



**THE READINESS AND PERCEPTIONS OF PUBLIC HEALTH DENTISTS ON
ELECTRONIC HEALTH RECORDS:
CASE OF CAPE TOWN SOUTH AFRICA**

NAME OF CANDIDATE: HEINCA DE VRIES

STUDENT NUMBER: 3167496

SUPERVISOR: DR CAROLIEN VAN DEN BERG

DECEMBER 2020

Declaration

I declare that this thesis, the readiness and perceptions of dentists in the Western Cape public health sector to implement Electronic Health Records in Cape Town, South Africa, is my work. The research has not been submitted for any degree or examination in any other university. Moreover, all the sources I have reviewed or quoted have been indicated and acknowledged.

The researcher has no interests in any corporate entities; therefore, no financial gain or other advantages were derived from researching the respective topic. The research held no position in any entities. The funding of the research was exclusively dependent on the researcher self. The research was conducted for academic exploration in the field of advanced research for writing thesis papers on the master's level.



Heinca de Vries

August 2020



Abstract

This study aimed to understand the readiness and perceptions of Electronic Health Record (EHR) adoption among dentists in the public service of the Western Cape. A qualitative study design was chosen due to a lack of understanding of the phenomena. Additionally, the research sought to identify the factors that would potentially influence readiness and perceptions in order to identify how these factors could potentially influence EHR adoption among dentists.

The emerging themes included effort expectancy, age, years of service, experience, cost (availability of and access to information technology), fear of change (resistance), computer literacy (skills training) and perception of time consumption. The researcher concluded that the sample population were less ready for adoption of EHR and recommended that management and leadership structures should probe the factors that have affected the negative and non-receptive perceptions, as most participants lacked managerial support to their anticipation for poor success of EHR.

Keywords

Electronic Health Records (EHR), adoption of Electronic Health Records (EHR), readiness and perceptions, Electronic Health Records (EHR) for dentists, Electronic Health Records (EHR) in South Africa



Acknowledgements

I want to acknowledge the German Academic Exchange Service (DAAD) for granting me the opportunity to be a part of the third international cohort of Health Information Management (HIM) in collaboration with Hochschule Neu Ulm in Germany and Muhimbili University of Health Sciences. It has been a life-changing experience.

I want to acknowledge my supervisor, Dr van den Berg, for her in-depth contributions and advice during the process of completing this thesis. Dankie dokter.

I want to acknowledge all of my support structures. Firstly, to my support structure at work, thank you for your encouragement and continuous support. Thank you for pushing me to be better when I was remarkably close to giving up and losing hope. Thank you to Miss Taahirah Kozain, my oral hygiene colleague, for keeping the boat afloat during long periods of leave of absence. I acknowledge your hard work and wish to return an act of gratitude when you decide to further your academic career.

Secondly, to Dr Laurentia Fillis and Miss Nomthandzao Juqu, thank you for your endorsement and support without question during this journey. I can never thank you enough.

Thirdly, to my family, related by blood and by choice. Thank you for never doubting my ability to succeed in this endeavour. My ouers, Frederick en Christiaan, dankie vir al julle liefde en ondersteuning en verdraagsaamheid. Abby, J.C., Niki, Anél, Ané en Lila, dankie vir elke gebedjie, elke boodskap van ondersteuning en verdraagsaamheid elke keer wat ek planne kanselleer of nie opdaag nie omdat ek besig is met studies. Ek sou niks hiervan kon doen sonder julle nie.

Lastly, I want to acknowledge my classmates from HIM. Thank you for being part of this lifechanging experience. Special love for Miss Marion Nuebling and Miss Duha Zakariah, for being my sisters throughout the struggles of student life. Through all the laughter, late nights, travels, adventures, assignments due and frustration, we finally made it! We did it, and the pact still stands- meet me in Paje!

Contents

Declaration	2
Abstract.....	3
Keywords.....	3
Acknowledgements	4
Contents	5
CHAPTER 1: INTRODUCTION	10
1.1. Introduction.....	10
1.2. Background	11
1.3. Problem Statement	11
1.4. Research Question	11
1.5. Scope.....	12
1.6. Research Paradigm.....	12
1.7. Research Design	12
1.8. Participants	13
1.9. Research Instruments	13
1.10. Research Data Analysis Process.....	13
1.13. Outline of the Thesis.....	14
CHAPTER 2: LITERATURE REVIEW	16
2.1. Introduction.....	16
2.2. The Evolution of Health Records	16
2.2.1. The 1920s.....	16
2.2.2. The 1960s	17
2.2.3. The 1970s	17
2.2.4. The 1980s and 1990s	17
2.3. Factors that Restrict the Readiness of Electronic Health Record Adoption.....	18
2.3.3. Unified Theory of Acceptance and Use of Technology (UTAUT).....	21

