, it is important to note that facilities, where the CEO had a shorter term of experience at the facility, had a higher rate of acceptance (Sharma and Rai, 2003), probably based on a more modern approach. On the other hand, Ifinedo (2016) argues that age has no substantial impact on the approach taken towards the implementation of the information system. This could imply that under pressure, all changes will be accepted (eventually), even by older, more experienced staff. In view of all that has been mentioned so far, there seems to be some evidence that prior user experience greatly affects the adoption of health information systems (Ludwick and Doucette, 2009).

5.3.2 Technological factors

5.3.2.1 ICT Infrastructure

Lluch (2011) notes that the appropriate spending on infrastructure ultimately affects the suitability and use of technology. MicevskaMaja (2005) stated that the development of telecommunication networks plays a crucial role in public healthcare. The results gathered from the present study reveal that there is a poor network infrastructure among the facilities assessed. The participants complain about a slow internet network during peak hours of data capturing on the PHCIS. They also claim that the PHCIS cannot cope with the many facilities capturing data at the same time, and as result, the system becomes very slow or even stops working.

UNIVERSITY of the
WESTERN CAPE

> **Participant 1** – "As I said before, I am quite sure … but even our manager is quite keen … even if there was a backlog, due to the network … work overtime … he supports that."
>
> **Participant 2** – "Ahh, it is very bad … if there is no network and electricity, there is specific data … we have to hand in our report, it means we have to hand in our work late, we have to deal with the backlog … everything and backdate everything. It is very inconveniencing."
>
> **Participant 3** – "Yes, the networks and servers, yes it does. Relatively fast when it is fast, slow when it is slow, like it is on and off these days when it is extremely slow. … what I have discovered, after 17:00, the system works fast. We attribute that … there are less people working on the system at that time, hence it is fast."
>
> **Participant 4** – "Yes, it does. They are fast, I can say they are effective, if the network is down, then the system will not work."
>
> **Participant 5** – "Yes, it does.Yes."

http://etd.uwc.ac.za/

Participant 7 – "Yes, they do. It is fast, depending on when there is too much work being done, for example, us and the pharmacy towards the end of the month, there are delays."

The present findings also support Wilkerson and Tan's (2008) study, indicating that developing countries have many problems such as weak connectivity for telecommunications. The finding is consistent with Coleman et al. (2011), who stated that the problems include the lack of basic infrastructure such as electricity and the internet, making it difficult to access e-health IS solutions. This was supported by Benson (2011), who mentioned the barriers caused by infrastructure underdevelopment and unpredictable power supplies. The Global e-Health Survey (WHO, 2010) also cited technological problems such as uncertain sources of electricity, poor communication networks, and poor or ineffective internet access as obstacles for developing countries. Burger (2010) indorsed the need for an appropriate ICT infrastructure for efficient healthcare delivery. Adequate investment in ICT infrastructure can lead to economic progress and the healthcare sector's transition to more effective systems (National Integrated ICT Policy Green Paper, 2014). Katurura and Cilliers (2016) claim that the appropriate healthcare infrastructure is a crucial success factor in ensuring that EHRs are efficiently integrated throughout the South African healthcare facilities.

UNIVERSITY of the
WESTERN CAPE

5.3.2.2 System complexity

The finding to emerge from this study is that the PHCIS is user-friendly and does not require that the users receive a lot of training to be able to operate the system, and even interns adapt quickly. Some research participants also state that they also conduct they own internal training on the system, especially for interns, who tend to learn the system quickly.

Participant 1 – "No, it is much easier, I was even telling the guys of the PHCIS to train our guys internally instead of taking them out of office."
Participant 2 – "No, not that much, one day is enough."
Participant 3 – "For a new person - yes it does, if you do not know the system, then you will create a lot of duplicates; hence, a person should be taught thoroughly, so that you avoid making a mistake like duplication."
Participant 4 – "It does need … like … focus, but not really too much mental effort."
Participant 5 – "Yes, it requires a lot of effort."
Participant 6 – "It is user-friendly."
Participant 7 – "No, it does not … we have interns … they quickly adapt to the system."

http://etd.uwc.ac.za/

The present finding is consistent with the findings by Lluch and Abadie (2013) that user-friendly or less complex technologies tend to be more readily embraced. Kushniruk and Borycki (2008) argued that a significant impediment to the implementation of an electronic system is very often the lack of ease of use. Similarly, the lack of a current e-health information system utilised by many practitioners impedes quick and dependable access to knowledge.

5.3.2.3 Security and privacy

This study reveals that the patients' privacy and confidentiality can and has sometimes been compromised by the PHCIS. For example, for the HIV patient records, all data will become visible if one punches in the folder number. This data insecurity emerged when the PHCIS was merged with the iKapa system. Even though the PHCIS users are trained regarding the privacy and confidentiality of every patient, participants also report that users of the PHCIS tend to often share passwords and computers, especially during night shifts.

> **Participant 1** – "When a new employee is appointed, then the first thing … they sign a contract … they are oriented regarding the privacy and confidentiality of the patient. For HIV, everything will come out if you punch the folder number."
>
> **Participant 2** – "It does compromise the privacy, more especially if it was merged with iKapa. Let us say you are HIV-positive, and I select you on the system, then it displays confidential information such as HIV status, treatment, and so forth. It should not do that."
>
> **Participant 3** – "There is something I am having a problem with regarding the incorporation of iKapa and PHCIS. I am working on the TB and HIV side … during iKapa, there are departments that did not have access to information. Now that they incorporated iKapa and PHCIS, even if the person is at the OPD side, once you punch in the folder number, you will see even the medication that the person is on. That is the only problem I am having, it sorts of compromises that element of confidentiality."
>
> **Participant 4** – "You know the first thing … during the training, we were told that confidentiality is part of our job, so it does not … every user on PHCIS has their own username and password, so I cannot use yours or you cannot use mine. It is guaranteed, especially where I am working, when I scan a patient, I scan by the folder number and not by name, I do not actually know the patient's name, only the folder number, nothing about the information about patients. Their medical record or what is in the folder is not reflected."
>
> **Participant 5** – "No concerns."
>
> **Participant 6** – "Yes, first of all the password, I would say there is really no privacy, we keep our computers on, because more people can use one computer."

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Participant 7 – “It is, because if I am scanning, on my system it gives me the folder and not the name.”

This indicates that even the best system is only as good as the people who use it. A casual attitude towards security aspects such as username and password being used by different individuals, results in breaches of security. This is in line with literature by Berger and Adedeji (2013), who state that in the public health sector, challenges such as breaches of confidentiality and protection measures that were meant for the protection of patients’ records and data, are known to occur. Juma et al. (2012) state that the implementation of electronic health is severely influenced by safety, privacy, and security issues. However, surprisingly, Alqahtani, Crowder, and Wills (2017) claim that only 9% of their study’s participants are concerned about the EHRs programs in terms of their ability to ensure security of the medical information. However, Mchunu (2013) reports that users tend to swap their login accounts, and some still hold their old passwords and privileges, while their access profiles have not been updated according to their new job roles. In most cases, healthcare workers are reported to be hesitant to disclose their patients’ medical information, because they fear that the system does not promise full data protection (Hollis, 2016).

5.3.2.4 System support

Many technology innovations have failed because of a lack of technical support. Yusof et al. (2008) described the lack of adequate and timeous technical support as one of the users’ stated reasons that had adversely affected the adoption of a system. While most participants in the present study claim that the end-users of the PHCIS receive proper technical support, however, through observation at the facilities, the technical support varies from facility to facility. Participants also mention that the technical support staff have a tendency of using very technical terms, which makes it difficult for the end-user to comprehend what they are telling them, while being assisted online at times. Participants also state that the fastest turnaround time for some facilities is one day, sometimes two to three days, and the longest is one month. The technical support staff are only based at head office and have a low capacity to support the complete number of facilities in each district.

Participant 1 – “Usually, the entire Western Cape has a help desk, we do have direct contact with them. You log a call and generate a reference number. They are not taking long, one day is long, we also have a WhatsApp group.”

Participant 2 – “The technical support is kind of disappointing, there are things that you can fix, but you must log a call, or it needs administrative rights. Their response is

http://etd.uwc.ac.za/

quick. When you phone, they ask the technician to come in a day or the following, depending on the business."

Participant 3 – "Two help desks (Provincial and PHCIS in Tygerberg) … we have a support team. If we have a problem, we phone them, there is a support structure. Two to three days … there is a delay with the PGWC help desk."

Participant 4 – "They are supportive in their own way. They like to use their technical jargons and do sometimes take their time. We have one in Cape Town (head office) responsible for our facilities."

Participant 5 – "What we do is we contact head office in Cape Town, then they send their IT guys. All the time … sometimes printers and scanners, so since I work with them, I can fix smaller issues. If I call them today, they can come tomorrow, depending on who has logged a call before us."

Participant 6 – "It depends on the error, but the people who help us re the system are controllers. Help desk is our technical support, and also in-house we have people who can merge folders for example. One day."

Participant 7 – "We do have a help desk, developers, they are at head office Karl Bremer. The response depends on … take two to three days, sometimes the issue gets resolved as quickly as possible … a day. Sometimes the query can take a month to be resolved. There is a language issue when follow-up is unresolved. One, we have a WhatsApp group, when there is a … we report, and they resolve it remotely or log a call if it cannot be resolved remotely."

UNIVERSITY of the
WESTERN CAPE

The current study backs up previous results by Simon et al. (2005), who discovered that two-thirds of physicians cited a lack of technical assistance as a barrier to EMR implementation. According to Simon et al. (2005), one of the reasons for the high adoption rates in the organisation of bigger hospitals cited by physicians was the availability of more sophisticated programs to assist and teach clinicians how to utilise their EHRs. According to Ludwick et al. (2009), most suppliers were unable to offer the necessary technical assistance. According to the literature, there is also a shortage of ICT professional people, such as IT maintenance personnel, who might teach health practitioners (Pavalam, Jawahar, and Akorli, 2010). These studies indicate that effective implementation of the technology innovation and transition will be unpredictable in the absence of efficient and fast technical support, and adoption of new technology or e-health systems will be negatively affected (Asua et al., 2012). This appears to be the major problem in most facilities. Technical support teams must be well capacitated to deal with all the challenges presented by the system.

http://etd.uwc.ac.za/

5.3.2.5 System resistance

The results of this investigation indicate no resistance against the actual PHCIS system, especially as it closely resembles the previous iKapa system in many ways. A possible explanation is that research participants are of the view that the PHCIS is a work in progress, as the system is being improved on an ongoing basis. The research participants state that they have used the PHCIS for some time now, and they cannot afford to start afresh with a new system. Although some state that they would be willing to try a new system, such system would have to operate faster and more effectively than the current PHCIS; thus, the implementation of a new system would depend on the efficiency of the system.

> **Participant 1** – "For me, since we have used PHCIS for so long now, it is just those improvements coming from PHCIS, there is room for improvement. I mentioned the network, maybe we can use a better network such as wireless maybe or whatever, you know those networks used by Vodacom, though it is much more expensive than the one used by the PHCIS."
> **Participant 2** - No response.
> **Participant 3** – "PHCIS is a work in progress, I am saying this precisely as there are new things that are being developed every day. I would not know if it would be proper to develop another system which I am not used to."
> **Participant 4** – No response.
> **Participant 5** – "Yes, if it works faster and is more efficient than the PHCIS, yes."
> **Participant 6** – "It will depend on that other system."
> **Participant 7** – "The better option is to advance on the PHCIS, because it is the system of the Department. We cannot rule out PHCIS and say we get a new system. We can upgrade the PHCIS by adding on PHCIS instead of scrapping it out."

A previous study by Agarwal (2000) indicated that end-users may oppose a new device altogether or indulge in disruption or aggressive resistance; they may use its capabilities only partly, or they may fully accept the technology and the possibilities it presents. When it comes to the PHCIS, some report that there was some initial resistance, because of the misconception that technology replaces jobs (Chowles, 2014). Ouma and Herselman (2008) found that the cost of software and the lack of computers in rural hospitals have been found to hinder the introduction of e-health systems (Ouma and Herselman, 2008). Mutula (2001) recommended that there was a need for better knowledge and preparation for early adopters of technologies.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

5.3.2.6 System functionality

The result of the present study indicates that the PHCIS is not a stable system. Challenges highlighted by research participants include network problems (down-time), cable theft, electricity (loadshedding), data duplicates, stickers blur, system down-time, bugs, and data taking time to save.

> **Participant 1** – "Network, cable theft, taking time to save, disadvantage of us is … we have three receptions, back in the days MOU was under Mowbray maternity, now MM used to have its own receipting and TB have its own as well, for example, capture MOU of OPD, because someone forget to change the clinic … if you make a mistake, you cannot delete it, you apply and wait for the support guys to delete for you, sometimes they take longer. I want to suggest, if we can have one super-user in every facility to delete for us, instead of applying and waiting for the support guys to delete for us. Facility managers write emails to the PHCIS guys at Tygerberg, requesting them to delete the error."
>
> **Participant 2** – "… it is very bad … if there is no network and electricity, there is specific data … we have to hand in our report, it means we have to hand in our work late, we have to deal with a backlog … everything … and backdate everything. It is very inconveniencing."
>
> **Participant 3** – "In some instances, you will find patients sharing a folder with another patient from another institution when the system is down. It is extremely slow, which creates a problem for us … merging of patients' folders, because we have old patients using old folder numbers … sometimes it does not allow you to merge, because you are not permitted to merge, because the restrictions … in doing your job. You must phone somebody who is outside the site. It delays us."
>
> **Participant 4** – "There was a time, like stickers … we scan to PC … they were blurred, we have to punch in manually, using the F3 function to appear or A3 … sometimes they do not appear. But that was fixed."
>
> **Participant 5** – "The only challenge is when the system is down or having an error."
>
> **Participant 6** – "When the system is offline and when the patients are using more names in different facilities, because it is difficult to search that patient, and that creates a room for duplicates. Also, our name creates duplicates, for example, Phumza or Pumza."
>
> **Participant 7** – "Network most of the time."

According to Mchunu (2013), the system's functionality in technological innovations such as Clinicom in South Africa has been largely ineffective, mainly because of computer network

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

congestion, system slowness and technical failures, which is consistent with the present study. There have been design issues with implemented systems in the UK to the point that they could not be utilised for all the intended functions, resulting in minimal utilisation (Waterson, 2014). According to Black et al. (2011), system down-time frequently disturbs conversations and interferes with emergency concerns between physicians and radiologists, causing the laboratories from where the samples are collected to be delayed. These statements are supported by Mostert-Phipps et al. (2013), who state that these systems have seen a deterioration in reliability, with the users experiencing negative repercussions from the technology innovation. Consequently, many healthcare professionals assume that they have no choice but to use paper-based structures to execute their clinical tasks (Cline and Luiz, 2013).

5.3.3 Organisational factors

5.3.3.1 Top management involvement

Two participants of this study report that top management were involved in the design, development, and implementation of the PHCIS, while one participant reports that top management were not involved. The researcher believes that participants might be making assumptions about top management's involvement, as they might not always be informed about such involvement.

UNIVERSITY of the
WESTERN CAPE

Participant 2 – "… they were involved."

Participant 3 – "The current manager of the facility … I must give credit to him, he is involved and gives time to learn about the system."

Participant 4 – "I was not here."

Participant 5 – "Not sure."

Participant 6 – No response.

Participant 7 – "Well, I think the implementation was top to bottom, so engagement was not there."

According to Rahimi (2008), management's contribution to and during the development of the electronic health information system is critical. Umble et al. (2002) stated that success drivers of ICT execution had to include strategic priorities that involved ICT, and the engagement of senior management and outstanding project management. Mehrtens et al. (2001) claimed that there is a strong correlation between the CEO's positive attitude towards ICT and innovation, which is essential for the adoption and the success of technology. Lewis et al. (2003) stated

http://etd.uwc.ac.za/

that the trust in technology can be affected by a high-level management dedication to digital technology, and individual considerations of professional creativity and self-efficiency.

5.3.3.2 ICT readiness

According to Demiris et al. (2004), the assessment of electronic health readiness is a pre-implementation prerequisite. The finding of the present study reveals that an ICT readiness assessment was conducted and continues to be conducted in the facilities under investigation. According to the research participants, the system supporters check users' readiness every year. System supporters, in collaboration with end-users, check if computers, printers, scanners, and all other relevant equipment are in working condition, and users were trained to be able to use the system.

> **Participant 2** – "Yes, they did check who was trained. Also, the change management … we did do that."
> **Participant 4** – "They actually do that every year, they check if computers, printers, scanners and all that … if they are in good working condition."
> **Participant 6** – "I would say yes."

Consistent with the findings of the present study, Adjorlolo and Ellingsen (2013) and Demiris, Oliver, Parock, and Courtney (2004) suggested that pre-evaluation of the ICT applications and readiness assessments of the institution before the acceptance and rollout of ICT-related projects are considered critical measures to eliminate the risk of failure. This was supported by Brender (2006), who stated that if no readiness assessment had been done before the adoption of the EHRs, it would present the organisation's inability to undergo change, which would ultimately contribute to failure. According to Adjorlolo and Ellingsen (2013), most healthcare institutions in Africa had not carried out an initial evaluation of the institutions' readiness to adopt ICT applications, which might have led to the high failure rate of the systems' implementation.

5.4 The Research Model

According to Lethbrige and Laganiere (2005), the technology adoption models offer a systematic approach to the problems that occur within a given domain. According to Miles and Huberman (2005), the variables and the interaction between the variables can be used to address study questions. The present study attempted to provides a useful theoretical contribution by modifying the TAM to include two additional constructs, motivation, and experience. Locke and Golden-Biddle (1997) argued that contributions are not merely

http://etd.uwc.ac.za/

concepts, but should be regarded as important inputs by a given academic group and validated by existing sources. The theoretical structure thus distinguishes the relevant variables that are relevant to the study's challenge, and the interrelationship between variables (Saunder et al., 2003). Miles and Huberman (2005) advocated that model comprised pieces that contain features, variables or elements that have a vital relationship.

The reason behind the extension of the TAM model was that the current TAM model has a minimum level of an explanatory ability and lacks application (Chuttur, 2009). Scholars such as Bagozzi (2007) criticised the TAM's theoretical basis and believed that the model was not sufficient to assess an information system's suitability or acceptability. Bagozzi also criticised the weak theoretical relationship formed between the various constructs proposed in the TAM and argued that the TAM left out major considerations. Taylor and Todd (2001) stated that none of the potential hurdles that would hinder the user from implementing a new technology were considered by the TAM. Several academic reports also raise questions about using the TAM in its original framework format to describe users' intentions against health information technology (Kamal, 2020). According to Kamal (2020), the real use by users of telemedicine facilities is based on a variety of social and behavioural variables that are not accounted for in the TAM model. At the same time, some authors claim that the TAM has a considerable influence on technology acceptance, and that experience and motivation variables make the model more complete (Al-Maroof et al., 2020). According to Lethbrige and Laganiere (2005), a technology acceptance framework may be narrated or demonstrated by diagrams and an explanation of concepts and their relationship. In this study, the researcher employed diagrams and narrated the relationship between the constructs. Having stated the discussed TAM weaknesses, the following extension model addresses the low PHCIS adoption and use in public clinics.

UNIVERSITY of the
WESTERN CAPE

5.4.1 Extended Technology Acceptance Model (TAM)

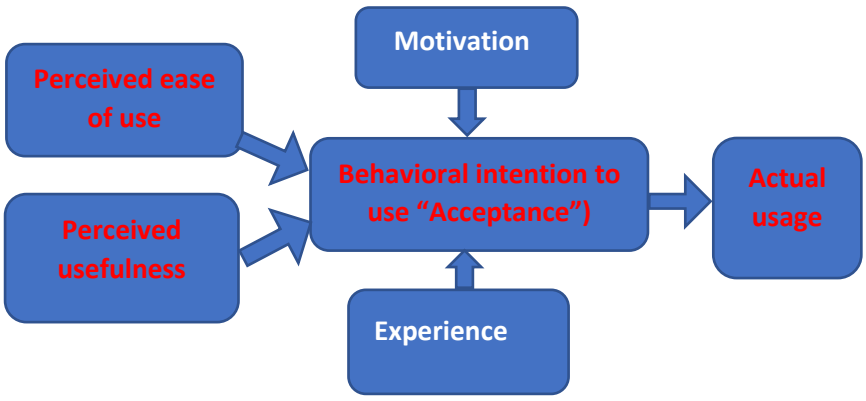


Figure 13: Extended TAM for PHCIS adoption and use

http://etd.uwc.ac.za/

5.4.1.1 Motivation

Motivation studies tend to combine the factor of motivation with other TAM variables (Al-Maroof, 2020). A lack of offered incentives was described by Maria (2011) as one of the obstacles to reach adoption by many users. Motivation, and especially hedonic motivation, is meant to have a positive influence on the change in behaviour and the increased intention to use a product (Venkatesh, 2012). Hedonistic motivation often relates to the concept of enjoyment or pleasure that is generated by the usage of technology (Al-Maroof, 2020). Al-Maroof (2020) states that when the degree of fun or enjoyment is high, motivation may be developed, which is supposed to inspire consumers to adopt and use the technology. Another research study examined motivation from a different angle, looking at how it links to cultural and competency factors (Schikofsk et al., 2020). Lluch (2011) noted that the incentives for end-users inevitably have an impact on the use of technology. Lluch (2011) recommended that for a technology to be adopted and used, it requires the provision of incentives to multiple end-user classes. Bates (2005) advocated that if some financial benefits were to be offered to doctors, this might motivate them to adopt the electronic health system. The research participants mention that they do not receive any motivation or incentive to adopt and use the EHRs system. Thus, if the healthcare professionals or users of the PHCIS were to be more motivated or provided with incentives, such steps might induce them to adopt and use the PHCIS. It was suggested that to raise the adoption rate of EMRs, there should be some form of motivation or incentive offered to healthcare providers (Vishwanath et al., 2007).