2.4. Benefits of Electronic Health Records	23
2.4.1. Cost and Time	23
2.4.2. Improved Communication	24
2.4.3. Quality Patient Care	24
2.4.4. Data Management.....	24
2.5. Public Healthcare in Developing Countries.....	25
2.6. Current Status of Record-keeping Practices in Public Healthcare (Western Cape, South Africa).....	26
2.6.4. The Guidelines for Record-keeping	28
2.7. Conceptual Model	29
CHAPTER 3: METHODOLOGY	30
3.1. Introduction.....	30
3.2. Research Objectives	30
3.3. Research Paradigm	31
3.4. Research Design and Methodology.....	31
3.5. Study Population and Sampling Defined	32
3.6. Research Instruments Defined	33
3.7. In-depth, Semi-structured Interviews	33
3.8. Data Analysis: Moustakas 1994 combined with Inductive analytic approach.....	33
CHAPTER 4: ANALYSIS	35
4.1. Introduction.....	35
4.2. Analysis Process – Moustakas 1994	35
4.3. Identifying Emerging Themes	36
Table 4: Themes	36
4.4. Theme Description	36
4.4.1. Theme 1: Cost.....	36
4.4.2. Theme 2: Fear of Change (Resistance).....	37



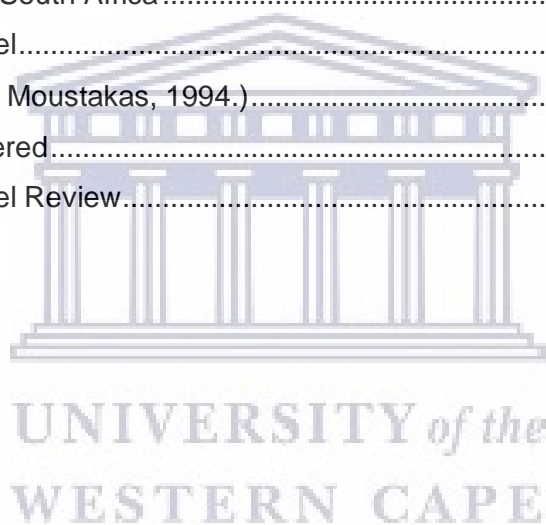
4.4.3. Theme 3: Computer Literacy (Skills Training)	38
4.4.4. Theme 4: Effort Expectancy	39
4.4.5. Theme 5: Age/Years of Service/Experience	40
4.4.6. Theme 6: Perception of time consumption	41
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS	42
5.1. Introduction	42
5.2. The Objective of the Study	42
5.3. The Thought Pathway of How Objectives were Used to Support Main and Sub Research Questions:	43
5.4. Relooking at the Original Conceptual Framework	45
5.5. Recommendations	46
5.5.1. Management and Leadership Structures	46
5.5.2. Resource Distribution	46
5.5.4. Future Research	48
5.6. Limitations	48
5.7. Declaration of Interest	48
5.8. Relevance Statement	48
5.9. Conclusion	49
6. REFERENCE LIST	50
Appendix A	56
Appendix B	58

List of Tables

Table 1: Research question, sub-questions, methodology, and objectives.....	12
Table 2: List of Themes	36
Table 3: Description and linkage of objectives	43
Table 4: Interview QuestionsThe following was the guiding questions to the interviewees: ..	56
Table 5: Participant StatementsStatements of participants	58

List of Figures

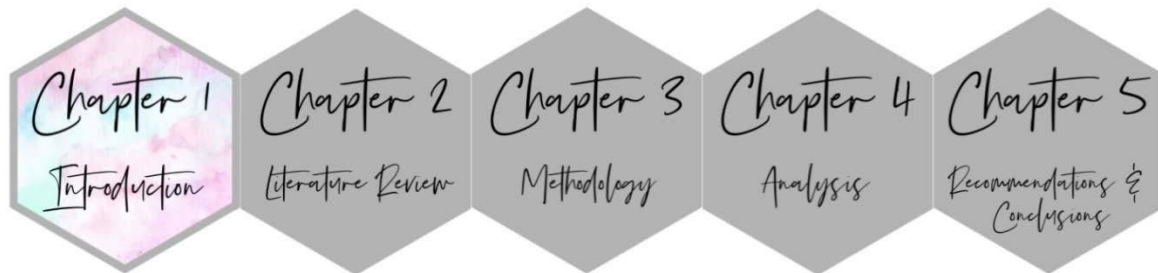
Figure 1: Health Sector of South Africa	27
Figure 2: Conceptual Model.....	29
Figure 3: Epoché (Source: Moustakas, 1994.).....	34
Figure 4: Questions answered.....	43
Figure 5: Conceptual Model Review.....	45



List of Abbreviations

Abbreviation	Definition
CDC	Centres of Disease Control and Prevention
COVID-19	Coronavirus disease 2019
EDR	Electronic Dental Record
EHR	Electronic Health Record
HIS	Health information system
HPCSA	Health Professions Council of South Africa
ICD- 10	International Classification of Diseases
IT	Information Technology
POPI	Protection of Personal Information Act 4 of 2013
PHCIS	Primary Healthcare Information System
RQ	Research question
SA	South Africa
Sinjani	Standard Information Jointly Assembled by Networked Infrastructure
SQ	Sub-question
TAM	Technology acceptance model
TRA	Theory of reasoned action
UTAUT	Unified Theory of acceptance and use of technology
WC	Western cape
WHO	World Health Organisation

CHAPTER 1: INTRODUCTION



1.1. Introduction

The world is progressively moving towards digitisation and incorporating the Internet of Things (IoT) into most aspects of daily living, including healthcare (Tavares, 2018). Patients can now make online appointments and consult remotely with physicians using telemedicine (Yang et al., 2019). One can even be operated on in theatre by having a remote surgeon operating robotics that is powered by Information Technology (IT) (Giovagnoli, Crucitti & Dodig-Crnkovic, 2019). Telemedicine and ICT have brought significant advances even to the current COVID-19 pandemic, where patients can be consulted in quarantine (Hollander & Carr, 2020).

The interconnectivity brought by ICT provides multiple benefits such as improved communication, cost-efficacy, time-saving, improved quality of patient care and better data management. However, it might come at a higher acquisition cost than initially expected (Aceto, Persico & Perscapé, 2020). It is therefore essential to understand the broader return on investment in benefits such as the transformation of workflows and processes. Electronic Health Records (EHR) are beneficiary to patients as well as healthcare workers, organisations, and the entire healthcare system (Kaipio, Kuusisto, Hypponen, Heponiemi & Lääveri, 2020). Patients may benefit from receiving the improved quality of care supported by evidence-based clinical decision-making. Evidence-based supported decision-making can be facilitated by providing a clinician access to a complete medical history that greatly contributes to the continuation of care of a patient. Organizations could benefit greatly from EHR by having access to data that is accurate, readily available and consistent. Aforementioned contributes to the entirety of the health system. Also, according to Hailey *et al.* (2014), it is highly agreeable that the health informatics community can no longer ignore the needs and wants of healthcare professionals for EHR that is tailored and built to their specific needs to support their information management.

EHRs provide a broad, overall, and holistic recorded timeline of a patient focusing on all-inclusive records from all different healthcare services accessed (Choi, 2019). EDRs merely focus on the dental aspect of a patient and therefore, might not be considered a holistic approach to patient care (Aceto, Persico & Perscapé, 2020). Furthermore, it is vital to understand the readiness of clinicians to transition from paper-based recordkeeping to EHRs and what their perceptions are to implement strategies for change management that could facilitate a smoother transition.

1.2. Background

The South African National Health Act of 2003 (Republic of South Africa, 2013) addresses the legality of a citizen's human right to have access to healthcare. The Act further promotes the practice of holistic healthcare and treatment of a patient. Furthermore, the South African Department of Health provided a strategic approach in the Healthcare 2030 document (2013) that guided improvements to holistic healthcare via the adoption of an integrated public healthcare approach. The strategic goals of South African Public Healthcare are in line with holistic healthcare and promotive practices (health promotion and prevention) as recommended by the World Health Organisation (WHO) (Eriksson & Lindström, 2008). Therefore, the researcher found it was more fitting to focus on EHRs that are comprised of multiple integrated health service sources, including Electronic Dental Records (EDR).