UNIVERSITY of the
WESTERN CAPE

5.4.1.2 Experience

User experience is crucial in developing users' acceptance of technology, especially if prior experience has occurred before the early period of the new technology's usage (Al-Maroof et al., 2020). According to these authors, experience relates to the TAM variable of perceived ease of use. Along with cultural beliefs, attitude, and technical history, experience has a strong effect on users' readiness to embrace technology (Field, 1996). This was supported by a study undertaken by Irani (2000) on the adoption of internet networking tools, which showed that previous usage enhances the perceived usefulness of the technology. Previous research on experience also indicates that there is a clear relationship between the successful use of technology and experience (Field, 1996). According to Al-Maroof et al. (2020), user experience with the technology is more critical than general work experience, because it relates to user cognition, actions, and the product. Therefore, a correlation can be drawn between a negative user experience and the rejection of technology (Al-Maroof et al., 2020). According to Al-Maroof et al. (2020), users who lack the necessary technical or ICT skills are more likely to dismiss the technology. Therefore, there is a connection between experience with the technology and anxiety on one side, and experience and self-efficiency on the other (Al-Maroof

http://etd.uwc.ac.za/

et al., 2020). Another view by Simon et al. (2007) was that healthcare providers with longer years of service (and thus generally older workers or professionals) were more likely to be non-adopters than those with shorter service durations (and most often younger workers). This was supported by DesRoches et al. (2008), who advocated that the proportion of EMR adopters among physicians who had worked for 30 or more years was lower. Studies also claim that younger nurses have more positive attitudes to the adoption of modern technology than their older counterparts (Salameh et al., 2019). Reid (2016) recommends that colleagues with extensive training and knowledge of electronic health systems should be utilised to train the less ICT-experienced healthcare professionals.

5.5 Chapter 5 Summary

In summary, this chapter discussed the study participants, the themes and sub-themes in terms of human factors, technological, and organisational factors. The study also proposed an extension to the TAM model, introducing two additional components (refer to Figure 13). The following chapter discusses the findings and makes recommendations regarding the factors that influence the adoption of the primary healthcare information system's adoption by healthcare workers in the public health sector.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The previous chapter presented, analysed, and discussed the findings of this study in the light of the literature, where applicable. This chapter offers a brief discussion on the summary of the thesis and answers to research questions and recommendations. Furthermore, research limitations, suggestions for future research, study contributions, and conclusion based on this study are presented in the chapter.

6.2 Summary of the Findings

This research investigated the factors that hinder the adoption and use of the PHCIS in the public health clinics in the Western Cape, South Africa.

Chapter 1 presented an overview of the research and provided a brief introduction and background to the study. It contributed to the research problem statement, primary research question, sub-question and objectives, as well as the overall layout of the study.

In chapter 2, the study discussed the literature review surrounding the health information system adoption. This section covered topics such as the adoption of health information systems in developed and developing countries. Thereafter, it examined the status of HIS adoption in SA and specifically the Western Cape Province. Finally, this chapter discussed the benefits and barriers to HIS adoption.

UNIVERSITY of the
WESTERN CAPE

Chapter 3 deliberated in detail some of the TAMs and theories. Among the models discussed in this study were the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Theory of Diffusion of Innovations (DOI), the Theory of Task-technology Fit (TTF), the Theory of Acceptance and the Use of Technology (UTAUT) and Technology Acceptance Model (TAM).

In Chapter 4, the study outlined the research methods used in this research. The research was carried out using a qualitative approach and applied an exploratory strategy. To find qualified research subjects for this study, a purposive sampling strategy was used. The study used a content analysis technique to uncover themes and associations that emerged from the acquired data for data analysis objectives. The interview questions for the research were semi-structured. The TAM was utilised as a theoretical framework and to develop the interview questions. Thus, data was gathered at three (3) healthcare institutions in Khayelitsha sub-district: the Nolungile clinic, the Michael Mapongwana clinic, and the Khayelitsha Site B clinic.

http://etd.uwc.ac.za/

Chapter 5 presented an introduction, and a discussion of the demographics of the participants. Subsequently, the study themes and sub-themes were presented, and further detail on discussing, analysing, and critiquing the data gathered from the research interviews.

Chapter 6 begins with the introduction, then discusses the summary of the findings regarding the research questions, with recommendations. This chapter closes with research limitations, suggestion for future research and an overall summary.

6.3 Answers to Research Questions

6.3.1 What is the perceived usefulness of the PHCIS?

6.3.1.1 ICT Infrastructure

According to the findings of the current study, the network infrastructure of the clinics evaluated is in a poor condition. Research participants complain about a sluggish network during peak time of data capturing on the PHCIS. They also state that the PHCIS is unable to cope with the large number of clinics gathering data at the same time, causing the system to become exceedingly sluggish or even stop completely. The present findings also support Wilkerson and Tan's (2008) study, indicating that developing countries have many problems such as weak connectivity for telecommunications. The finding is consistent with Coleman et al. (2011), who stated that the problems experienced when aiming to use technology include the lack of basic infrastructure such as electricity and the internet, making it difficult to access e-health IS solutions. In addition, the Global e-Health Survey (WHO, 2010) cited technological problems such as uncertain sources of electricity, poor communication networks, and poor or intermittent ineffective internet access as obstacles for developing countries. MicevskaMaja (2005) stated that the development of telecommunication networks played a crucial role in public healthcare. Lluch (2011) noted that the appropriate spending on infrastructure will ultimately affect the suitability and use of technology.

Recommendations: Burger (2010) indorsed the need for an appropriate ICT infrastructure for efficient healthcare delivery. Appropriate investment in ICT infrastructure can lead to economic progress and the healthcare sector's transition to more efficient systems (National Integrated ICT Policy Green Paper, 2014). Katurura and Cilliers (2016) claim that appropriate and sufficient healthcare infrastructure is a crucial success factor in ensuring that EHRs are efficiently integrated throughout the South African healthcare facilities.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

6.3.1.2 Security and privacy

This study reveals that the PHCIS can and has occasionally jeopardised patients' privacy and confidentiality. For example, if one enters the folder number for the HIV patient records, all data will become viewable. When the PHCIS was combined with the iKapa system, this data vulnerability arose. Even though the PHCIS users are educated to respect the privacy and confidentiality of all patients, participants say that the PHCIS users frequently exchange passwords and computers, especially during night shifts. Mchunu (2013) reports that users tend to swap their login accounts, and some still hold their old passwords and privileges, while their access profiles had not been updated regarding their new job roles. A careless approach regarding security concerns, such as various persons using the same username and password, leads to security breaches. This is in line with the study by Berger and Adedeji (2013), who state that in the public health sector, challenges such as breaches of confidentiality and protection measures that were meant for the protection of patients' records and data, are known. Juma et al. (2012) state that the implementation of electronic health is severely influenced by safety, privacy, and security issues. In most cases, healthcare workers are reported to be hesitant to disclose their patients' medical information, because they fear that the system does not promise full data protection (Hollis, 2016).

Recommendations: In line with the recently promulgated POPI Act, policymakers and other legal agencies need to analyse the applicability of the POPIA to the use of EHRs to protect patient records (McLeod and Dolezel, 2018). End-users of the electronic health systems must be properly capacitated on system security measures to prevent regulatory issues (Perera et al., 2011).

UNIVERSITY of the
WESTERN CAPE

6.3.1.3 System support

Many technology innovations have failed because of a lack of technical support. Research participants in this study state that the technical support staff have a tendency of using very technical terms, which makes it difficult for the end-user to comprehend instructions, esepecially when they are assisted online at times. Research participants also state that the fastest turnaround time for some facilities is one day, sometimes two to three days, and the longest is one month. The technical support staff are only based at head office and have a low capacity to support all clinics. Yusof et al. (2008) described the lack of adequate and timeous technical support as one of the users' factors that had adversely affected the adoption of a system. The current study backs up previous results by Simon et al. (2005), who discovered that two-thirds of physicians cited a lack of technical assistance as a barrier to EMR implementation. According to the literature, there is also a shortage of ICT professional people, such as IT maintenance personnel who might teach health practitioners (Pavalam, Jawahar,

http://etd.uwc.ac.za/

and Akorli, 2010). According to Ludwick et al. (2009), most suppliers were unable to offer the necessary technical assistance. These studies indicate that effective implementation of the technology innovation and transition will be unpredictable in the absence of efficient and fast technical support, and adoption of new technology or e-health systems will be negatively affected (Asua et al., 2012).

Recommendations: It is suggested that for the e-health system to be useful, timeous technical support is needed in the clinics. The shortage of ICT professional people needs to be addressed so that the users can be capacitated on the e-health system and offered the essential technical assistance.

6.3.2 What is the perceived ease of use of the PHCIS?

6.3.2.1 System complexity

Blumenthal and Tavenner (2010) argued that complex systems are regarded as a barrier to adoption by many healthcare practitioners. Coleman (2013) acknowledges that despite the availability of ICT facilities in hospitals, many South African medical doctors are unable to use them. Kushniruk and Borycki (2008) argued that a significant impediment to the implementation of an electronic system is very often the lack of ease of use. The study found that the PHCIS is user-friendly and does not require a lot of training for users to be able to use the system, and even interns learn quickly how to use it. However, older professionals tend to be less technology-savvy and are thus also often loathe to use it and show that they do not understand how the system works. The present finding is consistent with the findings by Lluch and Abadie (2013) that user-friendly or less complex technologies have been more readily embraced.

UNIVERSITY of the WESTERN CAPE

Recommendation: System developers and business analysts should collaborate with business people and senior executives to create an easy-to-use system that does not result in counterproductive reactions. It should also be borne in mind that many older administrative staff and medical professionals are not comfortable with using technology.

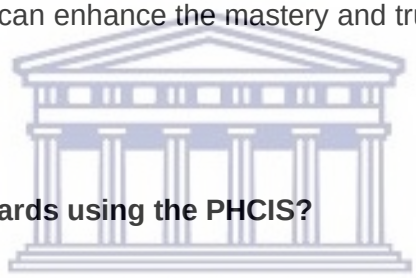
6.3.2.2 ICT skills and user training

According to this study, not all PHCIS users received the necessary training. Some participants state that they would like refresher training sessions, owing to the system's continual expansion. This finding is consistent with Lawal, Adio, and Adebisi (2014), who state that insufficient human and IT skills obstruct the effective adoption and execution of IT innovation. Other research participants indicate that the PHCIS training is no longer

http://etd.uwc.ac.za/

accessible. In the same vein, the connection between ICT skills and e-health adoption is addressed by Juma et al. (2012), who point out that the low adoption of e-health is often based on insufficient ICT skills. Omary et al. (2010) linked the poor adoption of e-health to a lack of computing skills by clinicians in developed countries. Malik et al. (2009) stated that sluggish internet usage among physicians in Pakistan was based on a lack of proper technology and computer training.

Recommendations: Walsham (2006) indicated that training increases comprehension and confidence, as users can overcome their technophobia by connecting usage to expected benefits. Overall, there seems to be some evidence to indicate that ongoing or at least refresher training must be provided to improve the level of understanding and the level of trust among users, so that they can resolve their technophobia when linking usage to the anticipated advantages (Walsham, 2006). Reid (2016) recommends that healthcare institutions should continuously educate their workers on EHRs as a way of overcoming this deployment hurdle, as training can enhance the mastery and trust of healthcare professional in using the system.



UNIVERSITY of the
WESTERN CAPE

6.3.3 What is the attitude towards using the PHCIS?

6.3.3.1 Users' attitudes

Users' attitudes towards information systems relates to the users' curiosity, expected value, and excitement when interacting with the system (Castillo et al., 2010). In the current study, only one of the five participants who replied to this question cites a lack of secrecy or security, as well as passwords being exchanged, especially at night. According to Mutingi and Matope (2013), technology implementation is a dynamic process, affected and motivated by several factors. Kemper (2006) found that negative attitudes on the part of healthcare professionals can result from a lack of comprehension of the perceived benefits of the program. Young (1984) mentioned that overall, physicians exhibited more traditional behaviour, desires, and passion for the doctor-patient relationship as the key factors why computer systems were not approved. Junior physicians were concerned about negative work consequences such as constraints on professional autonomy, severe administrative obligations, and growing established professional hierarchies, whereas nurses saw good effects that may stimulate healthcare administration (Darr, Harrison, Shakked, and Shalom, 2003). Managers who regarded ICT proposals favourably at the outset of the project were more likely to remain optimistic during the implementation phase (Chisolm et al., 2010).

http://etd.uwc.ac.za/

Recommendation: Callen et al. (2008) claimed that when preparing for a new system's implementation in the healthcare industry, the interaction between culture and attitudes towards clinical information system (CIS) must be considered. Some seasoned healthcare professionals believed that technology could also lead to reduced critical thinking and excessive reliance on technology, in which machines made medical decisions on behalf of the doctor (Kossman, 2008; Georgiou, 2009). Thus, this topic must be addressed when informing the professionals, and especially older doctors, about their role and that of the system.

6.3.3.2 System fear

The study found that when the PHCIS was first implemented, users felt apprehensive, but this appears to change as they get more exposure to and experience with working with the system. The survey results also suggest that users were fearful of making mistakes on the system and were concerned that novice users, such as interns and new employees, would make mistakes while attempting to work with the system. Previous research by Khan et al. (2012) found that some individuals are still scared to utilise ICT in the health sector, because they believe it will be difficult to use. Croll (2009) stated that one of the greatest initial obstacles facing healthcare information system adoption is fear of the unknown, one's own ability to learn, or being shown off as being unable to use the system. According to Hollis (2016), the fear is also that the technical innovation will not guarantee data protection. According to Caine and Tierney (2015), hacking, phishing, spamming, and logging were among the primary fears about the use of EHRs and thus, non-compliance with the required POPIA regulations.

UNIVERSITY of the
WESTERN CAPE

Recommendations: Coleman (2013) states that there is evidence to suggest that in the delivery of healthcare the more end-users have access and are using the system, the sooner the fear of the unknown and unfamiliar will disappear, especially if the users are properly and regularly trained. The issue of potential attacks on the system and thus loss of confidentiality or patient privacy would have to be addressed by experts in the field.

6.3.3.3 Social status

Overall, most PHCIS users believe that using the PHCIS does not improve their social position, and they consider themselves normal beings even with the extra IT skill. Others stated that utilising the PHCIS boosts their image in their social system. Moore and Benbasat (1991) described image as "the degree to which use of an innovation is perceived to enhance one's status in one's social system." Doolan, Bates and James (2003) found that doctors who supported the method may exert some peer pressure on others, boosting their own position by being regarded to be more knowledgeable and able to assist others.

http://etd.uwc.ac.za/

Recommendation: This may suggest that social network research could be used to analyse healthcare provider partnerships and classify prominent people, who could become the opinion leaders and encourage the effective adoption of IT programs (Anderson, 2002). Opinion leaders and top executives have a role to play in terms of encouraging the use of the PHCIS.

6.3.3.4 System resistance

The findings of this study reveal that there is no longer a resistance to use the PHCIS system among those who currently use it. However, when the PHCIS was rolled out initially, some reported that there was some resistance, because of the misconception that technology replaces jobs (Chowles, 2014). Research participants in the study believe that the PHCIS is still "a work in progress" and will continue to be improved. Participants in the study claim that they have been using the PHCIS for quite some time and cannot afford to start again with a new system. Although some say they would be prepared to try a new system, such a system would have to be faster and more effective than the PHCIS, although it would still be faced with the electricity down times, loadshedding or even a lack of compatibility within the organisations' other systems.

Recommendations: Mutula (2001) recommended that there is a need for better knowledge and preparation for early adopters of technologies. The better trained the early adopters are and the sooner they are able to see the benefits of the system, the less resistance will there be among others to also use it.

6.3.3.5 Top management involvement

The findings of this study reveal that some top management in certain clinics were involved in the design, development, and implementation of PHCIS. Mehrtens et al. (2001) claimed that there is a strong correlation between the CEO's positive attitude towards ICT and innovation, which is essential for the adoption and the success of technology. Lewis et al. (2003) stated that the trust in technology can be affected by a high-level management dedication to digital technology, and individual considerations of professional creativity and self-efficiency.

Recommendations: According to Rahimi (2008), management's contribution to the development of the electronic health information system and their subsequent visible support of the system is critical. According to Umble et al. (2002), the success drivers of ICT execution must include strategic goals such as ICT, senior management's participation, and superb

http://etd.uwc.ac.za/

project management. Abraham et al. (2011) argued that in the medical sector, the effective use of IT for the transformation of healthcare requires IT knowledge and an awareness of its benefits. Thus, it starts at management's attitude towards the development of an innovative environment, where IT systems are encouraged to be used.

6.3.4 What is the behavioural intention to use the PHCIS?

6.3.4.1 Incentives

Maria (2011) described a lack of incentives as one of the barriers to widespread adoption of new systems. The research participants state that incentives tend to encourage the adoption and use of the PHCIS, although they had started to use the system without having been offered any incentives to use the PHCIS. According to Maria (2011), one of the challenges to adopting a new system was often a lack of incentives, where individuals did not see why they should change their behaviour without a clear benefit (to them). Lluch (2011) noted that the incentives for end-users inevitably have an impact on the use of technology and that adoption, thus, required the provision of incentives to multiple end-user groups. In the UK, healthcare professionals tended to include incentives into their ICT training (Kouroubali, 2003).

Recommendations: It was suggested that to raise the adoption rate of EMRs, there should be some form of motivation or incentive offered to healthcare providers (Vishwanath et al., 2007). If financial benefits are shown to accrue from the use of such systems, or incentives are provided and major barriers such as expenses are overcome, doctors may be persuaded to embrace the system (Bates, 2005). To raise the adoption rate of EMRs, it might be necessary to offer healthcare providers an extra motivation to adopt and implement the system and even to provide some incentives (Vishwanath et al., 2007).

6.3.4.2 User involvement

According to the findings of this study, very few users were or are engaged in the design, development, and implementation of the PHCIS other than top management. The research participants voice their discontent with this fact that they were not involved in any of the system's improvement initiatives. User involvement in technology development and deployment promotes the involvement of health professionals, the IT industry, and end-users, resulting in the formulation of a common set of priorities (Mudaly et al., 2013). According to Mair et al. (2012), little attention is paid to the ways in which healthcare practitioners are involved when such systems are developed. At the same time, there seems to be some evidence to indicate that the perceived usefulness and acceptance of the e-health system (Carayon et al., 2013) could be attributed to users' involvement during the planning stages.

http://etd.uwc.ac.za/

Recommendations: Khoja et al. (2007) stated that healthcare professionals must be active participants during the development and deployment of new e-health initiatives. The clinical leaders with expertise or interest in informatics might serve as liaisons with other healthcare professionals during the adoption and implementation process to give input and promote an interest in the new system (Doolan et al., 2003). Mudaly et al. (2013) write that user involvement in technology development and deployment of technology advocates the engagement of health providers, the IT sector, and end-users, leading to the establishment of a shared collection of priorities. This confirms that user involvement might lead to a better adoption of such system and help create a sense of ownership of the implementation of the system (Ernstmann et al., 2009).

6.3.4.3 Experience

Cultural beliefs, attitude, technical history and experience have a strong effect on users' readiness to embrace technology (Field, 1996). This was supported by a study undertaken by Irani (2000) on the adoption of internet networking tools, which showed that previous usage enhanced the perceived usefulness of the technology. Previous research on experience also indicated that there was a clear relationship between the successful use of technology and experience (Field, 1996). According to Al-Maroof et al. (2020), user experience with the technology is more critical than general work experience, because it relates to user cognition, actions, and the product. Therefore, a correlation can be drawn between a negative user experience of IT and the rejection of technology (Al-Maroof et al., 2020). According to Al-Maroof et al. (2020), users who lack the necessary technical or ICT skills are more likely to dismiss the technology. Therefore, there is a connection between experience with the technology and anxiety on one side, and experience and self-efficacy on the other (Al-Maroof et al., 2020).

In contrast to the studies regarding experience, Simon et al. (2007) stated that healthcare providers with longer years of service were more likely to be non-adopters than those with shorter service durations. This was supported by DesRoches et al. (2008), who advocated that the proportion of EMR adopters among physicians who had worked for 30 or more years was lower. However, in those cases, experience was job-related and had no reflection on their IT experience. In most cases, these professionals had no or extremely limited IT experience. Thus, studies state that younger nurses have more positive attitudes to the adoption of modern technology than their older counterparts (Salameh et al., 2019).

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Recommendations: Reid (2016) recommends that colleagues with extensive training and knowledge of electronic health systems should be utilised to train the less ICT-experienced healthcare professionals. While this might in some instances be seen as “arrogant and impatient” younger generations’ input, there could be a chance that the two generations exchange their skills: younger and more IT-savvy individuals teach the older individuals their IT system skills, while the older individuals teach them job-related aspects that only experience can teach.

6.3.5 What is the actual use of the PHCIS?

6.3.5.1 Disrupted routines

According to the findings of this study, some research participants do not consider the PHCIS to be disruptive to their workflow, while others state that any change is generally disruptive, so switching to the PHCIS also affected them, and any new additions to the system will disrupt their daily operations. Previous research stated that workflow intrusion had been reported to contribute to frustration with new applications (Castillo, Garcia, and Pulido, 2010). Croll (2009) described workflow-process transition as one of the obstacles facing the adoption of an electronic health information system. Some researchers reported that the problem with the introduction of the new information system was not the technological design, but the development of new work practices that were enabled by the new IT innovation (De Mul et al., 2004). According to Khakifa (2013), the acceptance and usage of these innovations in the healthcare field has been poor, because these systems are not integrated into the working activities of healthcare practitioners. Littlejohns, Wyatt, and Garvincan (2003) found the reasons why e-health systems were failing, was related to the complexity of the healthcare processes, and the system’s ability to weaken the sanctity of the physician-patient partnership (Norman, Alkins, and Binka, 2011).

UNIVERSITY of the WESTERN CAPE

Recommendations: The impact of workflow interference could be drastically reduced with adequate planning and implementation (Castillo et al., 2010). Castillo et al. (2010) stated that workflow interruptions should be considered during the preparation process to enhance the application of e-health in routine clinical care practices. Fit-between-the-task and the preferred technologies are crucial aspects for a broader acceptance, as inadequate fitness-for-use can have a detrimental effect on the time spent and the quality of patient care (Ammenwerth et al., 2003).

http://etd.uwc.ac.za/

6.3.5.2 System functionality

The results of the present study indicate that the PHCIS is not a stable system, especially when the system suffers from electricity fluctuations or down-times. Challenges highlighted by research participants include network problems (down-time), cable theft, power cuts (loadshedding), data duplicates, stickers blur, system down-time, bugs, and data taking time to save. According to Mchunu (2013), the system's functionality in technological innovations such as Clinicom in South Africa has been largely ineffective, mainly because of computer network congestion, system slowness and technical failures, which is consistent with the present study. There have been design issues with implemented systems in the UK to the point that they could not be utilised for all the intended functions, resulting in minimal utilisation (Waterson, 2014). According to Black et al. (2011), system down-time frequently disturbs conversations and interferes with emergency concerns between physicians and radiologists, causing the laboratories from where the samples are collected to be delayed. Isemeck et al. (2019) report that insufficient and non-functional electronic health systems, poor internet access, and unreliable power supply are directly linked to the extent of EHRs' adoption. These statements are supported by Mostert-Phipps et al. (2013), who state that these systems have seen a deterioration in reliability, with the users experiencing negative repercussions from the technology innovation. Lober et al. (2008) and Tierney et al. (2002) indicated that an unreliable energy supply is one of the major factors that impede on the operation of the electronic medical record (EMR) systems.

UNIVERSITY of the
WESTERN CAPE

Recommendations: Blank (2013) and Douglas (2010) recommended that where there is a shortage of reliable electricity, solar power will have to provide an alternative. Kuo, Liu, and Ma (2013) recommend that healthcare institutions should update not only their record systems, but also ensure their independent power supply, so that they will be able to adjust to modern workflow methods. Thus, the healthcare sector will have to invest in robust technology infrastructure. Generators must be procured in cases of power cuts and where there is no other reliable source of power. System down-time procedures must always remain fully always functional.

6.3.5.3 ICT readiness

The current study's findings show that an ICT readiness assessment was performed and is still being performed in an ongoing manner at the facilities under review. System supports, in partnership with end-users, ensure that computers, printers, scanners, and all other required equipment are in good working order, and that users have been educated to operate the system. According to Demiris et al. (2004), the assessment of electronic health readiness is a pre-implementation prerequisite. Consistent with the findings, Adjorlolo and Ellingsen (2013)

http://etd.uwc.ac.za/

and Demiris, Oliver, Parock, and Courtney (2004) suggested that pre-evaluation of the ICT applications and readiness assessments of the institution before the acceptance and rollout of ICT-related projects are considered critical measures to eliminate the risk of failure. According to Adjorlolo and Ellingsen (2013), most healthcare institutions in Africa had not carried out an initial evaluation of the institutions' readiness to adopt ICT applications, which might have led to the high failure rate of the systems' implementation.

Recommendations: These e-health institutions must carry out initial and follow-up institutional readiness to adopt ICT application and initial implementation, and they must also carry out regular re-assessments whenever there are changes planned to be made to the system. According to Brender (2006), if no readiness assessment had been done before the adoption of the EHRs, it would present the organisation's inability to undergo change, which would ultimately contribute to failure.

6.3.5.4 Increased workload

Research participants believe that the PHCIS has increased their workload, because of new features that had been added to the system. However, some participants are of the view that the PHCIS does not add to their workload; rather, it appears to be plagued by absenteeism and power outages. Ward et al. (2008) suggested that general practitioners (GPs) were concerned about technological difficulties relating to machine usage, while pharmacists raised the workload as a central obstacle to learning how to use a new system. In the same vein, the problems of healthcare providers about the use of IT innovation during patient treatment are the extra time needed to learn new skills, resulting in additional time spent on technology (Boonestra and Broekhuis, 2010), which may then be seen as increasing the workload. Evidence also suggests that physicians in outpatient treatment who performed clerical and administrative duties such as order entry, coding and billing on the EHRs system, spent about twice as much time on these tasks than they spent on face-to-face encounters with the patient (Sinsky et al., 2016). Middleton et al. (2013) confirm that using an electronic health system creates an additional workload through the task of having to enter data into the system. Physician burnout has recently been declared a public health issue, and their frustration with the electronic record system seems to have exacerbated the burnout rates among physicians (Jha et al., 2019).

Recommendations: It is recommended that there must be an optimal fit between tasks and technology. Data collection tools and the system must be aligned to avoid capturing mistakes, which would cause additional corrections. Unnecessary data elements must be discarded as

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

they create an unnecessary workload. It is also suggested that system user interface must be user-friendly.

6.4 Research Limitations

This research was limited to the Khayelitsha sub-district and excluded all other districts of the greater Cape Town Metropolitan area, including rural districts and some sub-districts. The researcher employed face-to-face interviews as data collection tool. When interviewing participants on a face-to-face basis, this may in some cases lead to interviewer bias and participants may give responses, they believe the interviewer expects to hear, rather than their true feeling. The researcher was only able to interview administrative staff in the selected facilities, because doctors, clinicians and pharmacists are currently not using the system in the selected facilities. The researcher believes that this limited the broader view in as far as adoption and use among healthcare professionals is concerned. Another limitation was that system managers, system controllers and developers were not included in the study, who could have added their experience when training the users. Another limitation for this study was the low response rate of research participants and thus, the small size of the final sample.

6.5 Suggestions for Future Research

The findings and limitations of the present study provided important insights for future research. Further work is needed to focus on the adoption and use of the PHCIS in the rural districts and the entire metropolitan area that falls under the Western Cape Health Department. It is also recommended that further research be undertaken on how the PHCIS integrates with other patient administration systems, because many systems were claimed to be working in isolation and according to different standards. A better understanding of healthcare workers' perception regarding their adherence to the PHCIS' security and privacy systems or rules, and how these can be improved needs to be garnered. Considerably more work will need to be done to develop the PHCIS' implementation framework, especially given the fact that other districts and other provinces have not yet implemented this system.

6.6 Study Contributions

The research contributes value to the existing body of knowledge in the healthcare sector domain. The findings and recommendations of this research contribute to a better understanding of the factors that affect the adoption and use of the PHCIS by healthcare workers in the public healthcare sector in the Western Cape Province. This study contributes to knowledge for research institutions, research students, healthcare sector system developers, business analysts and users of healthcare systems. This research adds further

http://etd.uwc.ac.za/

value by contributing an extension to the TAM model by adding the constructs of motivation and IT as well as job experience. The outcomes of this study can be used by current and future public healthcare personnel within the Western Cape and other provinces who plan to implement the PHCIS. This model is flexible and can be customised to any investigation.

6.7 Chapter 6 Summary

The aim of this research was to investigate the factors influencing the adoption and use of the PHCIS in the public health facilities in the Khayelitsha area. The study revealed that the PHCIS does not cater for all datasets or modules, and paper-based processes were used together with automated processes. During peak hours, the network tends to be very slow, which negatively affects efficiency and patients' waiting times. Another challenge seems to be that sharing of computers and passwords is prevalent in health facilities, causing a loss of data confidentiality. Cable theft and power outages are also pronounced in the public health facilities investigated. Another challenge is that the PHCIS was not integrated with other health systems, except for Clinicom, and even that integration seems to be causing some challenges. The PHCIS is not yet rolled out to all clinicians, pharmacists, laboratories, and doctors' rooms, as had been intended, but only the administrative staff are currently users of the PHCIS. Patient information is not kept confidential because of the dysfunctionality of the system for certain modules. Technical errors such as "error downloading" were experienced. The addition of other system elements or modules are seen to increase the administrative staff's workload and interfere with their workflow. Folder duplication is still a major issue. The lack of user involvement during the system's development or improvement is also a challenge, leading to some levels of resistance and users believing that the system could have been simplified. Turnaround time of the technical support seems to be disappointing, and solutions are often not compatible with the scanner, or do not give the proper bar code. Some modules do not have automatic data quality checks, while the users do not have the authority to correct errors on the system. Instability of the PHCIS is also mentioned, caused by power interruptions, outages or loadshedding. This also implies that none of these healthcare facilities are equipped with solar power or generators that could overcome the problems caused by the reliance on Eskom power. Thus, overall, the Department of Health will have to address far more than merely the PHCIS and its implementation, but also the investment into infrastructure that capacitates the various health clinics and hospitals, investment in training and technical support, as well as the necessary staff to fill the vacancies in the system.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

REFERENCES:

Abdekhoda, M., Ahmadi, M., Gohari, M., and Noruzi, A. (2015). The effects of organisational contextual factors on physicians' attitude towards adoption of Electronic Medical Records. *Journal of biomedical informatics*, 53, 174-179.

Abelson, R. P. (1972). *Are attitudes necessary? Attitudes, conflict, and social change*, 19, 32.

Abu-Elezz, I., Hassan, A., Nazeemudeen, A., Househ, M., and Abd-Alrazaq, A. (2020), "The benefits and threats of blockchain technology in healthcare: a scoping review", *International Journal of Medical Informatics,* Vol. 142, p. 104246.

Addae-Korankye, A. (2013). Challenges of financing healthcare in Ghana: the case of national health insurance scheme (NHIS). *International Journal of Asian Social Science,* 3(2), 511-522.

Adebesin, F., Kotzé, P., Van Greunen, D., and Foster, R. (2013). *Barriers and challenges to the adoption of E-Health standards in Africa*.

Adesina, A. O., Agbele, K. K., Februarie, R., Abidoye, A. P., and Nyongesa, H. O. (2011). Ensuring the security and privacy of information in mobile healthcare communication systems. *South African Journal of Science,* 107(9-10), 27-33.

Adjorlolo, S., and Ellingsen, G. (2013). Readiness assessment for implementation of electronic patient record in Ghana: A Case of University of Ghana Hospital. *Journal of Health Informatics in Developing Countries*, 7(2), 128-140.

Agarwal, R. (2000). Individual acceptance of information technologies. *Educational Technology Research and Development*, 40, 90-102.

Agarwal, R., and Prasad, J. (1997). The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision sciences,* 28(3), 557-582.

Agarwal, R., and Prasad, J. (2000). A field study of the adoption of software process innovations by information systems professionals. *IEEE Transactions on Engineering Management,* 47(3), 295-308.

Aggelidis, V. P., and Chatzoglou, P. D. (2009). Using a modified Technology Acceptance Model in hospitals. *International journal of medical informatics*, 78(2), 115-126.

Aharony, N. (2015). An exploratory study on factors affecting the adoption of cloud computing by information professionals. *The Electronic Library*, 33(2): 308 – 323.

Ahern, D. K. (2007). Challenges and opportunities of e-Health research. *American journal of preventive medicine*, 32(5), S75-S82.

Ahlan, A.R., and Ahmad, B.I. (2014). User Acceptance of Health Information Technology (HIT) in Developing Countries: A Conceptual Model. In *Procedia Technology*. V. 16. Elsevier B.V. 1287–1296.

http://etd.uwc.ac.za/

Ajami, S., and Bagheri-Tadi, T. (2013). Barriers for adopting electronic health records (EHRs) by physicians. *Acta Informatica Medica*, 21(2), 129.

Ajzen, I., and Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behaviour*. Englewood Cliffs, NJ: Prentice Hall Inc.

Ajzen, I. (1985). From intentions to actions: A Theory of Planned Behaviour. In *Action control* (pp. 11-39). Springer, Berlin, Heidelberg.

Ajzen, I. (1988). *Attitudes, personality and behaviour*. Chicago: The Dorsey Press.

Ajzen, I. (1991). The Theory of Planned Behaviour. *Organizational behavior and human decision processes,* 50(2), 179-211.

Ajzen, I. (2005). *Attitudes, Personality and Behaviour* (Second ed.). England: Open University Press-MacGraw-Hill Education.

Ajzen, I., and Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour.* Englewood Cliffs, NJ: Prentice Hall.

Akbar, F. (2013). *What Affects Students Acceptance and Use of Technology? A Test of UTAUT in the Context of a higher education Institution in Qatar.* Master's thesis, Carnegie Mellon University, Qatar**.**

Al Farsi, M., and West, D. J. (2006). Use of electronic medical records in Oman and physician satisfaction. *Journal of medical systems,* 30(1), 17-22.

Alam, M. Z., Hoque, M. R., Hu, W., and Barua, Z. (2020). Factors influencing the adoption of m-Health services in a developing country: A patient-centric study. *International Journal of Information Management*. 50:128–143.

Alatawi, F., Dwivedi, Y., Williams, M. D., and Rana, N. P. (2012, May). Conceptual model for examining knowledge management system (KMS) adoption in public sector organisations in Saudi Arabia. *Int. Gov Workshop* (Vol. 2, pp. 1-22).

Albar, A. M., and Hoque, M. R. (2019). Patient Acceptance of e-Health Services in Saudi Arabia: An Integrative Perspective. *Telemedicine and e-Health*. 25(9):847–852.

Al-Gahtani, S. S., and King, M. (1999). Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology. *Behaviour and Information Technology*, 18 (4), 277-297.

Alghamdi, A. S. (2015). *Factors associated with the implementation and adoption of electronic health records (EHRs) in Saudi Arabia*. (Doctoral dissertation, Rutgers University School of Health Professions).

Al-Harbi, A. (2011). Healthcare providers' perceptions towards health information applications at King Abdul-Aziz Medical City, Saudi Arabia. *International Journal of Advanced Computer Science and Applications*, 2(10), 10-13.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

AlJarullah, A., Crowder, R., Wald, M., and Wills, G. (2018). Factors affecting the adoption of EHRs by primary healthcare physicians in the Kingdom of Saudi Arabia: an integrated theoretical framework. *International Journal of e-Healthcare Information Systems,* 5(1), 126-138.

Alloghani, M., Hussain, A., Al-Jumeily, D., and Abuelma'atti, O. (2015). Technology Acceptance Model for the Use of M-Health Services among Health-Related Users in UAE. In *2015 International Conference on Developments of E-Systems Engineering* (DeSE). IEEE. 213– 217.

Al-Maroof, R. S., Salloum, S. A., AlHamadand, A. Q. M., and Shaalan, K. (2020). Understanding an Extension Technology Acceptance Model of Google Translation: A Multi-Cultural Study in United Arab Emirates. International Journal of Interactive Mobile Technologies (3).

Alqahtani, A., Aljarullah, A. J., Crowder, R., and Wills, G. (2017). Barriers to the adoption of EHR systems in the Kingdom of Saudi Arabia: an exploratory study using a systematic literature review. *Journal of Health Informatics in Developing Countries,* 11(2).

Alshehri, M., Drew, S., and Alghamdi, R. (2013). Analysis of Citizens Acceptance for E-government Services: Applying the UTAUT Model. IADIS *International Conferences Theory and Practice in Modern Computing and Internet Applications and Research*. 627(16):37–1.

Anderson, C. L., and Agarwal, R. (2011). The digitisation of healthcare: boundary risks, emotion, and consumer willingness to disclose personal health information. *Information Systems Research*, 22(3), 469-490.

Arvola, A., Vassallo, M., Dean, M., Lampila, P., Saba, A., Lähteenmäki, L., and Shepherd, R. (2008). Predicting intentions to purchase organic food: The role of affective and moral attitudes in the Theory of Planned Behaviour. *Appetite,* 50(3), 443-454.

Ash, J. S., and Bates, D. W. (2005). Factors and forces affecting EHR system adoption: report of a 2004 ACMI discussion. *Journal of the American Medical Informatics Association*, 12(1), 8-12.

Ashley, C., and Mitchell, J. (2009). *Tourism and poverty reduction: Pathways to prosperity.* Routledge.

Aubel, J. (1984). *Guidelines for Studies Using the Group Interview Technique*, International Labour Organization, Switzerland.

Ayers, J. D., Menachemi, N., Ramamonjiarivelo, Z., Matthews, M., and Brooks, G. R. (2009). Adoption of electronic medical records: the role of network effects. *Journal of Product and Brand Management*, 18(2), 127-135.

Babbie, E. (2011). *Introduction to social research*. Belmont, California: Cengage Learning.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Babbie, E. (2011a). *The basics of social research*. 6th ed. M. Kerr, S. Dobrin, R. Jucha, N. Bator, and J. Chell, eds. Canada: Wadsworth, Cengage Learning.

Babbie, E. (2011b). *The practice of social research*. 13th ed. E. Mitchell, J. Chell, and M. Evans, eds. Belmont, USA: Wadsworth Cengage Learning.

Babbie, E., and Mouton, J. (2001). *The practice of social research*: South African edition. Cape Town: Oxford University Press Southern Africa.

Babbie, E., and Mouton, J. (2004). *The practice of good social research.*

Baenbasat, I., and Barki, H. (2007). Quo Vadis, TAM. *Journal of the Association for Information Systems*, 8, 211–218.

Bagherian, R., Bahaman, A. S., Asnarulkhadi, A. S., and Shamsuddin, A. (2009). Social Exchange Approach to People"s Participations in Watershed Management Programs in Iran. *European Journal of Scientific Research*, 34(3):428-411.

Bagozzi, R. P. (2007). The legacy of the Technology Acceptance Model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, 5(4), 244-254.

Bagozzi, R. P., Davis, F. D., and Warshaw, P. R. (1992). Development and test of a theory of technological learning and usage. *Human relations*, 45(7), 659-686.

Bagui, L. (2013). *Public participation in government: the place of e-participation in the City of Cape Town, Western Cape* (Doctoral dissertation, Cape Peninsula University of Technology).

Bahadori, M., Alimohammadzadeh, K., Abdolkarimi, K., and Ravangard, R. (2017). Factors affecting physicians' attitudes towards the implementation of electronic health records using structural equation modeling (SEM). *Shiraz E-Medical Journal,* 18(11).

Balsari, S., Fortenko, A., Blaya, J. A., Gropper, A., Jayaram, M., Matthan, R., and Khanna, T. (2018). Reimagining Health Data Exchange: An application programming interface–enabled roadmap for India. *Journal of medical Internet research*, 20(7), e10725.

Bandura, A. (1986). '*Social foundations of thought and action: Asocial cognitive theory*'. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). Self -efficacy: The exercise of control. New York: W. H.: Freeman & Co.

Bass, F. M. (1969). A New Product Growth Model for Consumer Durables. *Management Science,* 215- 227.

Bawack, R. E., and Kala Kamdjoug, J. R. (2018). Adequacy of UTAUT in clinician adoption of health information systems in developing countries: The case of Cameroon. *International Journal of Medical Informatics*. 109(April 2017):15–22.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Bechhofer, F., and Lindsay, P. (2000). *Principles of Research Design in the Social Sciences.* London: Routledge.