1.3. Problem Statement

The benefits of EHR include accurate, readily available and consistent data that reviews patients holistically. Many studies have been conducted to explore the readiness and perceptions of medical clinicians regarding the adoption of EHR (Aceto, Persico & Perscapé, 2020). However, no research was found that explicitly focused on the dental fraternity in South Africa. It is crucial to stay abreast with the progression of EHR adoption in public health and to ensure inclusion of the dental fraternity. This study could potentially contribute to the piloting stages of factors that limit impending changes relating to EHR adoption.

1.4. Research Question

The study was guided by an overall research question and two secondary questions. The overall research question was:

What is the readiness and perception of public health dentists on EHR adoption?

The following sub-questions were included, as indicated in Table 1, to support the answering of the main research question.

Table 1: Research question, sub-questions, methodology, and objectives

Sub- Research Questions	Methodology	Objective
SQ 1: What are the factors that could potentially influence the readiness and perception of EHR adoption?	Literature review	Identify the factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption.
SQ 2: How could the identified factors potentially influence EHR adoption among dentists?	In-depth semi-structured interviews	Understand the identified factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption among dentists in public health in the Western Cape.

1.5. Scope

The study aims to understand the readiness and perceptions of dentists to adopt HER. This study focused on public healthcare facilities around the Southern/Western Substructure of Metro District Health in the Western Cape, with permanently employed dentists. They have not yet implemented EHR for patient record-keeping. The healthcare professionals taking part in this study are full-time employed dentists within the identified district. The following were not included in this study: private healthcare facilities, locum dentists (within the identified facilities) and community service dentists (within the identified facilities).

1.6. Research Paradigm

An interpretivist research paradigm was applied. According to Reeves and Hedberg (2003), researchers who research with an interpretive paradigm believe that reality entails individuals' subjective experiences of the external world as the case in this study. A detailed discussion follows in Chapter 3.

1.7. Research Design

A qualitative design was chosen due to a lack of understanding about the readiness and perceptions of dentists concerning the adoption of EHRs (Flick, 2014). Qualitative research was conducted in a real-life setting in an attempt to find the answers to the research questions. Leedy and Ormrod (2010), suggest the need for further exploration, which is the concept and purpose of qualitative research designs. These methods focus on

understanding human experiences and aspects of meaning, and it is often also referred to as an insider's view or emic perspective (Van der Walt, Brink & Van Rensburg, 2012).

The rationale of the research was not to generalise findings, but rather to understand them in the context of the setting that dentists in the public sector practice dentistry (Liebenberg, Benadé & Ellis, 2018). In nature, phenomenological studies examine human experiences through detailed descriptions from participants. The actions taken in this research approach included horizontalization but was not limited to, bracketing, sensing, analysing, and describing. It is descriptive because no intervention occurred, and the primary purpose was not to examine relationships, but rather to provide a more in-depth understanding of the phenomenon identified as the readiness and perceptions of dentists regarding the adoption of EHRs (Flick, 2014).

1.8. Participants

The method used was purposive sampling (Liebenberg *et al.*, 2018). This type of non-probability sampling was used as it focuses on participants particularly knowledgeable about the research phenomena at hand, which is an advantage to the study. Therefore, the study population comprised of dentists who were exceptionally knowledgeable regarding the current record-keeping practices as well as the ability of their work environments to accommodate potential EHR adoption. The population was selected on the common characteristic that all were full-time dentists employed by the Department of Health Western Cape in the Western substructure.

1.9. Research Instruments

The researcher applied in-depth, semi-structured interviews. A semi-structured interview is a confidential gathering between a participant and a researcher in which the interviewer does not austere follow a formalised list of questions (Galletta, 2013). Instead, the researcher asked more open-ended questions, allowing for a conversation with the interviewee instead of a straightforward question and answer layout (Galletta, 2013). The semistructured interviews allowed for in-depth topic exploration, which provided more abundant data as participants were free to express themselves in a private setting without judgement or fear of creating volatile inter-colleague relationships (Kallio, Pietilä, Johnson & Kangasniemi, 2016).

1.10. Research Data Analysis Process

Moustakas' (1994) guide on qualitative data analysis was used in combination with an

inductive analysis. This method of logical reasoning was applied to develop theories and/or generalisations and to identify themes by critically studying the collected transcribed documents, recordings 4 and other printed and verbal material (Flick, 2014). The analysis included common trends to 'code' commonalities accordingly to interpret the information collected. Further detailed justification for the choice of data analysis will be discussed in Chapter 3.

1.11. Ethics and Confidentiality

The information gathered to compile this study is the work of the researcher. Additionally, acknowledgement is given to work of others and cited accordingly. During the process of completing the research, the researcher adheres to the highest ethical standards. Ethical clearance from the University of the Western Cape, reference number BM 19/6/21, was obtained to conduct the interviews.

No patient interaction occurred during the collection of data. The aim and objectives of the research were presented to participants, and they had a choice to participate and to withdraw at any time without repercussion. A consent letter was signed by each participant, which granted permission for the collected data to be disseminated as specified. The participants' information was not revealed to ensure anonymity and confidentiality. All the important documents were password encrypted using a personal computer which was also password encrypted, and these were kept in a safe place.

Authorised people, such as the supervisor, had accessed documents on request. Intellectual property was respected through thorough referencing, and confidentiality of participants were honoured. Participants' identities were kept private and no identifying traits were reported on. The data collected per voice recorder or additional notes were uploaded into a private vault folder using the researcher's cloud storage and all local copies of these files were deleted on the private device of the researcher. The files stored had no identifying files names and had codes that only the researcher was familiar with. The researcher acknowledges and respects ethical research practices and agreed to adhere to all such prescribed practices.

1.13. Outline of the Thesis

There a Chapter 2 seeks to understand the status of record-keeping practices by reviewing five chapters in this thesis, following this introductory Chapter, which seeks to describe the context for this study. The common barriers that hinder acceptance of the adoption of EHR

and subsequently of the thesis takes the following structure: determine the factors that enhance the readiness and perception for EHR adoption.

Chapter 2 is followed by a review of the adoption of EHR by dentists in public health. Chapter 3 clarifies the research methodology and rationale for strategies used to conduct this study. Chapter 4 describes the analytical findings of the research conducted and the methods used to compile data and draw conclusions. Chapter 5 concludes this thesis with recommendations and the conclusion.



CHAPTER 2: LITERATURE REVIEW



2.1. Introduction

This study explores the readiness and perceptions of dentists regarding the adoption of an EHR system within the public healthcare domain in the Western Cape Province in South Africa.

A review of the literature explored the first research objectives to identify the factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption. Subsequently, a review to determine factors that are pertinent among dentists in the Western Cape will take place. Therefore, the following Chapter will discuss concepts such as the evolution of health records and how the change in record-keeping contributed to the factors that restrict the readiness and perception for EHR adoption, as well as the benefits of EHR adoption. The Chapter will also discuss public healthcare in developing countries, the status of record-keeping practices in public healthcare and the adoption of EHRs by dentists in the Western Cape region. Lastly, the Chapter will illustrate the readiness and perceptions of dentists in implementing an EHR system within the public healthcare domain.

2.2. The Evolution of Health Records

Health records date back to the beginning of healthcare practices and research. The actual date of the origin of a written medical record is unknown. However, it is known that until the 1920s, written records were universally used for patient care and litigation purposes (Evans, 2016). The following timeline will elaborate on how HIM and EHR evolved over the centuries.

2.2.1. The 1920s

The origins of HIM is traced back to the 1920s when medical professionals started using medical records to document details of patient care, complications, and treatments (Brooks, 2015). In 1928, the Association of record librarians of North America (ARLNA), was

established to create a baseline standard for health records. This standard would, of course, change and transition in the years to follow (Flite & Harman, 2013). However, the system is still in use and known as the American Health Information Management Association (AHIMA) (Fenton & Smith, 2019).

2.2.2. The 1960s

Up to the early 1960s, medical records were predominantly paper based (Brooks, 2015). In 1965, after the introduction of medical aid concept funding schemes and structures, the use of standardised, sharable medical records became a large part of health care practices, as stated in the Act of July 30, 1965 in the United States of America (Social Security Amendments of 1965 - "Medicare"). Reimbursement for healthcare services would be determined by the accuracy and completeness of a shared health record. By using IT, Weed (as cited in Jacobs, 2009) could develop the problem-orientated medical record (POMR), which helped to organise the information within a medical record. POMR is the first known system implemented to transform unstructured data into organised forms of usable data to translate into information.

2.2.3. The 1970s

By the early 1970s, innovators had already started developing and improving on ideas for medical record-keeping (Bakker, 2007). During the period, the Health Evaluation through Logical Processing system was developed by 3M, University of Utah and Latter-Day Saints Hospital. The development is known as the first clinical decision support system. In this time, systems such as COSTAR, which means Computer stored Ambulatory Records, and Regenstrief Medical Record System, were also developed and implemented (Brooks, 2015).

By 1975, the use of EHR was already practised for approximately five years (McClanahan, 2012).