Bechhofer, F., and Paterson, L. (2012). *Principles of research design in the social sciences*. Routledge.

Beck, E. J., Shields, J. M., Tanna, G., Henning, G., De Vega, I., Andrews, G., and Low-Beer, D. (2018). Developing and implementing national health identifiers in resource limited countries: why, what, who, when and how? *Global health action*, 11(1), 1440782.

Benton, D. C., and Cormack, D. (2000). *Reviewing and evaluating the literature. The Research Process in Nursing.* Oxford: Blackwell Science.

Berkun, S. (2007). *The Myths of Innovations* (1st ed.). Sebastopol, CA: O'Reilly Media.

Bernard, H. R. (2013). *Social research methods: qualitative and quantitative approaches,* 2nd ed., London: SAGE Publications Ltd.

Bhattacherjee, A. (2012). *Social science research: Principles, methods, and practices*.

Bhattacherjee, A., and Hikmet, N. (2007). Physicians' resistance towards healthcare information technology: a theoretical model and empirical test. *European Journal of Information Systems,* 16(6), 725-737.

Biemer, P. P., and Lyberg, L. E. (2003). *Introduction to Survey Quality*. Hoboken, NJ: Wiley-Interscience.

Black, A. D., Car, J., Pagliari, C., Anandan, C., Cresswell, K., Bokun, T., and Sheikh, A. (2011). The impact of e-Health on the quality and safety of healthcare: a systematic overview. *PLoS med*, 8(1), e1000387.

Blanche, M. T., Blanche, M. J. T., Durrheim, K., and Painter, D. (Eds.). (2006). *Research in practice: Applied methods for the social sciences*. Juta and Company Ltd.

Blank, A., Prytherch, H., Kaltschmidt, J., Krings, A., Sukums, F., Mensah, N., Zakane, A., Loukanova, S., Gustafsson, L. L., Sauerborn, R., and Haefeli, W. E. (2013). Quality of prenatal and maternal care: bridging the know-do gap (QUALMAT study): an electronic clinical decision support system for rural sub-Saharan Africa. *BMC Med Inform Decis Mak,* 13:44.

Blaya, J. A., Fraser, H. S., and Holt, B. (2010). E-Health technologies show promise in developing countries. *Health Affairs*, 29(2), 244-251.

Bleich, H. L., and Slack, W. V. (2010). Reflections on electronic medical records: when doctors will use them and when they will not. *International journal of medical informatics,* 79(1), 1-4.

Bless, C., and Higson-Smith, C. (2000). *Fundamentals of social research methods: An African perspective*, 3rd ed. Cape Town, South Africa: Juta and Co. Ltd.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Bless, C., and Smith, C. H. (1995). *Fundamentals of social research methods: An African perspective,* 2nd ed. Zambia: Juta Education.

Bless, C., Smith, C. H., and Kagee, A. (2006). *Fundamentals of social research methods: an African perspective*, 4th ed. Cape Town South Africa: Juta and Co Ltd.

Blumenthal, D., and Tavenner, M. (2010). The "meaningful use" regulation for electronic health records. *New England Journal of Medicine*, 363(6), 501-504.

Boonstra, A., and Broekhuis, M. (2010). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC health services research*, 10(1), 231.

Boulle, A., Heekes, A., Tiffin, N., Smith, M., Mutemaringa, T., Zinyakatira, N., and Vallabhjee, K. (2019). Data centre profile: the provincial health data centre of the Western Cape Province, South Africa. *International Journal of Population Data Science*, 4(2).

Braa, J., and Hedberg, C. (2000). Developing district-based healthcare information systems: the South African experience. In *Proceedings of IRIS* (Vol. 23, pp. 1-29).

Brannen, J. (2005). Mixing methods: The entry of qualitative and quantitative approaches into the research process. *International journal of social research methodology*, 8(3), 173-184.

Brenner, S. K., Kaushal, R., Grinspan, Z., Joyce, C., Kim, I., Allard, R. J., Delgado, D., and Abramson, E. L. ((2016). Effects of health information technology on patient outcomes: a systematic review. *Journal of the American Medical Informatics Association*, 23(5), 1016-1036.

Brewerton, P., and Millward, L. (2001). *Organisational research methods*, London: SAGE Publications Ltd.

Brink, HI. (1996). *Fundamentals of research methodology for healthcare professionals.* Kenwyn: Juta.

Brown, K. (2008). Developing countries must plan road map for e-Health. In *Conference Interview by Africa*. Bellagio, Italy. [Online] www. allfrica. com [Accessed: 20/10/2010].

Bryman, A., and Bell, E. (2011). *Business Research Methods* (3rd edn): Oxford University Press.

Buntin, M. B., Burke, M. F., Hoaglin, M. C., and Blumenthal, D. (2011). The benefits of health information technology: a review of the recent literature shows predominantly positive results. *Health affairs*, 30(3), 464-471.

Burger, R., Bredenkamp, C., Grobler, C., and Van Der Berg, S. (2012). Have public health spending and access in South Africa become more equitable since the end of apartheid? *Development Southern Africa*, 29(5), 681-703.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Burke, M.E. (2007). Making choices: research paradigms and information management: Practical applications of philosophy in IM research. *Library review*, 56(6): 476–484.

Burns, N., and Grove, S. K. (2011). *Understanding Nursing Research: Building an Evidence-based Practice.* 5th ed. Elsevier.

Busse, H., Aboneh, E. A. and Tefera, G. (2014). Learning from developing countries in strengthening health systems: an evaluation of personal and professional impact among global health volunteers at Addis Ababa University's Tikur Anbessa Specialised Hospital (Ethiopia). *Globalisation and health*, 10(1), p. 1.

Buzeley, P. (2002). *'Issues in mixing qualitative and quantitative approaches to research',* 1st International Conference - Qualitative Research in Marketing and Management, University of Economics and Business Administration, 10 April 2002, Vienna, pp. 1-11.

Caine, K., and Tierney, W. M. (2015). Point and counterpoint: patient control of access to data in their electronic health records. *Journal of general internal medicine*, 30(1), 38-41.

Cao, Y., Bi, X., and Wang, L. (2013). A Study on User Adoption of Cloud Storage Service in China: A Revised Unified Theory of Acceptance and Use of Technology Model. *IEEE Computer Society*, 287-293.

Carestreeam. (2013). *Carestream vue RIS* [Online]. Available from: http://www.carestream.com/vue-ris.html [Accessed 24 February 2013].

Carruthers, J. (2007). 'A rationale for the use of semi-structured interviews'. *Journal of Educational Administration*, Vol.28, No.1. pp. 63-68.

Carter, L., and Weerakkody, V. (2008). E-Government adoption: A cultural comparison. *Information Systems Frontiers*, 10, 473-482.

Carter, L., Shaupp, L.C., Hobbs, J., and Campbell, R. (2011). The role of security and trust in the adoption of online tax filing. *Transforming Government: People, Process and Policy*, 5 (4):303- 318.

Carter, S. (2000). Improving the numbers and performance of women-owned businesses: some implications for training and advisory services. *Education and Training*, 42(4/5):326- 333.

Chang, P. (2009). *Understanding Individuals' Behaviour in the Convergent Use of Mobile Phones.* Unpublished PhD thesis, Royal Melbourne Institute of Technology, Melbourne, Australia.

Chatzoglou, P. D. (2008). Using a modified technology acceptance model in hospitals. *International journal of medical informatics*, 78:115-126.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Chau, P. Y. (1996). An empirical investigation on factors affecting the acceptance of CASE by systems developers. *Information and Management*, 30(6), 269-280.

Chau, P. Y. K. (2001). Influence of computer attitude and self-efficacy on IT usage Behaviour. *Journal of End-User Computing*, vol. 13, no. 1, p. 26.

Chau, P. Y. K., and P. J.-H. Hu (2002). "Investigating healthcare professional' decisions to accept telemedicine technology: an empirical test of competing theories." *Information and Management* 39: 297-311.

Chen, H, C. (2003). *Marketing International Higher Education to Taiwanese International Higher Education: Reaching the Taiwanese Market*. Unpublished doctoral dissertation. Australia: Griffith University.

Chen, S., and Li, S. (2011). Recent Related Research in Technology Acceptance Model: A Literature Review. *Australian Journal of Business and Management Research*, 1(9), 124–127.

Chestnutt, I.G. (2016). *Dental Public Health at a Glance*. John Wiley and Sons. Chichester, West Sussex.

Chetley, A., Davies, J., Trude, B., McConnell, H., and Ramirez, R. (2006). Improving health, connecting people: The role of ICTs in the health sector of developing countries. A framework paper. *Infodev.* Retrieved 20-04-2014, from http://www. popline. org/node/185203

Chow, S. K. Y., Chin, W., Lee, H., Leung, H., and Tang, F. (2011). Nurses' perceptions and attitudes towards computerisation in a private hospital. *Journal of clinical nursing,* 21:1685- 1696.

Chowles, T. (2014). *Western Cape Leads the Continent with PHCIS - E-health News ZA.* [Online] e-Health News ZA. Available at: [Accessed 17 April 2020].

Chuttur, M.Y. (2009). "Overview of the Technology Acceptance Model: Origins, Developments and Future Directions," Indiana University, USA. *Sprouts: Working Papers on Information Systems,* 9(37).

Cilliers, L., Viljoen, K. L.-A., and Chinyamurindi, W. T. (2017). A study on students' acceptance of mobile phone use to seek health information in South Africa. *Health Information Management Journal.* 1–11.

Clark, V. L. P., and Creswell, J. W. (2005). *Student study guide to accompany Creswell's educational research: planning, conducting, and evaluating quantitative and qualitative research*. Merrill.

Cline, G. B., and Luiz, J. M. (2013). Information technology systems in public sector health facilities in developing countries: the case of South Africa. *BMC medical informatics and decision-making*, 13(1), 13.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Coleman, A. (2013). Using a virtual ICT training framework to support doctors in rural hospitals in South Africa. *Studies on Ethno-Medicine*, 7(3), 137-141.

Coleman, A., Herselman, M. E., and Potass, D. (2011, November). E-Health readiness assessment for e-Health framework for Africa: a case study of hospitals in South Africa. In *International Conference on Electronic Healthcare* (pp. 162-169). Springer, Berlin, Heidelberg.

Compeau, D. R., and Higgins, C. A. (1995). Application of social cognitive theory to training for computer skills. *Information systems research*, 6(2), 118-143.

Compeau, D. R., and Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211.

Compeau, D., Higgins, C. A., and Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS quarterly*, 145-158.

Conner, M., and Armitage, C. J. (1998). Extending the Theory of Planned Behaviour: A review and avenues for further research. *Journal of applied social psychology*, 28(15), 1429-1464.

Conrick, M. (2006). *Health Information Systems. In M. Conrick (Ed.), Health Informatics: Transforming Healthcare with Technology* (pp 222-332). Melbourne: Thompson Social Science Press.

Conrick, M., and Newell, C. (2006). Issues of Ethics and Law. In: M. Conrick (Ed.), *Health Informatics: Transforming Healthcare with Technology*. Melbourne: Thompson Social Science Press.

Cooper, D. R., and Emory, C. W. (2007). *Business research methods* (5th edition). (R. D. Irwin, Ed.). New York, USA: McGraw-Hill. Eds. Dusit Niyato, Ekram Hossain, and Jeffrey Diamond (n.d.).

Cooper, D. R., and Schindler, P. S. (2013). *Business Research Methods*. Twelfth Edition. McGraw-Hill. Avenue of the Americans, New Yolk.

Cooper, D., and Schindler, P. (2008). *Business research methods*. Second European edition Europe, Maidenhead: McGraw-Hill Higher Education.

Cormack, D. (2000). *The research process in nursing,* Blackwell Publishing.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed-methods approaches* (2nd ed.). Thousand Oaks, CA: SAGE.

Creswell, J. W. (2005). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. 2nd ed. Upper Saddle River, NJ: Merrill.

Creswell, J. W. (2007). *Qualitative Inquiry and Research Design. Choosing among five approaches*. (2nd Ed.). London: SAGE Publications.

Creswell, J. W. (2009). *Research Design. Qualitative, Quantitative and Mixed-Methods Approaches.* (3rd Ed.). London: SAGE Publications.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Creswell, J. W., and Clark, V. L. P. (2017). *Designing and conducting mixed-methods research.* SAGE publications.

Creswell, J. W., and Plano Clark, V. L. (2011). *Designing and conducting mixed-methods research.* 2nd ed. Thousand Oaks, CA: SAGE.

Culler, S. D., Jose, J., Kohler, S., and Rask, K. (2011) 'Nurses perceptions and experiences with the implementation of a medication administration system', *Computers Informatics Nursing*, Vol. 29, No. 5, pp. 280–288.

Dada, D. (2006). E-readiness for developing countries: moving the focus from the environment to the users. *Electronic Journal of Information Systems in Developing Countries*, 27(6):1-14.

Darr, A., Harrison, M. I., Shakked, L., and Shalom, N. (2003). Physicians' and nurses' reactions to *electronic medical records. Journal* of Health Organization and Management.

Davis, F. D. (1989). "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, 13, 319–340.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace 1. *Journal of applied social psychology*, 22(14), 1111-1132.

Dearing, J., and Cox, J. (2018). Diffusion of Innovations Theory, Principles, and Practice Article in Health Affairs. *Health Affairs*. 37(2):183–190.

Demiris, G., Oliver, D. R. P., Porock. D., and Courtney, K. (2004). Home telehealth: The Missouri telehospice project: Background and next steps. *Home Healthcare Technology Report,* 1(49), 55- 57.

DesRoches, C., Campbell, E., Rao, S., Donelan, K., Ferris, T., Jha, A., Kaushal, R., Levy, D., Rosenbaum, S., Shields, A., and Blumenthal, D. (2008). Electronic Health Records in Ambulatory Care — A National Survey of Physicians. *New England Journal of Medicine*, 359(1): 50-60.

Devers, K., and Frankel, R. (2000). Study design in qualitative research 2: Sampling and data collection strategies. *Education for health*, 13(2), 263-271.

Diagne, A., and Demont, M. (2007). Taking a new look at empirical models of adoption: Average treatment effect estimation of adoption rates and their determinants. *Agricultural Economics*, 37(2-3), 201-210.

District Health Service (2017). *Circular H82 of 2017. Primary Healthcare Information System (PHCIS) headcount reporting*. Department of Western Cape.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Douglas, G. P., Gadabu, O. J., Joukes, S., Mumba, S., McKay, M. V., Ben-Smith, A., and Chimbwandira, F. (2010). Using touchscreen electronic medical record systems to support and monitor national scale-up of anti-retroviral therapy in Malawi. *PLoS Med,* 7(8), e1000319.

Drosatos, G., and Kaldoudi, E. (2019), "Blockchain applications in the biomedical domain: a scoping review", *Computational and Structural Biotechnology Journal*, Vol. 17, pp. 229-240.

Duan, L., Street, W. N., and Xu, E. (2011). Healthcare information systems: data mining methods in the creation of a clinical recommender system. Enterprise Information Systems, 5(2), 169-181.

Ducey, A. J., and Coovert, M. D. (2016). Predicting tablet computer use: An extended Technology Acceptance Model for physicians. *Health Policy and Technology.* 5(3):268–284.

Dünnebeil, S., Sunyaev, A., Blohm, I., Leimeister, J., and Krcmar, H (2012). 'Determinants of physicians' technology acceptance for e-Health in ambulatory care', *International Journal of Medical Informatics*, 81(11), 746-760 ed. England: Pearson Education Limited.

Dutot, V., Bergeron, F., Rozhkova, K., and Moreau, N. (2019), "Factors affecting the adoption of connected objects in e-health: a mixed-methods approach", *Systèmesd'Informationet Management*, Vol. 23 No. 4(3).

Dwivedi, Y. K., Williams, M. D., and Lal, B. (2008, October). The diffusion of research on the adoption and diffusion of information technology. In *IFIP Working Conference on Open IT-Based Innovation: Moving Towards Cooperative IT Transfer and Knowledge Diffusion* (pp. 3-22). Springer, Boston, MA.

Elliott, N., and Lazenbatt, A. (2005). 'How to recognise a quality grounded theory research study', *Australian Journal of Advanced Nursing*, Vol. 22, No. 3, pp. 48-52.

England, I., Stewart, D., and Walker, S. (2000). Information technology adoption in healthcare: when organisations and technology collide. *Australian Health Review,* 23(3), 176-185.

Evans, R. S. (2016). *Electronic health records: then, now, and in the future. Yearbook of medical informatics* (Suppl 1), S48.

Ferreira, K. N. (2009). October 17). *Programming the World with Philosophy*. (Illustrated). Delaware, Mid-Atlantic region, USA: iUniverse.

Fichman, R. G. (2004). Going Beyond the Dominant Paradigm for IT Innovation Research: Emerging Concepts and Methods. *Journal of the Association for Information Systems*, 5 (8), 314-355.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Fichman, R. G. (2004). Real Options and IT Platform Adoption: Implications for Theory and Practice. *Information Systems Research*, 15 (2), 132–154.

Fishbein, M., and Ajzen, I. (1975). *Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research*. MA: Addison-Wesley.

Fishbein, M., and Ajzen, I. (1977). *Belief, attitude, intention, and behaviour: An introduction to theory and research.* Philosophy and Rhetoric, 10(2).

Fishbein, M., and Ajzen, I. (1980). *Understanding the attitudes and predicting social behaviour.* Englewood Cliffs, New Jersey: Prentice Hall Inc.

Fitzgerald, L., Ferlie, E., Wood, M., and Hawkins, C. (2002). Interlocking interactions, the diffusion of innovations in healthcare. *Human Relations*, 55, 1429-49.

Ford, J. M. (2004). Content analysis: An introduction to its methodology. *Personnel Psychology*, 57(4), 1110.

Frasier, H., May, M. A., and Wanchoo, R. (2008). *E-Health Rwanda case study*. American Medical Informatics Association.

Gagnon, M. P., Simonyan, D., Godin, G., Labrecque, M., Ouimet, M., and Rousseau, M. (2016). Factors influencing electronic health record adoption by physicians: A multilevel analysis. *International Journal of Information Management*, 36(3), 258-270.

Gatt, S., and Sammut, R. (2008). An exploratory study of predictors of self-care behaviour in persons with type 2 diabetes. *International Journal of Nursing Studies*. 45:1525–1533.

George, J. F. (2004). The Theory of Planned Behaviour and internet purchasing. *Internet Research*, 14(3): 198-212.

Giuse, D. A., and Kuhn, K. A. (2003). Health information systems challenges: the Heidelberg conference and the future. *International journal of medical informatics.*

Glanz, K., Rimer, B. K., and Viswanath, K. (2015). *Health Behaviour: Theory, Research, and Practice.* John Wiley and Sons. San Francisco.

Goodhue, D., and Thompson, R. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly*. 19(2):213–236.

Goodwin, R. (2002). *Conducting cross-cultural psychological research in changing cultures: Some ethical and logistical considerations*. Online readings in psychology and culture.

Grandon, E. E., and Mykytyn Jr, P. P., (2004). Theory-based instrumentation to measure the intention to use electronic commerce in small and medium sized businesses. *Journal of Computer Information Systems*, 44(3), pp.44-57.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Graneheim, U. H., and Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today,* 24, 105-112.

Gray, D. (2016). *UAE, the Netherlands and China leading the way in digital health.*

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., and Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Quarterly*, 84 (4), 581– 629.

Grove, S., K, Gray, J. R., and Burns, N. (2015). *Understanding Nursing Research: Building an evidence-Based Practice*. 6th ed. China: Elsevier.

Gruber, D., Cummings, G. G., LeBlanc, L., and Smith, D. L. (2009). 'Factors influencing outcomes of clinical information systems implementation: a systematic review'. *Computers, Informatics, Nursing: CIN*, Vol. 27, No. 3, pp. 151–163.

Guma, W. (2013). *PACS RIS* [Email]. Message to: N Mchunu. 29 January 2013.

Gupta, B., Dasgupta, S., and Gupta, A. (2008). Adoption of ICT in a government organization in a developing country: An empirical study. *The Journal of Strategic Information Systems*, 17(2), 140-154.

Hagger, M. S. (2019). *The reasoned action approach and the theories of reasoned action and planned behaviour.*

Ham, C. (2007). *Green Labelling: Investigation into the marketing of FSC certified timber along the domestic timber value chain in South Africa* (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Han, S. (2003). Individual adoption of information systems in organisations: a literature review of technology acceptance model, *TUCS Technical Report* 540, TUCS.

Hannabus S. (1996). 'Research interviews', *New Library World*, Vol. 97, No. 1129, pp. 22–30.

Harvey, J. N., and Lawson, V. L. (2009). The importance of health belief models in determining self-care behaviour in diabetes. *Diabetic Medicine*. 26(1):5–13.