2.2.4. The 1980s and 1990s

The 1980s and 1990s brought many innovations and possibilities for the improvement of EHR. By this time, basic EHR systems were affordable enough to be used by even the smallest medical practice. The acquisition cost had been lowered by the continuous innovation of technology and this meant that more health professionals could buy into the concept and contribute to bigger scale data collection. By the mid-1980s, the Institute of

Medicine, an American non-profit organisation, started using medical records and outcome-based monitoring to determine the benefits of

EHR (McClanahan, 2012). This research was not published until 1991 (McClanahan, 2012). In 1982, the first voice recognition system was developed for health records. The voice recognition system, known as the Dragon System, served as a dictation device for later transcribing. Other EHR systems introduced in this time included Master Patient Index, Healthcare Information Exchange and Indiana Network for Patient Care (McDonald, Overhage, Barnes, Schadow, Blevins, Dexter & Mamlin, 2005).

Tim Berners-Lee established the World Wide Web in 1989-1991 which initially did not mean much to healthcare (McDonald, Overhage, Tierney, Dexter, Martin, Suico, Zafar, Schadow, Blevins, Glazener, Meeks-Johnson, Lemmon, Warvel, Porterfield, Warvel, Cassidy, Lindbergh, Belsito, Tucker, Williams & Wodniak, 1999). However, it provided a viable example of how to access, share and navigate information. As a result, in 1994, the WHO implemented ICD-10 coding for healthcare, which further supported standardised record-keeping and more accurate data entry for research purposes (Berners-Lee, Cailliau, Luotonen, Nielsen & Secret, 1994).

2.2.5. The 21st Century Information Technology

The 21st Century has brought many technological advances and innovations to healthcare. Technology evolves so fast; it is challenging to stay abreast with 20th Century technology. In this technological era; for example, one makes use of telemedicine, cloud computing, Internet of Things (IoT) health devices, technology drive innovation and extensive investments for data tools (Paek & Hove, 2017).

2.3. Factors that Restrict the Readiness of Electronic Health Record Adoption

Studies showed that various concepts frequently emerge from all research reviewed regarding the readiness and perception of EHR adoption (Yogeswaran & Wright, 2010). For example, the influence of cost versus the benefits, as well as importance and advantages of implementing EHR (Yogeswaran & Wright, 2010) and the influence of resources, mainly financial and human resources, on restricting the successful adoption of EHR (Urowitz, Wiljer, Apatu, Eysenbach, Delenardo, Harth, Pai & Leonard, 2008). Lastly, the influence of management and leadership also plays a vital role in the success of the change management process (Seeley, 2009).

The literature refers to factors related to four fundamental constructs; namely, performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh, 2016). Aspects relating to the acceptance and readiness for technology adoption can have an impact as well. These aspects include age, gender and patient load on the acceptance or rejection of EHR by clinicians (Ghazisaeidi, Ahmadi, Sadoughi, & Safdari, 2014).

2.3.1. Cost

Cost is considered the factor that occurs most across the literature reviewed. Levin (2018), states that the cost implication of adopting EHR in the medical setting has two major components, namely the initial procurement cost and the maintenance cost. It is, therefore, not only the implication of once-off costly procurement but also the ongoing expense. Aforementioned is in line with emerging results of all similar studies. Research focusing on barriers to implementing EHR concluded that cost remains the most significant barrier to EHR adoption (Menachemi, Ford, Beitsch & Brooks, 2007). Despite federal incentives from the United States government that support and promote the adoption of EHR, the implication of cost remains the biggest concern of health organisations (Kruse, Kristof, Jones, Mitchell & Martinez, 2016).

The concern of the initial procurement cost of EHR systems was identified in 2006 (Menachemi, 2006). Menachemi (2006) attributes the cost implication as a concern for failure due to change resistance and poor user experience. The fear of procuring a costly system that will not provide a plausible return on investment due to inefficient end-user utilisation weighs heavy on decision-makers. There was also an additional emerging concept related to cost, and that is perception. The general perception is that IT comes at a significant cost (Vishwanath & Scamurra, 2007). With the usage of IT comes an acquisition cost, and often available resources cannot provide funding for the procurement of IT infrastructure. Despite the known benefits of EHR, the adoption of such a costly system could potentially receive criticism in the South African public health context (Akbal & Akbal, 2016).