Harwell, M. R. (2011). *Research Design in Qualitative/Quantitative/Mixed-Methods. Opportunities and Challenges in Designing and Conducting Inquiry*.

Hasanain, R. A., Vallmuur, K., and Clark, M. (2015). Electronic medical record systems in Saudi Arabia: knowledge and preferences of healthcare professionals. *Journal of Health Informatics in Developing Countries*, 9(1).

Hasani, I. B., Chroqui, R., Okar, C., Ouiddad, A., and Talea, M. (2017). Literature review: All about IDT and TAM. In *1st edition of a scientific day: performance management.*

Haux, R. (2006). Health information systems–past, present, future. *International journal of medical informatics,* 75(3-4), 268-281.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Heart, T., Ben-Assuli, O., and Shabtai, I. (2017). A review of PHR, EMR and EHR integration: A more personalised healthcare and public health policy. *Health Policy and Technology*, 6(1), 20-25.

Heekes, A., Tiffin, N., Dane, P., Mutemaringa, T., Smith, M., Zinyakatira, N., and Boulle, A. (2018). Self-enrolment antenatal health promotion data as an adjunct to maternal clinical information systems in the Western Cape Province of South Africa. *BMJ global health*, 3(Suppl 2).

Heffernan, C. J. (1988). Social foundations of thought and action: A social cognitive theory, Albert Bandura Englewood Cliffs, New Jersey: Prentice Hall, 1986, xiii+ 617 pp. *Behaviour Change*, 5(1), 37-38.

Helia, V. N., Asri, V. I., Kusrini, E., and Miranda, S. (2018). Modified Technology Acceptance Model for hospital information system evaluation–a case study. In *MATEC Web of Conferences* (Vol. 154, p. 01101). EDP Sciences.

Henning, E., Van Rensburg, W., and Smit, B. (2004). *Finding your way in qualitative research.* Van Schaik Publishers.

Hennington, A., and Janz, B. D. (2007). Information Systems and Healthcare XVI: Physician Adoption of Electronic Medical Records: Applying the UTAUT Model in a Healthcare Context. *Communications of the Association for Information Systems,* 19(1): 5.

Hollis, K. F. (2016). To share or not to share: ethical acquisition and use of medical data. *AMIA Summits on Translational Science Proceedings*, 2016, 420.

Hong, W., Thong, J. Y. L, Wong, W. M., and Tam, K. Y. (2001). Determinants of User Acceptance of Digital Libraries: An Empirical Examination of Individual Differences and System Characteristics. *Journal of Management Information Systems*, 18(3):97- 124.

Hoque, M. R., and Bao, Y. (2015). Cultural influence on adoption and use of e-Health: evidence in Bangladesh. *Telemedicine and e-Health*, 21(10), 845-851.

Hoque, M. R. (2016). An empirical study of m-Health adoption in a developing country: The moderating effect of gender concern. *BMC Medical Informatics and Decision-Making.* 16(1):1–10.

Horner, V., Rautenbach, P., Mbananga, N., Mashamba, T., and Kwinda, H. (2013). An e-Health decision support system for improving compliance of health workers to the maternity care protocols in South Africa. *Applied clinical informatics*, 4(1), 25.

Hossain, A., Quaresma, R., and Rhman, H. (2019). Investigating factors influencing the physician's adoption of electronic health record (HER) in healthcare system of Bangladesh: an empirical study. *International Journal of Information Management,* 44, 76-87.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Howard, M. C., and Rose, J. C. (2019). Refining and extending task–technology fit theory: Creation of two Task-Technology Fit scales and empirical clarification of the construct. *Information and Management*, 56(6):103134.

Hsieh, H. F., and Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), 1277-1288.

Hu, P. J., Chau, P. Y., Sheng, O. R. L., and Tam, K. Y. (1999). Examining the Technology Acceptance Model using physician acceptance of telemedicine technology. *Journal of management information systems*, 16(2), 91-112.

Huang, W. H. D., Hood, D. W., and Yoo, S. J. (2013). Gender divide and acceptance of collaborative Web 2.0 applications for learning in higher education. *The Internet and Higher Education*, 16, 57-65.

Hussain, S.A. (2015). A qualitative study of user perceptions of mobile health apps. *BMC Public Health.* 16(1).

Ifinedo, P. (2016). The moderating effects of demographic and individual characteristics on nurses' acceptance of information systems: A Canadian study. *International journal of medical informatics*, 87, 27-35.

Irani, T. (2000). Prior Experience, Perceived Usefulness, and the Web: Factors Influencing Agricultural Audiences' Adoption of Internet Communication Tools. *Journal of Applied Communications,* 84(2), 49-63.

Irick, M.L. (2008). Task-Technology Fit and Information Systems Effectiveness. *Journal of Knowledge Management Practice*. 9(3):1–5.

Isaac, O., Abdullah, Z., Ramayah, T., Mutahar, A. M., and Alrajawy, I. (2017). Towards a better understanding of internet technology usage by Yemeni employees in the public sector: An extension of the Task-Technology Fit (TTF) model. *Research Journal of Applied Sciences,* 12(2):205–223.

Isemeck, C. S., Ngure, K., Kariuki, M. J., and Muchene, M. O. (2019). Factors influencing the adoption of electronic health records in public health facilities in Kisumu County, Kenya. *Journal of health, medicine, and nursing*, 4(1), 74-101.

Jabali, A. K. (2018). Electronic health records' functionalities in Saudi Arabia: Obstacles and major challenges. *Global Journal of Health Science*, 10(4), 1-50.

JAC. (2012). JAC is changing lives in the Western Cape. *JAC Medicine Management* [Online]. https://www.westerncape.gov.za/news.

Jackson, C. M., Chow, S., and Leitch, R. A. (1997). Towards an understanding of the behavioural intention to use an information system. *Decision sciences*, 28(2), 357-389.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Jha, A. K., Iliff, A. R., Chaoui, A. A., Defossez, S., Bombaugh, M. C., and Miller, Y. R. (2019). *A crisis in healthcare: a call to action on physician burnout*. Waltham, MA: Massachusetts Medical Society MHaHA, Harvard TH Chan School of Public Health, and Harvard Global Health Institute.

Joshi, S. (2016). *Web 2.0 and its implications on globally competitive business model. In Mobile Computing and Wireless Networks: Concepts, Methodologies, Tools, and Applications* (pp. 1638-1654). IGI Global.

Juhriyansyah, D. (2010). The Relationship Between PU and PEOU Towards the behaviour intention to use New Student Placement (NSP) System of Senior High School in Banjarmasin, South Kalimantan, Indonesia. In *International Conference on Arts, Social Sciences and Technology (iCAST).* V. 1. 15–21.

Juma, K., Nahason, M., Apollo, W., Gregory, W., and Patrick, O. (2012). *Current status of e-health in Kenya and emerging global research trends 1.*

Juntumaa, M. (2011). *Putting consumers' IT adoption in context: failed link between attitudes and behaviour.* Aalto University.

Kamal, S. A., Shafiq, M., and Kakria, P. (2020). Investigating acceptance of telemedicine services through an extended Technology Acceptance Model (TAM). *Technology in Society,* 60, 101212.

Kaminski, J. (2011). Diffusion of Innovation Theory: Theory in Nursing Informatics. Canadian *Journal of Nursing Informatics*, 6(2), 1-6.

Kandeh, A. T., Botha, R. A., and Futcher, L. A. (2018). Enforcement of the Protection of Personal Information (POPI) Act: Perspective of data management professionals. *South African Journal of Information Management*, 20(1), 1-9.

Kaplan, B., Truex, D. P., Wastell, D., Wood-Harper, A. T., and DeGross, J. I. (Eds.). (2006). *Information systems research: Relevant theory and informed practice* (Vol. 143). Springer.

Kathryn, S. (2011). *Security and Privacy Implications of Healthcare Digitisation. Improving the Future of CyberSpace*. Royal Aberdeen Smithfield.

Katurura, M. C., and Cilliers, L. (2018). Electronic health record system in the public healthcare sector of South Africa: A systematic literature review. *African journal of primary healthcare and family medicine*, 10(1), 1-8.

Katurura, M., and Cilliers, L. (2016, May). The extent to which the POPI act makes provision for patient privacy in mobile personal health record systems. In *2016 IST-Africa Week Conference* (pp. 1-8). IEEE.

Keil, M., Beranek, P. M., and Konsynski, B. R. (1995). Usefulness and ease of use: field study evidence regarding task considerations. *Decision support systems*, 13(1), 75-91.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Kerr, K., and Norris, T. (2004). Telehealth in New Zealand: current practice and future prospects. *Journal of telemedicine and telecare*, 10 (1_suppl), 60-63.

Khalifa, M. (2013). Barriers to health information systems and electronic medical records implementation. A field study of Saudi Arabian hospitals. *Procedia Computer Science,* 21, 335-342.

Khan, I. U., Yu, Y., Hameed, Z., Khan, S. U., and Waheed, A. (2018). Assessing the Physicians' Acceptance of E-Prescribing in a Developing Country. *Journal of Global Information Management.* 26(3):121–142.

Khanh, N. T. V., and Gim, G. (2014). Factors Influencing Mobile Learning Adoption Intention: An Empirical Investigation in Higher Education. *Journal of Social Sciences,* 10(2):51-62.

Khoja, S., Scott, R. E., Casebeer, A. L., Mohsin, M., Ishaq, A. F. M., and Gilani, S. (2007). e-Health readiness assessment tools for healthcare institutions in developing countries. *Telemedicine and e-Health,* 13(4), 425-432.

Kifle, M., Mbarika, V. W. A., Tsuma, C., Wilkerson, D., and Tan, J. (2008, January). A TeleMedicine transfer model for sub-Saharan Africa. In Hawaii International Conference on System Sciences, *Proceedings of the 41st Annual.* pp. 244-244. IEEE.

Kijima, Y., Otsuka, K., and Sserunkuuma, D. (2011). An inquiry into constraints on a green revolution in sub-Saharan Africa: The case of NERICA rice in Uganda. *World Development,* 39(1), 77-86.

King, W. R., and He, J. (2006). A meta-analysis of the Technology Acceptance Model. *Information and management*, 43(6), 740-755.

Klein, G. (2013). *Billing and JAC* [Email]. Message to: N Mchunu. 06 February 2013.

Kondracki, N. L., Wellman, N. S., and Amundson, D. R. (2002). Content analysis: Review of methods and their applications in nutrition education. *Journal of nutrition education and behaviour,* 34(4), 224-230.

Korzilius, H. P., Hoofta, A. P., and Planken, B. C. (2007). A longitudinal study on intercultural awareness and foreign language acquisition in the Netherlands. *Journal of Intercultural Communication*, 15(6), 76-105.

Krauss, S. E., and Putra, U. (2005). Research Paradigms and Meaning Making: A Primer. *The Qualitative Report*, 10(4): 758–770.

Krippendorf, K. (2004). *Content analysis: an introduction to its methodology*. 2nd ed. Thousand Oaks, CA: SAGE.

Kruse, C. S., Kristof, C., Jones, B., Mitchell, E., and Martinez, A. (2016). Barriers to electronic health record adoption: a systematic literature review. *Journal of medical systems*, 40(12), 252.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Kuo, K. M., Liu, C. F., and Ma, C. C. (2013). An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *BMC medical informatics and decision-making*, 13(1), 88.

Kurnia, I. D., and Rama, J. A. (2017). *The Effect of Theory of Reasoned Action Implementation on Dietary and Physical Activity Adherence in Patients with Diabetes Mellitus Type 2*. 3(Inc):233–236.

Lai, P. (2017). The literature review of technology adoption models and theories for the novelty technology. *Journal of Information Systems and Technology Management*. 14(1):21–38.

Lai, P. C. (2006). The significant of E-business and knowledge-based Customer Relationship in the E-market Place Environment. *INTI Journal*, 2 (1) 552-559.

Lai, P. C. (2016). Design and Security impact on consumers' intention to use single platform E-payment. *Interdisciplinary Information Sciences*, 22 (1), 111-122.

Lai, P. C., and Zainal, A. A. (2015). Consumers' Intention to Use a Single Platform E-Payment System: A Study among Malaysian internet and Mobile Banking Users. *Journal of internet Banking and Commerce*. (20) (1) 1-13.

Lambrecht, I., Vanlauwe, B., Merckx, R., and Maertens, M. (2014). Understanding the process of agricultural technology adoption: Mineral fertilizer in Eastern DR Congo. *World Development*, 59(5), 132-146.

LaMorte, W. W. (2016). The Theory of Planned Behaviour. *The Theory of Planned Behaviour*, Boston University School of Public Health, 28.

Lazenbatt, A., and Elliott, N. (2005). How to recognise a 'quality' grounded theory research study. *Australian Journal of Advanced Nursing, The*, 22(3), 48.

Lean, O. K., Ramayah, T., Fernando, Y., and Zailani, S. (2009). Factors influencing intention to use e-Government services among citizens in Malaysia. *International Journal of Information Management,* 29, 458-475.

Lee, D. (2019). "A model for designing healthcare service based on the patient experience", *International Journal of Healthcare Management*, Vol. 12 No. 3, pp. 180-188.

Lee, H.W., Ramayah, T., and Zakaria, N. (2012). External factors in hospital information system (HIS) adoption model: a case on Malaysia. *Journal of medical systems*, 36(4): 2129–40.

Lee, J., Cerreto, F. A., and Lee, J. (2010). Theory of Planned Behaviour and Teachers' Decisions Regarding Use of Educational Technology. *Educational Technology and Society,* 13 (1), 152–164.

Lee, Y., Kozar, K. A., and Larsen, K. R. T. (2003). The Technology Acceptance Model; past, present and future. *Communication of AIS*, 12 (50), 752-780.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Leedy, D., and Ormrod, J. E. (2001). *Practical Research Planning and Planning and Design.* Seventh edition. Upper Saddle Review: Merrill Practice Hall.

Leedy, P. D., and Ormrod, J. E. (2010). *Practical Research: Planning and Design* (9th Edition ed.). New Jersey: Pearson Education Inc, Publishers.

Leedy, P. D., and Ormond, J. E. (2013). *Practical research: planning and design*, 10th ed. New Jersey: Pearson Education Inc.

Legris, P., Inghamb, J., and Collerette, P. (2003) 'Why do people use information technology? A critical review of the Technology Acceptance Model', *Information and Management*, Vol. 40, No. 3, pp. 191-204.

Lethbridge, T. C., and Laganiere, R. (2005). *Object-oriented software engineering: Practical software development using UML and Java* (2nd Edition), Berkshire, England, McGraw-Hill-Education.

Levine, M., Little, S., and Mills, S. (1997). *PHC 6500 Foundations of Health Education*/Fall 1997.

Lewis, W., Agarwal, R., and Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: An empirical study of knowledge workers. *MIS quarterly*, 657-678.

Liao, C., Chen, J. L., and Yen, D. (2007). 'Theory of planning behaviour (TPB) and customer satisfaction in the continued use of e-service: An integrated model', *Computers in Human Behaviour*, 23(6):2804{2822.

Liebenberg, J., Benadé, T., and Ellis, J. (2018). Acceptance of ICT: Applicability of the Unified Theory of Acceptance and Use of Technology (UTAUT) model to South African Students. *African Journal of Information Systems*, 10(3), pp. 160-173.

Liker, J. K., and Sindi, A. A. (1997). User acceptance of expert systems: A test of the Theory of Reasoned Action. *Journal of Engineering and Technology Management*, 14(2), 14- 173.

Lindsay, D. (1995). *Guide to Scientific Writing*. Longman Cheshire, Melbourne.

Lippert, S. K., and Davis, M. (2006). A conceptual model integrating trust into planned change activities to enhance technology adoption behaviour. *Journal of information science*, 32(5), 434-448.

Lober, W. B., Quiles, C., Wagner, S., Cassagnol, R., Lamothes, R., Alexis, D. R. P., and Kitahata, M. M. (2008). Three years' experience with the implementation of a networked electronic medical record in Haiti. In *AMIA Annual Symposium Proceedings* (Vol. 2008, p. 434). American Medical Informatics Association.

Locke, K., and Golden-Biddle, K. (1997). Constructing opportunities for contribution: Structuring intertextual coherence and "problematising" in organisational studies. *Academy of Management Journal,* 40, 1023-1062.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Lucas Jr, H. C., and Spitler, V. K. (1999). Technology use and performance: A field study of broker workstations. *Decision sciences*, 30(2), 291-311.

Ludwick, D. A., and Doucette, J. (2009). Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. *International journal of medical informatics*, 78(1), 22-31.

Lyytinen, K., and Damsgaard, J. (2001). What's wrong with the diffusion of innovation theory? *IFIP Advances in Information and Communication Technology*. 59:173–190.

MacGregor, H., McKenzie, A., Jacobs, T., and Ullauri, A. (2018). Scaling up ART adherence clubs in the public sector health system in the Western Cape, South Africa: a study of the institutionalisation of a pilot innovation. *Globalisation and health,* 14(1), 40.

Mack, N. (2005). *Qualitative research methods: A data collector's field guide*.

Magee, A. (2002). *Attitude-behaviour relationship*. Available at: http://www.ciadvertising.org/SA/fall_02/adv382j/mageeac/theory.htm

Mahalli, A. E. (2015). Adoption and barriers to adoption of electronic health records by nurses in three governmental hospitals in Eastern Province, Saudi Arabia. *Perspectives in health information management,* 12(Fall).

Mahomed, H. (2017). *Electronic systems at PHC level*. Presentation, South Africa.

Maiga, G., Makori, A. C., and Miph, M. (2013). *User issues on the adoption of health informatics systems in level 5 Hospitals in Nyanza, Kenya*.

Malik, M. A., and Khan, H. R. (2009, January). Understanding the implementation of an electronic hospital information system in a developing country: a case study from Pakistan. In *Proceedings of the Third Australasian Workshop on Health Informatics and Knowledge Management* - Volume 97(31-36).

Manueli K, Latu S., and Koh, D. (2007). '*ICT Adoption Models*.' 20th Annual Conference of the National Advisory Committee on Computing Qualifications (NACCQ), Nelson, New Zealand.

Maree, K., and Van der Westhuizen, C. (2007). *Planning a research proposal. First steps in research.* Pretoria: Van Schaik, 23-45.

Marra, M., Pannell, D. J., and Abadi Ghadim, A. (2002). The economics of risk, uncertainty and learning in the adoption of new agricultural technologies: Where are we on the learning curve? *Agricultural Systems*, 75(2-3), 215-234.

Marshall, C., and Rossman, G. B. (2006). *Designing qualitative research*, Thousand Oaks: SAGE Publications.

Martin. 2017. *Theory of Planned Behaviour: definition, explained, examples*.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Martins, C., Oliveira, T., and Popovič, A. (2014). Understanding the Internet banking adoption: A Unified Theory of Acceptance and Use of Technology and perceived risk application. *International Journal of Information Management*. 34(1):1–13.

Massey, A. P., Montoya-Weiss, M., Hung, C., and Ramesh, V. (2001). Cultural Perceptions of Task-Technology Fit. *Communications of the ACM*. 44(12):83.

Mathai, N., Shiratuddin, M. F., Sohel, F., and Wang, X. (2018). *Consumer perceptions in the adoption of the electronic health records in Australia: A pilot study*.

Mbananga, N., Madale, R., and Becker, P. (2002). *Evaluation of hospital information system in the Northern province in South Africa.* Durban: Health Systems Trust.

Mchunu, N. N. (2012). *Adequacy of healthcare information systems to support data quality in the public healthcare sector, in the Western Cape, South Africa* (Doctoral dissertation, Cape Peninsula University of technology).

McIntyre, D., and Ataguba, J. (2017). *Access to quality healthcare in South Africa: Is the health sector contributing to addressing the inequality challenge*. Parliament of South Africa, 2017.

McLeod, A., and Dolezel, D. (2018). Cyber-analytics: Modeling factors associated with healthcare data breaches. *Decision Support Systems*, 108, 57-68.

Melville, S., and Goddard, W. (1996). Research Methodology, Juta and Company Limited.

Mengesha, G. H., and Garfield, M. J. (2019). A contextualised IT adoption and use model for telemedicine in Ethiopia. *Information Technology for Development*, 25(2), 184-203.

Middleton, B., Bloomrosen, M., Dente, M. A., Hashmat, B., Koppel, R., Overhage, J. M., and Zhang, J. (2013). Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. *Journal of the American Medical Informatics Association,* 20(e1), e2-e8.

Midgley, D. F., and Dowling, G. R. (1978). Innovativeness: The Concept and Its Measurement. *The Journal of Consumer Research*, 4 (4), 229-242.

Miles, M. B., and Huberman, A. M. (2005). *Qualitative data analysis: An expanded sourcebook,* SAGE.

Mills, J. (2014*). JAC – Supplier Profile. Nootroclin - A Fluid Health Information System.*

Mishra, D., Akman, I., and Mishra, A. (2014). Theory of Reasoned Action Application for Green Information Technology. *Computers in Human Behaviour*, 36:29-40.

Mishra, S. (2014). Adoption of M-commerce in India: Applying Theory of Planned Behaviour Model. *Journal of Internet Banking and Commerce*, 19(1): 1-17.

Mlitwa, N. W. (2011). Integration of e-learning systems into academic programmes in modern universities: A South African perspective. TVK e-nnovations.

Moffat, J. (2003). *Complexity Theory and Network Centric Warfare.* Washington: CCRP.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Mohamed, A. H., Tawfik, H., Norton, L., and Al-Jumeily, D. (2011). e-HTAM: A technology acceptance model for electronic health. In *2011 International Conference on Innovations in Information Technology,* IIT 2011. 134–138.

Mohebi, S., Azadbakht, L., Feizi, A., Sharifirad, G., and Kargar, M. (2013). Review the key role of self- efficacy in diabetes care. *Journal of Education and Health Promotion*. 2(1):36.

Momani, A., and Jamous, M. (2017). The Evolution of Technology Acceptance Theories. *International Journal of Contemporary Computer Research* (IJCCR). 1(1):51–58.

Monette, D. R., Sullivan, T. J., DeJong, C. R., and Hilton, T. (2014). *Applied social research: a tool for the human services.* 9th ed. Thousand Oaks, CA: Cengage.

Moore, G. C., and Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research.* 2(3):192–222.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of mixed-methods research,* 1(1), 48-76.

Mostert-Phipps, N. (2013). *Health information technologies for improved continuity of care: a South African perspective* (Doctoral dissertation, Nelson Mandela Metropolitan University).

Mouton, J. (1996). *Understanding social research*. Van Schaik Publishers.

Mouton, J., and Babbie, E. (2001). *The practice of social research*. Cape Town: Wadsworth Publishing Company, 871-890.

Mouton, J., and Marais, H. C. (1996). *Basic concepts in the methodology of the social sciences.* HSRC Press.

Mudaly, T., Moodley, D., Pillay, A., and Seebregts, C. J. (2013, November). Architectural frameworks for developing national health information systems in low and middle-income countries. In *Proceedings of the First International Conference on Enterprise Systems: ES 2013* (pp. 1-9). IEEE.

Murtonen, M. (2005). *Learning of Quantitative methods. University Students' views, motivation, and difficulties in Learning*. University of Turku.

Mustonen-Ollila, E., and Lyytinen, K. (2003). Why organisations adopt information system process innovations: a longitudinal study using Diffusion of Innovation Theory. *Information Systems Journal*, 13(3), 275-297.

Mustonen-Ollola, E., and Lyytinen, K. (2003). Why organizations adopt information system process innovations: a longitudinal study using Diffusion of Innovation theory. *Information Systems Journal*, 13, 275-297.

Myers, D. (2010). *Social Psychology*. New York: McGraw-Hill.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Myers, M. D. (2009). *Qualitative Research in Business and Management*. SAGE Publications. London, UK.

Naicker, V. (2010). *The use of computers among secondary school educators in the Western Cape central metropole*. Unpublished Doctoral dissertation, University of the Western Cape: Cape Town.

Naidoo, S. (2012). The South African national health insurance: A revolution in healthcare delivery! *Journal of Public Health*, 34(1), 149-150.

Nasri, W., and Charfeddine, L. (2012). Factors Affecting Adoption of Internet Banking in Tunisia: An Integration Theory of Acceptance Model and Theory of Planned Behaviour. *Journal of High Technology Management Research*, 23(1):1-14.

National Department of Health. (2011). *District Health Management Information System (DHMIS) Policy.* Pretoria: Government Printers.

National Department of Health. (2015). National health insurance for South Africa. Pretoria: Government Printers.

National Integrated ICT Policy Green Paper. (2014). *Department of Communication*, South Department of Communication.

Negahban, A., and Chung, C.-H. (2014). Discovering determinants of users perception of mobile device functionality fit. *Computers in Human Behaviour*. 35:75–84.

Neuman, L. (2011). *SRM: Qualitative and Quantitative Approaches*. D. Musslewhite and L. Macey, eds.

Neuman, W. L., and Neuman, L. W. (2006). *Workbook for Neumann Social research methods: qualitative and quantitative approaches*. Allyn and Bacon.

Ngek, N. B., and van Aardt Smit, A. (2013). Will promoting more typical SME start-ups increase job creation in South Africa? *African Journal of Business Management,* 7(31), 3043-3051.

Nigeria Federal Ministry of Health. (2013). *Mission and Vision.*

Nisson, C., and Earl, A. (2004). The Theories of Reasoned Action and Planned Behaviour: Examining the Reasoned Action Approach to Prediction and Change of Health Behaviours. *Encyclopedia of Health Psychology.*

Noteboom, C. B., Motorny, S. P., Qureshi, S., and Sarnikar, S. (2014, January). Meaningful use of electronic health records for physician collaboration: A patient-centred healthcare perspective. In *2014 47th Hawaii International Conference on System Sciences* (pp. 656-666). IEEE.

Oates, B. J. (2008). *Researching Information Systems and Computing* (2nd Ed.) London: SAGE Publications Ltd.

Oates, S. (2006). *Introduction to media and politics*. University of Michigan: SAGE.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Odekunle, F. F., Odekunle, R. O., and Shankar, S. (2017). Why sub-Saharan Africa lags in electronic health record adoption and possible strategies to increase its adoption in this region. *International journal of health sciences*, 11(4), 59.

Ogundaini, O. O. (2016). **Adoption and use of electronic healthcare information systems to support clinical care in public hospitals of the Western Cape, South Africa** (Doctoral dissertation, Cape Peninsula University of Technology).

Oh, H., Rizo, C., Enkin, M., and Jadad, A. (2005). What is e-Health (3): a systematic review of published definitions. *Journal of medical internet research*, 7(1), e1.

Olsen, N. V., Sijtsema, S. J., and Hall, G. (2010). Predicting consumers' intention to purchase ready-to-eat meals: The role of moral attitude. *Appetite,* 55, 534-539.

Oludayo, O. O., Sunday, O. O., Mathew, O. A., Justice, O. E., and Xulu, S. S. (2007). *An architectural framework for rural e-healthcare information infrastructure with web service-enabled middleware support.* Proceedings of HELINA, 2007.

Omary, Z., Lupiana, D., Mtenzi, F., and Wu, B. (2010). Analysis of the Challenges Affecting E- healthcare Adoption in Developing Countries: A Case of Tanzania. International *Journal of Information Studies*, 2(1).

Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement,* New York: Basic Books Inc.

Oshlyansky, L., Cairns, P., and Thimbleby, H. (2007). Validating the Unified Theory of Acceptance and Use of Technology (UTAUT) tool cross-culturally. *Proceedings British Computer Society HCI 2007 Conference.* 2(September):83–86.

Otieno, O. C., Liyala, S., Odongo, B. C., and Abeka, S. (2016). Theory of Reasoned Action as an underpinning to technological innovation adoption studies. *World Journal of Computer Application and Technology*, 4(1), 1-7.

Ouheda, S., Hafeez-Baig, A., Chakraborty, S., and Gururajan, R. (2019). Factors influencing the adoption of electronic health records in the Australian environment. In *24th Annual Conference of the Asia Pacific Decision Sciences Institute: Full Papers* (pp. 185-194). APDSI Asia Pacific.

Ouma, S., and Herselman, M.E. (2008). E-Health in Rural Areas: Case of Developing Countries. *International Journal of Biological and Life Sciences*, 4(4), 194-200.

Ovretveit, J., Scott, T., Rundall, T. G., Shortell, S. M., and Brommels, M. (2007). 'Improving quality through effective implementation of information technology in healthcare', *International Journal for Quality in Healthcare/ISQua*, Vol. 19, No. 5, pp. 259–266.

Oye, N. D., Iahad, N. A., and Rahim, N. A. (2014). The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Education and Information Technologies,* 19(1), 251-270.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Oye, N. D., A'Iahad, N., and Ab'Rahim, N. (2014). The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Education and Information Technologies*, 141 19(1): 251–270.

Ozturk, A. B., Nusair, K., Okumus, F., and Hua, N. (2016). The role of utilitarian and hedonic values on users' continued usage intention in a mobile hotel booking environment. *International Journal of Hospitality Management.* 57:106–115.

Palabindala, V., Pamarthy, A., and Jonnalagadda, N. R. (2016). Adoption of electronic health records and barriers. *Journal of Community Hospital Internal Medicine Perspectives,* 6(5), 32643.

Palas, M.J.U., and Bunduchi, R. (2020). "Exploring interpretations of blockchain's value in healthcare: a multi-stakeholder approach", *Information Technology and People*.

Palmquist, D. L., (1993). *The practice of social research. South African Edition*. Cape Town: Oxford University Press.

Pelland, K. D., Baier, R. R., and Gardner, R. L. (2017). 'It is like texting at the dinner table': a qualitative analysis of the impact of electronic health records on patient–physician interaction in hospitals. *BMJ Health and Care Informatics*, 24(2).

Perera, G., Holbrook, A., Thabane, L., Foster, G., and Willison, D. J. (2011). Views on health information sharing and privacy from primary care practices using electronic medical records. *International journal of medical informatics*, 80(2), 94-101.

Petersen, F., Brown, A., Pather, S. and Tucker, W. D. (2019). Challenges for the adoption of ICT for diabetes self-management in South Africa. *The Electronic Journal of Information Systems in Developing Countries.* 86(5):1–14.

Petersen, F., Pather, S., and Tucker, W. D. (2018). User acceptance of ICT for diabetes self-management in the Western Cape, South Africa. In *African Conference of Information Systems and Technology (ACIST).* Cape Town. 1–11.

Polonsky, M. J. (2004). *Ethical Considerations*. Available at http://bit.ly/15IxiE1 [accessed September 8, 2013].

Pope, C., and Mays, N. (2006). *Qualitative methods in health research*. (C. P. Mays, Ed.) Cape Town, Western Cape, South Africa.

Province of the Western Cape. (2010). *Health Information Systems, South Africa.*

Rasimah, C., Ahmad, A., and Zaman, H. (2011). Evaluation of user acceptance of mixed reality technology. *Australasian Journal of Educational Technology*, 27(8), 1369-1387.

Rathert, C., Mittler, J. N., Banerjee, S., and McDaniel, J. (2017). Patient-centred communication in the era of electronic health records: What does the evidence say? *Patient education and counselling*, 100(1), 50-64.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Reichertz, P. L. (2006). Hospital information systems - past, present, future. *International journal of medical informatics*, 75(3-4): 282–99.

Reid Jr, M. L. (2016). *Adoption of electronic health record systems within primary care practices* (Doctoral dissertation, Walden University).

Robinson, L. (2009). *A summary of diffusion of innovation.*

Rogers, E. M. (1983). *Diffusion of innovations*. New York: Free Press.

Rogers, E. M. (1995). *Diffusion of Innovations*. 4th ed., New York: The Free Press.

Rogers, E.M. (2003). *Diffusion of innovations*. 5th edition. New York: The Free Press.

Rogers, E.M., (2010). *Diffusion of innovations*. Simon and Schuster.

Ruxwana, N. L., Herselman, M. E., and Conradie, D. P. (2010). ICT applications as e-Health solutions in rural healthcare in the Eastern Cape Province of South Africa. *Health information management journal*, 39(1), 17-29.

Sadoughi, F., Nasiri, S., and Ahmadi, H. (2018). The impact of health information exchange on healthcare quality and cost-effectiveness: A systematic literature review. *Computer methods and programs in biomedicine*, 161, 209-232.

Safi, S., Thiessen, T., and Schmailzl, K. J. (2018). Acceptance and resistance of new digital technologies in medicine in medicine: qualitative study. *JMIR Research Protocols,* 7(12).

Salameh, B., Eddy, L. L., Batran, A., Hijaz, A., and Jaser, S. (2019). Nurses' attitudes towards the use of an electronic health information system in a developing country. *SAGE Open Nursing*, 5, 2377960819843711.

Sale, J. E., Lohfeld, L. H., and Brazil, K. (2002). Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. *Quality and quantity*, 36(1), 43-53.

Samhan, B., and Joshi, K.D. (2017). "Understanding electronic health records resistance: a revealed causal mapping approach", *International Journal of Electronic Healthcare,* Vol. 9 Nos 2/3, pp. 100-128.

Saunders, M., Lewis, P., and Thornhill, A. (2003). *Research Method for Business Students,* 3rd edition. New York: Prentice Hall.

Saunders, M., Lewis, P., and Thornhill, A. (2009). *Research methods for business students.* Pearson education.

Schaper, L. K., and Pervan, G. P. (2007). ICT and OTs: A Model of Information and Communication Technology Acceptance and Utilisation by Occupational Therapists. *International Journal of Medical Informatics*, 7(6):212-221.

Schikofsky, J., Dannewald, T., and Kowald, M. (2020). Exploring motivational mechanisms behind the intention to adopt mobility as a service (MaaS): Insights from Germany. Transportation Research Part A: *Policy and Practice*, 131, 296-312.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Schnell, M. W., and Heinritz, C. (2006). *Forschungsethik: ein Grundlagen-und Arbeitsbuch mit Beispielen aus der Gesundheits-und Pflegewissenschaft*. Huber.

Scott, V. E. (2015). *A health system perspective on factors influencing the use of health information for decision-making in a district health system*.

Sebetci, O. (2018). Enhancing end-user satisfaction through technology compatibility: an assessment on health information system. *Health policy and Technology*, 7(3), 265-274.

Shank, G. D. (2006). *Qualitative research a personal skills approach*. New Jersey: Pearson.

Sharma, M., and Joshi, S. (2020), "Digital supplier selection reinforcing supply chain quality management systems to enhance firm's performance", *The TQM Journal.*

Sharma, M., and Joshi, S. (2021). Barriers to blockchain adoption in healthcare industry: an Indian perspective. *Journal of Global Operations and Strategic Sourcing*.

Sharma, R., and Kshetri, N. (2020). "Digital healthcare: historical development, applications, and future research directions", *International Journal of Information Management*, Vol. 53, p. 102105.

Shiferaw, K. B., Mengiste, S. A., Gullslett, M. K., Zeleke, A. A., Tilahun, B., Tebeje, T., and Mehari, E. A. (2021). Healthcare providers' acceptance of telemedicine and preference of modalities during COVID-19 pandemics in a low-resource setting: An extended UTAUT model. *Plos one*, 16(4), e0250220.

Silow-Carroll, S., Edwards, J. N., and Rodin, D. (2012). Using electronic health records to improve quality and efficiency: the experiences of leading hospitals. *Issue Brief* (Commonw Fund), 17(1), 40.

Sinsky, C., Colligan, L., Li, L., Prgomet, M., Reynolds, S., Goeders, L., and Blike, G. (2016). Allocation of physician time in ambulatory practice: a time and motion study in 4 specialties. *Annals of internal medicine*, 165(11), 753-760.

Sittig, D. F., and Singh, H. (2012). Rights and responsibilities of users of electronic health records. *CMAJ*, 184(13), 1479-1483.

Skiadas, C. H., and Skiadas, C. (2011). Innovation diffusion modelling: the deterministic, stochastic, and chaotic case. *Nonlinear dynamics, psychology, and life sciences,* 15(2), 285-303.

Sniehotta, F. F., Scholz, U., and Schwarzer, R. (2005). Bridging the intention–behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology and Health*, 20(2), 143-160.

Statistics South Africa and Lehohla, P. (2009). *South African Statistical Quality Assessment Framework (SASQAF).* Statistics South Africa.

Straub, D., Keil, M., and Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information and Management*. 33(1):1–11.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Straub, E. T. (2009). Understanding Technology Adoption: Theory and Future Directions for Informal Learning. *Review of Educational Research*. 79(2):625–649.

Struwig, F. W., and Stead¸ G. B. (2007). *Planning, designing and reporting research (*4th ed.). (A. Nattrass, Ed.) Cape Town, Western Cape, South Africa: Maskew Miller Longman.

Sun, Y., Wang, N., Guo, X., and Peng, Z. 2013. Understanding the acceptance of mobile health services: A comparison and integration of alternative model. *Journal of Electronic Commerce Research.* 14(2):183–201.

Surbhi, S. (2015). *Differences between developed countries and developing counties.* Available at: http://keydifferences.com/ (accessed: 11 September 2016).

Surendran, P. (2012). 'Technology acceptance model: A survey of literature', *International Journal of Business and Social Research*, 2, 175–178.

Susilo, A., and Kaufman, D. (2014). Proposing a Comprehensive Meta-Model for Technology Acceptance. *International Journal on Recent and Innovation Trends in Computing and Communication*, 2(11):3454-3472.

Sutton, S. (1998). Predicting and explaining intentions and behaviour: How well are we doing? *Journal of applied social psychology,* 28(15), 1317-1338.

Szajna, B. (1996). Empirical evaluation of the revised Technology Acceptance Model. *Management science*, 42(1), 85-92.

Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing*. 22:960–967.

Tandon, A., Dhir, A., Islam, N., and Mäntymäki, M. (2020). "Blockchain in healthcare: a systematic literature review, synthesizing framework and future research agenda", *Computers in Industry*, Vol. 122, p. 103290.

Tarutė, A., and Gatautis, R. (2014). ICT impact on SMEs performance. *Procedia - Social and Behavioural Sciences*, 110:1218-1225.

Tashakkori, A., and Teddlie, C. (2003). Issues and dilemmas in teaching research methods courses in social and behavioural sciences: US perspective. *International Journal of Social Research Methodology*, 6(1), 61-77.

Taylor, S., and Todd, P. (1995). Assessing IT Usage: The Role of Prior Experience. *MIS Quarterly*, 19 (4), 561-570.

Taylor, S., and Todd, P. (1995). Understanding Information Technology Usage: a Test of Competing Models. *The Journal of Information Systems Research*, 6(2), 144–176.

Teichler, U. (2006). Changing Structures of the Higher Education Systems: The Increasing Complexity of Underlying Forces. *Higher Education Policy*, 19, 447–461.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Terre Blanche, M., Durrheim, K., and Painter, D. (2006). *Research in practice: applied methods for the social sciences.* 2nd ed. Cape Town: University of Cape Town Press.

Thompson, R. L., Higgins, C. A., and Howell, J. M. (1991). Personal computing: Towards a conceptual model of utilisation. *MIS quarterly*, 125-143.

Tierney, W. M., Rotich, J. K., Smith, F. E., Bii, J., Einterz, R. M., and Hannan, T. J. (2002). Crossing the digital divide: implementing an electronic medical record system in a rural Kenyan health centre to support clinical care and research. *Proc AMIA Symp,* 792-5.

Todaro, P. M., and Smith, C. (2006). *Economic development.* New Delhi: Dorling Kindersley.

Triandis, H. C. (1977). *Interpersonal Behaviour*, Brooke/ Cole, Monterey, CA.

Tswane, S. (2012). *Indigenous knowledge and caregivers' use of data elements in home-based healthcare* (Doctoral dissertation, Cape Peninsula University of Technology).

Tubaishat, A. (2018). Perceived usefulness and perceived ease of use of electronic health records among nurses: application of Technology Acceptance Model. *Informatics for Health and Social Care,* 43(4), 379-389.

Tung, F. C., and Chang, S. C. (2008). Nursing students' behavioural intention to use online courses: A questionnaire survey. *International journal of nursing studies*, 45(9), 1299-1309.

Uddin, M.N., and Hamiduzzaman, M. (2009). The Philosophy of Science in Social Research. *The Journal of International Social Research,* 2(6): 131–132.

Umble, E. J., Haft, R. R., and Umble, M. M. (2002). "Enterprise Resource Planning: Implementation Procedures and Critical Success Factors", *European Journal of Operational Research,* vol 146, pp. 241–257.

Urumsah, D. (2015). Factors Influencing Consumers to Use e-services in Indonesian Airline Companies, In Urumsah, D. (Ed.). E-services Adoption: Processes by Firms in Developing Nations (*Advances in Business Marketing and Purchasing*, Volume 23B). Emerald Group Publishing Limited. 5-10.

Vallerand, R. J. (1997). Towards a hierarchical model of intrinsic and extrinsic motivation. *Advances in experimental social psychology*, 29, 271-360.

Van Hoeven, L. R., De Bruijne, M. C., Kemper, P. F., Koopman, M. M., Rondeel, J. M., Leyte, A., and Roes, K. C. (2017). Validation of multisource electronic health record data: an application to blood transfusion data. *BMC medical informatics and decision-making,* 17(1), 107.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Venancio, S. M. (2005). *Building awareness and supporting African universities in ICT management*. University of Eduardo Mondlane, Maputo.

Venkatesh, V. (1999). Creation of favourable user perceptions: Exploring the role of intrinsic motivation. *MIS quarterly*, 239-260.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the Technology Acceptance Model. *Information systems research,* 11(4), 342-365.

Venkatesh, V. (2002). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emostion into the Technology Acceptance Model. *Information Systems Research,* 11 (4), 342- 365.