2.3.2. Change Management

Another critical factor is the management of change, and according to Griffith (2001), comfort or stagnation is a primary motivation for change in organisational processes and structures. Regrettably, personnel are not always receptive to change and change often results in resistance. To combat change resistance, the German-American psychologist Kurt Lewin developed the “Unfreeze-Change-Refreeze” model in the 1950s (Griffith, 2001).

According to Bovey and Hede (2001), the model referred to three stages; namely, the unfreeze stage, the change stage and the refreezing stage. The authors Bovey and Hede (2001) describe the stages as follows:

The first stage, called the “unfreeze” stage, describes the process of completely disturbing the existing zone of comfort. It creates a platform or opportunity for people to let go of old habits and structures that foster comfort. During this stage, people can often realise the intention of impending change. They might feel strong emotions such as uncertainty, denial and impatience that lead to resistance.

The second stage, called “change”, deals with the adoption of the planned change. It occurs in a short period while people are still unsure and confused. The stability that the change brings makes people more receptive and accepting of the change as a safety net after the chaos in the “unfreeze” stage.

The third stage deals with “refreezing” or solidifying the implemented change. People are inclined to revert to old habits; therefore, this final stage is purely monitoring and evaluating how the change is progressing and settling. It focuses on providing support and motivation to prevent falling back into previous habits.

EHRs are designed to bring significant changes to current workflows after adoption, mostly with the predominant reason being increased efficacy in all concerned systems (Levin, 2018). EHRs by definition, and in most contexts, yield opportunity to organisations for transformational improvements such as improved quality of care and efficient workflows. However, if change management is not facilitated appropriately, EHRs could be detrimental as oppose to beneficial (King, Patel, Jamoom & Furukawa, 2013; 2014). In a systematic literature review by Kruse *et al.* (2016), 39 barriers to EHR adoption were identified. Among the top five of the 39 identified barriers, change management is number four. Change management, along with cost, technical concerns, and support concerns, appears 125 times in the review of the literature.

Adopting EHRs invites the apparent change to organisational operating systems not only in the way tasks are performed, but also to the people performing the tasks (Levin, 2018) . Change management in the context of EHR is driven by the concern for productivity, whereby end-users will have adequate skills, interest, willingness, abilities and time to fulfil productivity requirements to make adoption of EHR worthwhile for the organisation (Menachemi, 2006). Therefore, the need for staff buy-in is vital to the successful adoption of EHR (Vishwanath & Scamurra, 2007).

According to Khan, Shahid, Hendstrom and Andersson (2012), scepticism among physicians was the primary concern related to attitude and acceptance of EHR. Seeley (2009) asserts that the most prominent innovator in integrating new technology is change management and affirms that stable leadership structures must facilitate the process. Omachonu and Shatlock (2012) claim that an understanding of the organisational culture goes hand in hand with an understanding of the readiness of clinicians to implement EHR. In the South African context of change management regarding EHR adoption, a restricting factor to accepting change could; for example, possibly concern the basic fact that there are 11 official languages. It is important to consider the cost implications of creating a user interface to support all basic language requirements. With significant cost implications, the challenge arises to determine how limited language EHRs could be integrated into current workflows without unethically only excluding specific populations from the end-user job market. These are all concepts that do not emerge in international research, proving the unique challenges that South Africa potentially faces.

2.3.3. Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) explains user intentions to utilise information systems and consequent usage behaviour. The theory refers to four key constructs: namely, performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh, Morris, Gordon & Davis, 2003). According to Menachemi (2006) and Venkatesh *et al.* (2003), performance expectancy, effort expectancy and social influence are direct factors of behaviour. Although gender, experience, age, and voluntariness of utilisation are posited to moderate the impact of the four critical constructs on usage intention and behaviour. UTAUT also pinpoints the factors that would strengthen or restrict the effects of these determinants (Liebenberg *et al.*, 2018).

UTAUT model contributes to the growing body of research on technology acceptance. The model aids in understanding the drivers of acceptance to proactively design interventions like training and targeting users that may be less inclined to accept and use emerging technologies (Liebenberg *et al.*, 2018). Vishwanath and Scamurra (2007) identified similar factors in their research. They identified factors that could potentially create barriers to how people intend to utilise and accept new technologies. These factors mainly included herd mentality and social influence, concerns of adopting new technology regarding support, technical skills, and training opportunities for optimal utilisation of EHRs by end-users.