Venkatesh, V.; Brown, S., and Bala, H. (2013). Bridging the Qualitative–Quantitative Divide: Guidelines for Conducting Mixed-Methods Research in Information Systems. *MIS Quarterly,* 37(1), 21-54.

Venkatesh, V., and Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision sciences*, 27(3), 451-481.

Venkatesh, V., and Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management science,* 46(2), 186-204.

Venkatesh, V., Davis, F. D., and Morris, M. G. (2007). Dead or alive? The development, trajectory, and future of technology adoption research. *Journal of the Association for Information Systems,* 8(4), 267-286.

Venkatesh, V., and Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behaviour. *MIS quarterly*, 115-139.

Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003). User acceptance of information technology: Towards a unified view. *MIS quarterly*, 425-478.

Venkatesh, V., and Speier, C. (1999). The hidden minefields in the adoption of sales force. *Organisational Behaviour and Human Decision Processes*, 79, pp. 1-28.

Venkatesh, V., Speier, C., and Morris, M. G. (2002). User acceptance enablers in individual decision-making about technology: Towards an integrated model. *Decision sciences*, 33(2), 297-316.

Venkatesh, V., Thong, J., and Xu, X., (2012). Consumer acceptance and user of information technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, 36(1), 157-178.

Venkatesh, V., Thong, J. Y. L., and Xu, X. (2016). Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead. *Journal of the Association for Information Systems*. 17(5):328–376.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Vishwanath, A., and Goldhaber, G. M. (2003). An examination of the factors contributing to adoption decisions among late-diffused technology products. *New media and society*, 4, 547–572.

Vitari, C., and Ologeanu-Taddei, R. (2018). The intention to use an electronic health record and its antecedents among three different categories of clinical staff. *BMC health services research,* 18(1), 194.

Voce, A. (2004). *Qualitative Research Module. Introduction to research paradigms.*

Wallis, A. (2012). Survey explores nurses' use of e-Health tools. *Nursing Management,* 18(10).

Walsham, G. (2006). Doing interpretive research. *European journal of information systems*, 15(3), 320-330.

Weber, R. P. (1990). *Basic content analysis* (No. 49). SAGE.

Wejnert, B. (2002). Integrating Models of Diffusion of Innovations: A Conceptual Framework. *Annual review of socialogy*, 28, 297-326.

Welman, J. C., and Kruger S. J. (2005). Research methodology for the business and administrative sciences. 2nd ed. Oxford: University Press.

Welman, Kruger, S. J., and Mitchell, B. (2005). *Research Methodology*, Oxford University Press, Southern Africa (Pty) Ltd, Cape Town.

Wentzer, H. S., and Bygholm, A. (2013). Narratives of empowerment and compliance: studies of communication in online patient support groups. *International journal of medical informatics,* 82(12), e386-e394.

Werner, P. E. R. L. A. (2004). Reasoned action and planned behaviour. *Middle range theories: Application to nursing research,* 125-147.

Western Cape Government. (2016). *New Patient Administrative (AR) and Billing system at Prince Albert Hospital.*

WHO (2019). *"Health technology assessment – what is a health technology?"* Retrieved August 02, 2019, from WHO, available at: www.who.int/health-technology-assessment/about/ healthtechnology/en/ (accessed 25 October 2020).

Wicker, A. W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioural responses to attitude objects. *Journal of Social issues*, 25(4), 41-78.

Williams, M., Rana, N., Dwivedi, Y., and Lal, B. (2011). *Is UTAUT really used or just cited for the sake of it? A systematic review of citations of UTAUT's originating article.*

Williams, P. J. (2007). Valid knowledge: the economy and the academy. *Higher Education,* 54, 511–523.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Woods, S. S., Schwartz, E., Tuepker, A., Press, N. A., Nazi, K. M., Turvey, C. L., and Nichol, W. P. (2013). Patient experiences with full electronic access to health records and clinical notes through the My HealtheVet Personal Health Record Pilot: qualitative study. *Journal of medical internet research*, 15(3), e65.

Workman, M. (2005). Expert decision support system use, disuse, and misuse: a study using the Theory of Planned Behaviour. *Computers in Human Behaviour*, 21, 211-231.

World Health Organization. (2019). *World health statistics overview 2019: monitoring health for the SDGs, sustainable development goals* (No. WHO/DAD/2019.1). World Health Organization.

Wright, G., O'Mahony, D., and Cilliers, L. (2017). Electronic health information systems for public healthcare in South Africa: a review of current operational systems. *Journal of Health Informatics in Africa,* 4(1).

Yanamadala, S., Morrison, D., Curtin, C., McDonald, K., and Hernandez-Boussard, T. (2016). Electronic health records and quality of care: an observational study modeling impact on mortality, readmissions, and complications. *Medicine,* 95(19).

Young, A. S., Sullivan, G., Burnam, M. A., and Brook, R. H. (1998). Measuring the quality of outpatient treatment for schizophrenia. *Archives of General Psychiatry*, 55(7), 611-617.

Yousafzai, S. Y., Foxall, G. R., and Pallister, J. G. (2007). Technology Acceptance: A Meta-Analysis of the TAM: Part 1. *Journal of Modelling in Management* (2) 3, pp. 251–280.

Yusif, S., Hafeez-Baig, A., and Soar, J. (2020). "An exploratory study of the readiness of public healthcare facilities in developing countries to adopt health information technology (HIT)/e-Health: the case of Ghana", *Journal of Healthcare Informatics Research,* pp. 1-26.

Zayyad, M. A., and Toycan, M. (2018). Factors affecting sustainable adoption of e-health technology in developing countries: an exploratory survey of Nigerian hospitals from the perspective of healthcare professionals. *PeerJ*, 6, e4436.

Zhang, K. (2018). Theory of Planned Behaviour: Origins, development and future direction. *International Journal of Humanities and Social Science Invention*, 7(5), 76-83.

Zhang, X., Yu, P., Yan, J., and Spil, T. A. (2015). Using diffusion of innovation theory to understand the factors impacting patient acceptance and use of consumer e-health innovations: a case study in a primary care clinic. *BMC health services research,* 15(1), 1-15.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Zikmund, W. G., Babin, B. J., Carr, J. C., and Griffin, M. (2010). *Business Research Methods*, South Western. Cengage Learning.

Zimri, I. S. (2017). *The Complexities and Possibilities of Health Data Utilisation in the West Coast District.*

http://etd.uwc.ac.za/

LIST OF APPENDICES:

Appendix 1: Ethics approval certificate from UWC.

OFFICE OF THE DIRECTOR: RESEARCH
RESEARCH AND INNOVATION DIVISION

Private Bag X17, Bellville 7535
South Africa
T: +27 21 959 4111/2948
F: +27 21 959 3170
E: research-ethics@uwc.ac.za
www.uwc.ac.za

11 February 2019

Mr M Ntwenkwezi
Information Systems
Faculty of Economic and Management Science

Ethics Reference Number: BM18/8/19

Project Title: Primary Healthcare Information Systems (PHCIS).

Approval Period: 6 February 2019 – 6 February 2020

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report in good time for annual renewal.

The Committee must be informed of any serious adverse event and or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

UNIVERSITY of the WESTERN CAPE

BMREC REGISTRATION NUMBER -130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE

http://etd.uwc.ac.za/

Appendix 2: Approval letter to conduct interviews at Michael Mampongwana CDC

Western Cape Government
Health

Health Impact Assessment
Health Research sub-directorate
HealthResearch@westerncape.gov.za
tel: +27 21 483 0866; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_201902_017
ENQUIRIES: Dr Sabela Petros

University of Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mr Masibonge Nkwenkwezi

Re: **Primary Healthcare Information Systems (PHCIS).**

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following person to assst you with any further enquiries in accessing the following sites:

Michael Mapongwana CDC	**Dr Germaine Fouché**	**021 361 3353**

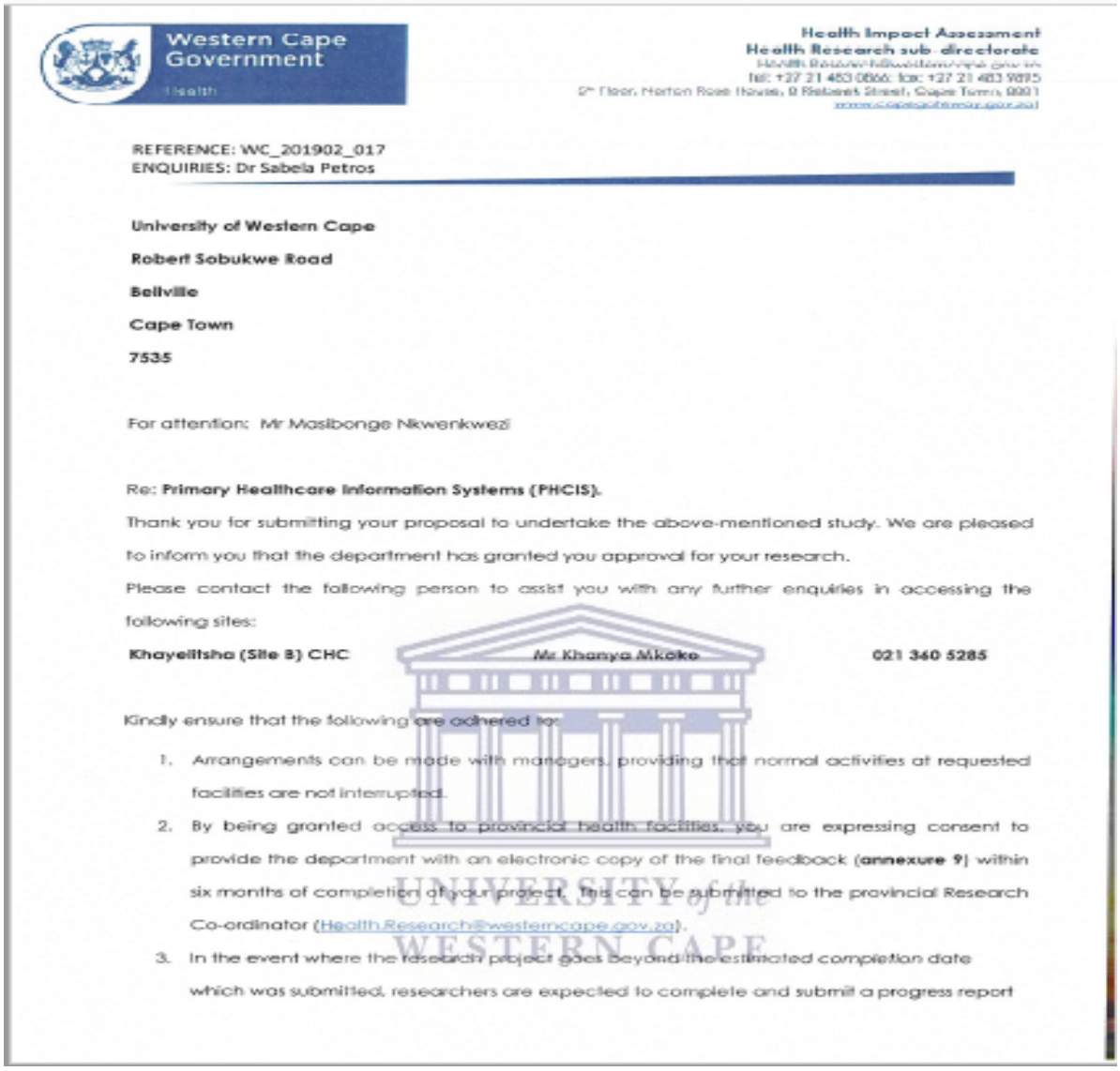
Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities of requested facilities are not interrupted.
2. By being granted access to provincial health facilities, you are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of your project. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the estimated completion date which was submitted, researchers are expected to complete and submit a progress report

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 3: Approval letter to conduct interviews at Khayelitsha Site B CHC



Western Cape Government
Health

Health Impact Assessment
Health Research sub-directorate
Health.Research@westerncape.gov.za
Tel: +27 21 483 0866; Fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_201902_017
ENQUIRIES: Dr Sabela Petros

University of Western Cape
Robert Sobukwe Road
Bellville
Cape Town
7535

For attention: Mr Masibonge Nkwenkwezi

Re: **Primary Healthcare Information Systems (PHCIS).**

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following person to assist you with any further enquiries in accessing the following sites:

Khayelitsha (Site B) CHC	***Ms Khanya Mkoko***	**021 360 5285**

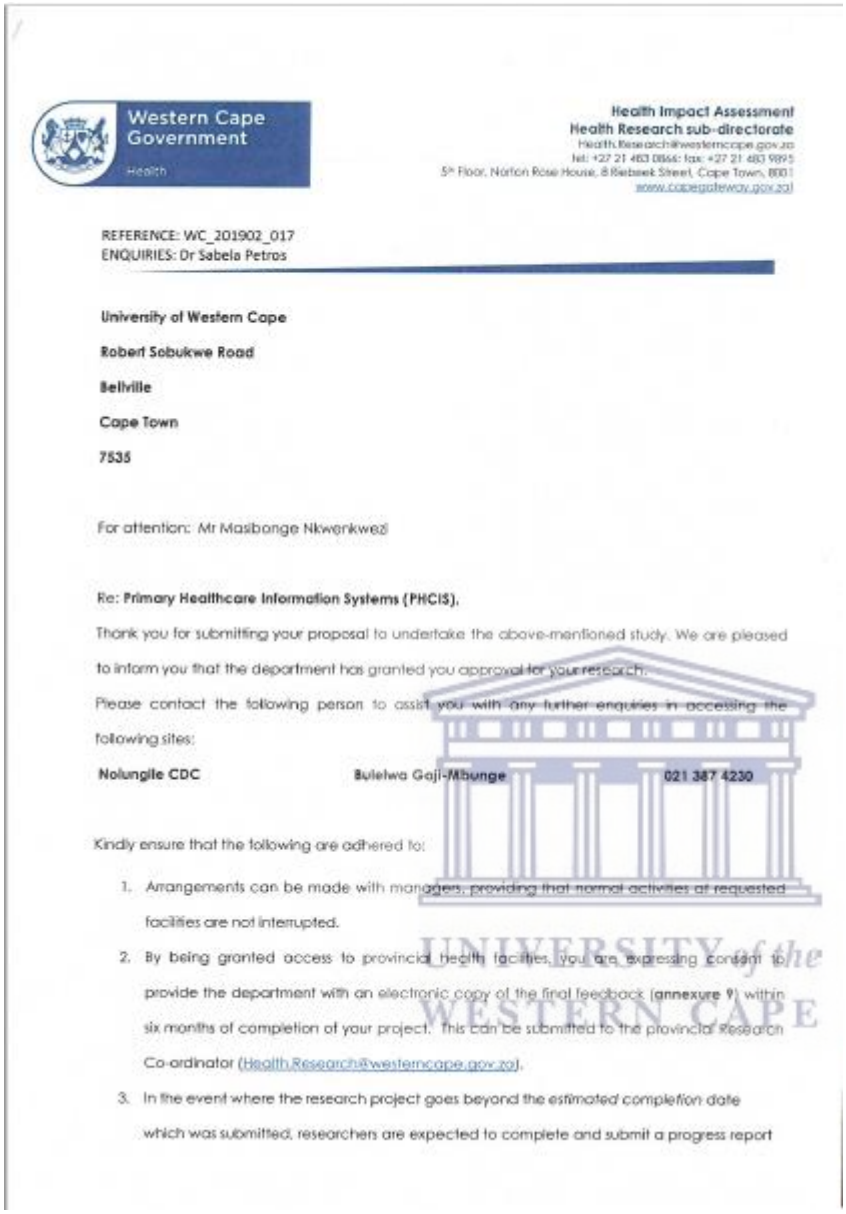
Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. By being granted access to provincial health facilities, you are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of your project. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the estimated completion date which was submitted, researchers are expected to complete and submit a progress report

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 4: Approval letter to conduct interviews at Nolungile CDC



Western Cape Government
Health

Health Impact Assessment
Health Research sub-directorate
Health.Research@westerncape.gov.za
tel: +27 21 483 0866; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: WC_201902_017
ENQUIRIES: Dr Sabela Petros

University of Western Cape
Robert Sobukwe Road
Bellville
Cape Town
7535

For attention: Mr Masibonge Nkwenkwezi

Re: **Primary Healthcare Information Systems (PHCIS).**

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following person to assist you with any further enquiries in accessing the following sites:

Nolungile CDC	**Bulelwa Gaji-Mbunge**	**021 387 4230**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. By being granted access to provincial health facilities, you are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of your project. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion date* which was submitted, researchers are expected to complete and submit a progress report

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

(**Annexure 8**) to the provincial Research Co-ordinator

(Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely

DR M MOODLEY

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 14-03-2014

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 5: Pilot feedback from Michael Mapongwana CHC

Pilot study Feedback:

Machael Mapongwana CHC:

- My participant was Information clerk of the facility. You have too many questions, trim down your questions. You are repeating questions sometimes. Work on you wording of questions.
- Your question are relevant. Interviews disrupt the work flow. The interview took 25 minutes (there we 5 heading according to TAM model and under each heading there is about 10 questions, so in total I had 50 questions. The participants was very elaborative in answering questions.
- The participants was bit uncomfortable with recording device, the researcher explained to the participants and he was "OK".
- The researcher almost forgot to use the recording devise.
- The research did not have time to transcribe during the pilot.
- The researcher skipped other questions, worried about the take it will take to finish the pilot study especial in the "Perceived usefulness section of TAM model, but managed to ask most of the questions in other contrasts of the TAM model.
- Also the researcher was rushing so that that the pilot interview does not take long, as the participants already complaint about the number of questions that will be asked.
- The participant used English and IsiXhosa when responding to questions and the researcher did the same when probing the participant to ensure that he understand the questions being asked.
- As a result of that the researcher was unequivocal in asking research question because of the pressure and in some question the researcher was biting the tongue, especial under the heading "Perceived usefulness" after that the researcher was comfortable.
- The following question were not asked to the participant and the researcher thinks that these are very important questions to ask the participant.
  - What is the best thing about using PHCIS?
  - How have system failures experiences affected your work?
  - What, if any are the best features of PHCIS?
  - What, if any are the worst features of PHCIS?
  - How, could it be made better, and why?
  - How often does PHCIS becomes down?
  - What is down time procedure?

Environment:

- Difficult to meet and find people to assist you even if you made an appointment.
- During the interview phones rings and the participants has to take it.
- Facility staff goes in and out to make Coffee and collect papers.
- The research from time to take had to pause the interview while the hospital staff in the interview room to make tea and collect documents.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 6: Pilot feedback from Nolungile CDC

Nolungile CHC:

- 12H40 I arrived at Nolungile Clinic.
- My participant was Information Clerk at ARV unit.
- I went to 3 rooms looking for the participant I had appointment with.
- One of the staffs assisted me in calling her, she said she is coming quick, I waited for about 20 minutes. finally, she came and apologized, bear in mind I did not have appointment with her, I requested her since the facility of Site B was in meeting, fortunately she squeezed me in, hence i did understand when she was coming in late.
- While I was waiting for her to come in I took the opportunity to use the input I got from Michael M to rectify my questions, to reword my sentences, to remove the duplicated questions.
- As a result, my question were more clear than before and the participant was able to answer without further explanation.
- She mentioned that my questions were relevant, we straight to the point, needed no more clarity.
- She also complained about the number of questions a had and suggested that I should cut a little bit.
- Our pilot interview took 27 minutes, slightly more than Michael M, because the participant was more knowledgeable PHCIS about the system, and she mentioned that the system was piloted to them

Environment:

- The room where I was piloting my questions had printing machine, which was printing the whole time I was there, of which I did not have a problem with that.
- The phone was also wringing, facility staff we coming in out of the room.
- In the room there was also a lady was working on a computer printing some staff, she was familiar with the system under investigation.
- Sometimes she would answer some question that the participants could and elaborate more in some.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 7: Pilot feedback from Khayelitsha Site B CHC

Khayelitsha Site B CHC:

I arrived at the facility, at about 11H10, the facility manager whom I had appointment with was in a meeting. I decided to go to Nolungile CHC for the time being the manager is in the meeting and I left past 12H00.

My participant was Head of patient registration staff.

My laptop battery was running out, I had to ask the participant to remove some of his plugs to accommodate me, of which he was ok with that.

What I have noticed the participants was also more knowledgeable with the system and a supper user and supervisor of the people who are using the system.

What I also notice is that I would ask one question, he would answer 10 question before I even get to them.

So, I had to be very careful to ask what was already cover, as he answers are broad and touch base on almost everything.

Because of his knowledge he was also making recommendations as to how the system should work, he has a technology awareness.

Another thing to note the participant was speaking bit soft with deep voice, so I had to make sure that move the recorder (Phone) close to him.

He was also learning backward and forward as he was speaking, so that could affect the sound of my recording.

We spent 30 minutes in his interview, he also wanted to show me some of the things he was referring to, due to time factor we could not.

What I notice also my questions were not structure, because they was he answer, he answer according to previous question, so I had to explain sometime this question is not related to the previous question.

Environment:

Phones were ringing, staff coming in and out.

My laptop frazed for 5 minutes.

I did not have print out for my question and I think I almost lost the opportunity to conduct pilot interview because of that, but that is the lesson.

When staff came in and out I had to pause the recorder and resume again, and I had to consistently check it is recording or not.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 8: Example of interview questions

Research Interview:

Introduction:

Hi, my name is Masibonge Emmanuel Nkwenkwezi, I am a student at the University of the Western Cape. I am doing my Master's degree in Information Management. The purpose of my study is to assess the factors that will facilitate an increase in **Primary Healthcare Information System** (PHCIS) **adoption** and **continued use** by public health healthcare personnel in the Khayelitsha sub-district.

Pre-interview question to the participant:

Job Title/profession:

Reception		**Admin Clerk**	**X**	Pharmacy		Head of reception	

Race:

African	**X**	Indian		Coloured		White	

Age

18-29		**30-49**	**X**	50-64	

UNIVERSITY of the WESTERN CAPE

Gender:

Male		**Female**	**X**

Education Level:

High school	**X**	College		University	

Computer Level

Basic		**Intermediate**	**X**	Advance	

Years of experience:

0-5		**6-10**	**X**	11-15	

Interview Questions: Questions and transcription

Usefulness:	

http://etd.uwc.ac.za/

	To what extent PHCIS is used in facility? According to my knowledge is that all reception that are supposed to use PHCIS.
	What else is used in conjunction with PHCIS? There are other forms of information that are not on PHCIS, like tally sheet, prescriptions that helps PHCIS because we use these tally sheets to capture on PHCIS.
	What is the best thing about PHCIS? User-friendly, save times, because you have to print your stickers instead of writing down everything.
	Does PHCIS supersede the paper-based system? PHCIS is more useful, I mean life would be easy if we could go on the computer and get everything there.
	What is the Common failure that hinders your work in PHCIS?
	In terms productivity, how does the PHCIS help you? In a way yes, because our stats come from there, whatever we are capturing is used as the stats at the end of the day that is where you figure out where more help is needed.
	How is the speed of PHCIS? Yhoo, the are days it is very slow, I think when there is a peak hour, when the system is very busy, and everyone is using it at the same like at the morning, could be the congestion, especially in the month end. There are also days where it would be very fast.
	What are the best features and what are the worst features on PHCIS? Best part is capturing because it is user-friendly, it helps to determine the number of patients in your facility.
	Do you have a down-time procedure? We have a temporary folder system when the system goes down, the only problem is stickers, but if we know that the system is going to be offline, we print stickers, if Eskom did not inform us about it, it is a problem, then it means we must write everything manually.
	Is PHCIS useful? PHCIS so far is still the useful one.
Perceived ease of use	
	How user-friendly is it? PHCIS is very easy once you know what is in the system.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

	List challenges? When the system is offline and when the patients are using more names in different facilities … it … because difficult to search that patient, and that creates a room for duplicates. Also our name creates duplicates, for example, Phumza or Pumza.
	How often are staff trained on PHCIS? We only get trained once before we use the system and that is it, any other new inventions that they do, no, I must be honest, we are not notified, we just see new features on the system.
	What version are you on? I do not know.
	When learning to operate PHCIS, does it require a lot of mental effort? It is user-friendly.
	Was PHCIS training adequate for you needs? With me, I was there before we … they first implemented PHCIS, I also train everyone on the system in the facility. I understand it better than others.
	Do you need refresher training on PHCIS? I would appreciate it, because every month or every 5 or 6 months there are new things.
	Do you feel confident about your abilities to use PHCIS? Yes, I do.
	Is the PHCIS user interface clear and easy to use? You see that is the tricky part about PHCIS, I have been using PHCIS for 10 years now, and I am ok with everything on the system, but maybe the new person … the system might tell you something different.
	How is PHCIS' navigation? I will not say navigation is easy, there might be easy way of doing things, but since they are not informing us, I would not know. Maybe I am still doing it the old way.
Attitude towards using:	
	What was your initial reaction when you were told that you were going to use PCHIS? You become scared and fearful, because you do not know what is going to happen.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

	Has it changed as you continue to use it? Yes.
	Are you worried about making errors on the PHCIS? Yes, because if you do duplicates, you have to delete it.
	Is PHCIS use mandatory in your facility? I would not say forced, because if the system is implemented, there is nothing you can do. PHCIS in the only the system we use.
	Do you have any trust issues with PHCIS? I would say 90% trust, there are days the stats do not come out as expected, though I am aware that whatever you put in is going to come out.
	Do you get incentives for using the PHCIS? No.
	Do people who are important to you think that you should or should not use PHCIS? They think we should use it, because it is the only system.
	Does the PHCIS enhance your status in the facility? They think that the system is good.
	Does the PHCIS disrupt your well-established routines? When it first … any change is very disruptive, because at the time, you are not confident enough about the system, and there is that fear that you do not want to press the wrong button.
	Were you involved in the development of PHCIS? Yes, I was involved.
	Do you enjoy using PHCIS? Yes, I do enjoy using PHCIS, I mean it is the only system we have.
	Does PHCIS increase your workload? I would not say that the system increases my workload, I would say absenteeism does, and power failures, but the system did not add more work.
	Does an information culture exist in your facility? Yes, we have one.
	Does PHCIS affect the clinician and patient engagement? No, it does not.
Intention to use.	
	Does the current organisational structure support the use of PHCIS in this facility?

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

	As we are speaking, we do not have computers, network points are functioning, but they are old.
	What are people's perceptions regarding PHCIS? I never heard anyone complaining, I suppose PHCIS is a good system.
	Is there any degree of fear when you are faced with the possibility of using the computer or PHCIS? Not at all.
	Negative or positive? Positive.
	Change management process? No.
	Was a readiness assessment conducted before the system was used? I would say yes.
	What versions are on PHCIS?
Actual usage	
	Do you have sufficient information technology (PC, Scanners, network points, printers)? The only thing I would complain about is printers, scanners, not all computers have scanners, also the computers, we do not have enough. They are 90% working. They do not always have problems, but sometimes.
	Does PHCIS increase your productivity? Yes, it does.
	What functions do you use on PHCIS? Opening up folder, reports, capturing that … we use and the reception use appointments system.
	Are you comfortable about using these functions? Not everybody would be comfortable, but I am comfortable because I have been using the system for a long time.
	Does the PHCIS compromise the privacy and confidentiality of patients? Yes, first of all the password, I would say there is not really privacy, we keep our computers on, because more people can use one computer.
	Do you have dedicated technical support? We do have a help desk, Malibongwe developers, they are at head office Karl Bremer, the response depends. It takes two to three days, sometimes the issue

UNIVERSITY of the
WESTERN CAPE

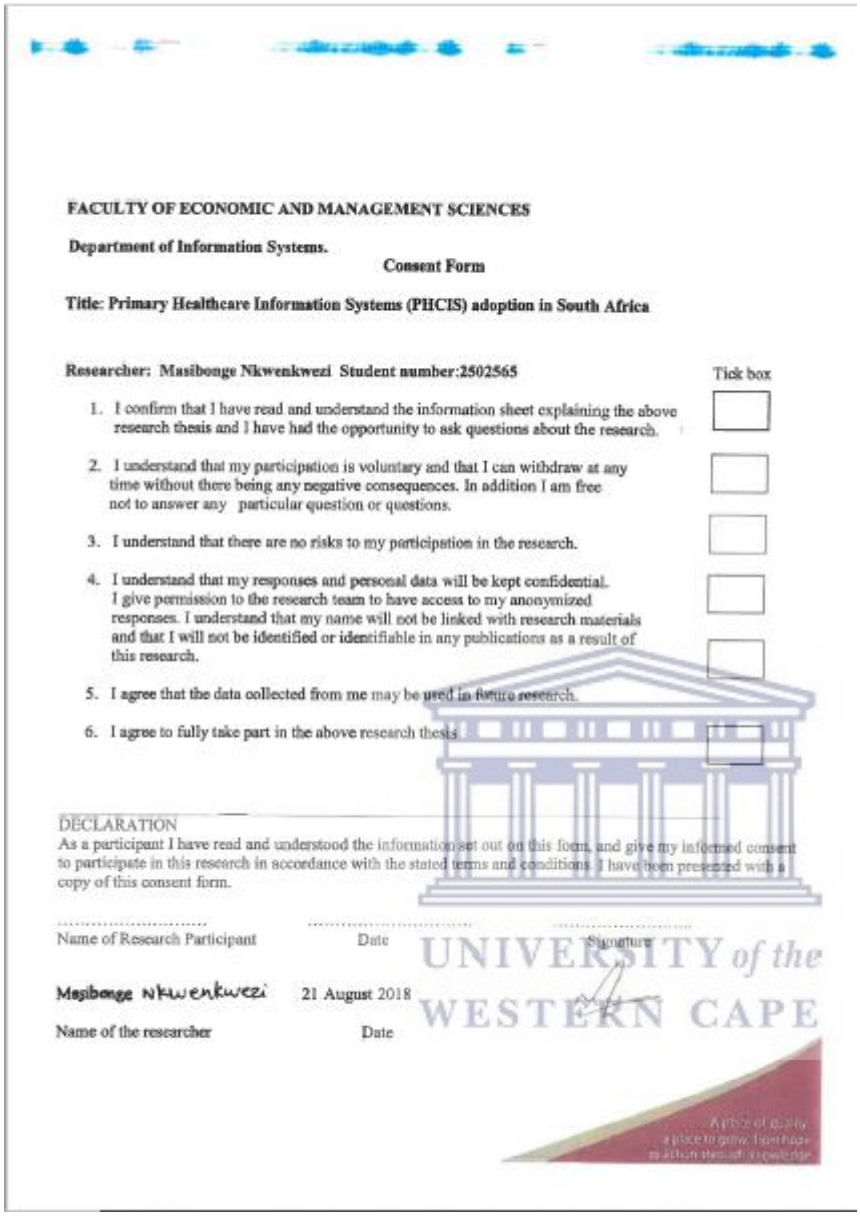
http://etd.uwc.ac.za/

	gets resolved as quick as possible one day. Sometimes the query can take a month to be resolved. Language issue when follow-up with unresolved problems.
	Slow, unreliable, unavailability of a system can cause end-users lose confidence in the technology system. Is that the case with PHCIS? Not the case in this facility.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 9: consent forms



FACULTY OF ECONOMIC AND MANAGEMENT SCIENCES

Department of Information Systems.

Consent Form

Title: Primary Healthcare Information Systems (PHCIS) adoption in South Africa

Researcher: Masibonge Nkwenkwezi Student number:2502565

Tick box

1. I confirm that I have read and understand the information sheet explaining the above research thesis and I have had the opportunity to ask questions about the research. ☐
2. I understand that my participation is voluntary and that I can withdraw at any time without there being any negative consequences. In addition I am free not to answer any particular question or questions. ☐
3. I understand that there are no risks to my participation in the research. ☐
4. I understand that my responses and personal data will be kept confidential. I give permission to the research team to have access to my anonymized responses. I understand that my name will not be linked with research materials and that I will not be identified or identifiable in any publications as a result of this research. ☐
5. I agree that the data collected from me may be used in future research. ☐
6. I agree to fully take part in the above research thesis ☐

DECLARATION

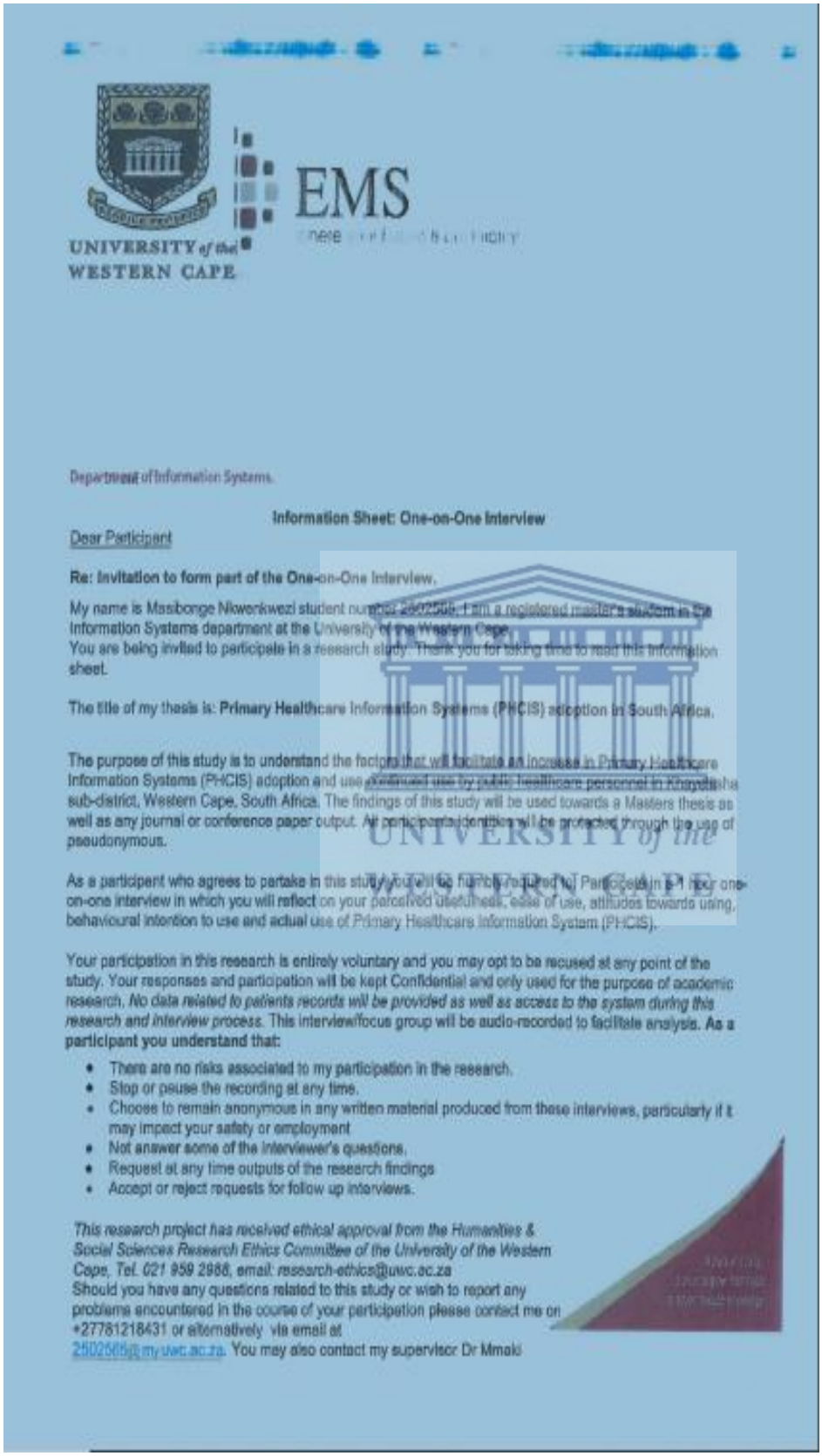
As a participant I have read and understood the information set out on this form, and give my informed consent to participate in this research in accordance with the stated terms and conditions. I have been presented with a copy of this consent form.

Name of Research Participant	Date	Signature
Masibonge Nkwenkwezi	21 August 2018	
Name of the researcher	Date	

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 10: Information Sheet



UNIVERSITY of the WESTERN CAPE

EMS

Department of Information Systems

Information Sheet: One-on-One Interview

Dear Participant

Re: Invitation to form part of the One-on-One Interview.

My name is Masibonge Nkwenkwezi student number 2602505. I am a registered masters student in the Information Systems department at the University of the Western Cape.
You are being invited to participate in a research study. Thank you for taking time to read this information sheet.

The title of my thesis is: **Primary Healthcare Information Systems (PHCIS) adoption in South Africa.**

The purpose of this study is to understand the factors that will facilitate an increase in Primary Healthcare Information Systems (PHCIS) adoption and use (continued use by public healthcare personnel in Khayelitsha sub-district, Western Cape, South Africa. The findings of this study will be used towards a Masters thesis as well as any journal or conference paper output. All participant identities will be protected through the use of pseudonymous.

As a participant who agrees to partake in this study you will be further required to participate in a 1 hour one-on-one interview in which you will reflect on your perceived usefulness, ease of use, attitudes towards using, behavioural intention to use and actual use of Primary Healthcare Information System (PHCIS).

Your participation in this research is entirely voluntary and you may opt to be recused at any point of the study. Your responses and participation will be kept Confidential and only used for the purpose of academic research. *No data related to patients records will be provided as well as access to the system during this research and interview process.* This interview/focus group will be audio-recorded to facilitate analysis. **As a participant you understand that:**

- There are no risks associated to my participation in the research.
- Stop or pause the recording at any time.
- Choose to remain anonymous in any written material produced from these interviews, particularly if it may impact your safety or employment
- Not answer some of the interviewer's questions.
- Request at any time outputs of the research findings
- Accept or reject requests for follow up interviews.

This research project has received ethical approval from the Humanities & Social Sciences Research Ethics Committee of the University of the Western Cape, Tel. 021 959 2988, email: research-ethics@uwc.ac.za
Should you have any questions related to this study or wish to report any problems encountered in the course of your participation please contact me on +27781218431 or alternatively via email at 2602505@myuwc.ac.za. You may also contact my supervisor Dr Mmaki

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 11: Findings by theme

THEME	FINDINGS
Usefulness:	Health facilities are still using both electronic and paper base system. System does not cater for other service areas like Trauma. The trust issues with technology with Primary Healthcare Information System. The system increases their workload when new module or elements are added. The users stated that the system increases their productivity when there are no issues. Not all datasets have automatic data verification functionality. Cable theft, power outages, slowness network during peak time we mentioned. Technical errors such as “error downloading” were experienced by users across facilities. Despite the challenges experience users are more loyal to PHCIS and not willing to start a new system. If user makes mistakes error you cannot delete it, he/she must apply and wait for support guys to delete it, sometimes they take longer.
Ease of use	PHCIS is easy to learn and use. Training is simple and offered twice a year and there is refresher training offered on demand. The Interface and navigation of the PHCIS is more user-friendly. Capturing fields on PHCIS capturer sheet are aligned with the paper-based system. When capturing in HIV module sometimes takes longer to save. Users at times creates a lot of duplicate folders in the system. Users at times cannot locate patient folders. Patient sharing a folder with another patient from another institution. Users sometimes are not notified when there are new features on the system. Users are not involved when new features or modules are developed. Patient using more than one name in different facilities make it difficult to search patient.
Attitude towards usage	Users have no fears using PHCIS. Users were happy when PHCIS was introduced. Users sceptical when PHCIS we integrated to Ekapa system. The scepticism changed as I continued using the integrated system. Worried about interns making errors especially in the OPD area. PHCIS is continuously being changed and improved.

UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za/

Intention to use	People who are important to users think that they should use PHCIS. The existing organisational and infrastructure do support PHCIS. Users do not get incentives for being PHCIS superusers. Users do get managerial support to use the system. Facility Managers are involved and give time to learn about the system.
Actual system use	Scanners, label printers, network points, backups are in good working conditions. Sharing of passwords among the user was prevalent. Quality of stickers when printing, sticker not compatible with the scanner, not giving proper bar code. PC have warranty, PC no longer working are assessed and replaced. During peak hours, the system is slow and after the peak hours then it runs fast and smooth. User were not sure about their PHCIS version, rather speculating. Errors in reports were attributed to human error. Current PHCIS functions are relevant to user's jobs. System down-time increases their workload and delays service delivery. PHCIS has changes users work processes and roles. Confidentiality and privacy of patient is not guaranteed. Tangible results in using PHCIS. PHCIS has technical support. Technical support sometimes takes time to respond to technical challenges, three days is maximum.

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/

Appendix 12: editing certificate

Barbara Wood
Tel: +27 44 873 5145
cell: 082 9022 571
E-mail: woodlandsmedia@gmail.com
8 Suikerbossie Street
Bergsig
George 6529
South Africa

TO WHOM IT MAY CONCERN

Editing Certificate

I, Barbara Wood, hereby confirm that I am a registered professional researcher and editor and have edited the following academic document:

INVESTIGATING FACTORS THAT AFFECT AND INFLUENCE THE LOW ADOPTION AND USE OF PRIMARY HEALTHCARE INFORMATION SYSTEMS (PHCIS) IN THE WESTERN CAPE OF SOUTH AFRICA

BY

MASIBONGE EMMANUEL NKWENKWEZI

Thesis submitted in fulfilment of the requirements for the degree
Master of Commerce (Mcom) in Information Management
in the Faculty of Economic Management Systems
in the Information System Department
at the University of the Western Cape

July 2021

Signed:
Barbara Wood

UNIVERSITY of the
WESTERN CAPE

http://etd.uwc.ac.za/