A study was conducted in hospitals in the North Gondar Zone of Ethiopia to determine the readiness of healthcare providers to accept the usage of EHR (Biruk, Yilma, Andualem & Tilahun, 2013). Results showed poor readiness and the authors emphasise the utmost urgency of increasing awareness, knowledge, and skills of healthcare professionals on EHR before attempting adoption to increase the probability of successful adoption (Biruk *et al.*, 2013). Hailey, Yu and Munyisia (2014) claim that the healthcare professionals of today are highly confident with the use of electronic information systems and are enthusiastically expecting the introduction of EHR to support their information management and clinical practices. The authors further assert that health professionals of today are IT perceptive and ready to adopt EHR. There was consideration to use either TAM (technology acceptance model) or TRA (Theory of reasoned action). However, UTAUT was found most appropriate for this study.

2.3.4. The Influence of Perception on Readiness

Perception, according to Bruner and Postman (1949) and Anderson (2017), can be defined as the process of an individual's definitive experience of the world. Bruner and Postman (1949) and Anderson (2017) claim that the concept of perception and sensation is said to be impossible to distinguish from one another, and the concept of perception is linked to the human experience. Thus, it is critical to define perception in the context of determining the readiness and perceptions of dentists to implement EHR.

In human behavioural psychology, the process leading up to the intention or decision to act is substantially driven by risk versus reward. Thus, if executing a specific act is perceived as too risky, or if the significant threat is perceived too high, an individual will, most likely, intuitively decide not to execute such an act (Paek & Hove, 2017).

In addition, Buchanan and DeVito (2009) suggest that humans can systematically describe all types of stimuli experienced, such as sights, smells, sounds, and tastes based on Bruner's theory of perception. They further their statement by referring to five stages of perception, namely stimulation, organisation, interpretation evaluation, memory, and recall. It is said that individuals act based on their perception of their external environment, and not necessarily on what their external environment truly is. Therefore, individuals' behaviour is impacted by their perception of reality (Bruner & Postman, 1949).

Bruner and Postman (1949) believed that what humans perceive from their work situation will influence their productivity more than the situation itself. However, according to King,

Patel, Jamoom and Furukawa (2014), it was the perception of great financial expense, and little return on investment that primarily drove health organisations not to adopt EHR.

According to Cherny (2010), if the theory is accepted that human behaviour and decision-making processes are perception driven, it may be assumed that readiness to act would be affected by a human's perception of risk and threat versus reward. A lowered perceived risk or threat consequence might be assumed to be a positive perception and would lead to an individual being more likely to execute an act or behaviour, and vice versa. Relative to this study, assumptions can be made that firstly, a positive perception towards the adoption of EHR might lead to dentists being more likely to adopt adoption thereof. Secondly, dentists who have negative perceptions regarding the adoption of EHR may be less likely ready to adopt the adoption of EHR.

The next section reviews the benefits of EHR adoption to identify the factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption.

2.4. Benefits of Electronic Health Records

EHRs hold benefits to patients as well as healthcare workers, organisations, and the entire health system (Borgman, 2010) as the entire world is progressively moving towards digitisation and incorporating the Internet of Things (IoT) into the essential parts of daily living (Borgman, 2010), similarly so for healthcare and EHR practices. It is important to understand the benefits in the bigger picture of factors besides cost that could bring transformational improvements to a healthcare setting's workflows and processes (Keyworth, Hart, Armitage & Tully, 2018).

2.4.1. Cost and Time

EHRs possess the ability to be money and time savers (7 benefits of electronic health records for hospitals, 2017). In justification of this statement, multiple sources report that EHR adoption has shown improved efficiencies in practice management (Menachemi *et al.*, 2007). Benefits include, but are not restricted to, improved patient care through clinicians being able to deliver appropriate, evidence-based and safe health services in a timely and efficient manner (What are the advantages of electronic health records, 2019).

Choi (2019) stipulated the benefits related to a reduction of clinician time spent on administration. For example, these benefits refer to requesting files, waiting for patients to fill in forms, manual entry of information, delays in tests and results between healthcare professionals and laboratories and locating patient information from another health

provider. Therefore, clinicians can devote more time for patient management as appose to administration (Wilson, 2019). Comprehensive health services can be provided when clinicians have access to patient-centred, comprehensive health records with integrated patient information from multiple sources (Medical Practice Efficiencies & Cost Savings, 2018). Clinical decision-making becomes improved through automated coding possibilities and other EHR features.

2.4.2. Improved Communication

Effective communication practices in any work environment are essential (Choi, 2019). Therefore, it is crucial to improve the communication system in healthcare. There are various benefits relating to the improvement of communication in healthcare. For example, one can access patient information anywhere and easily track electronic correspondence between healthcare providers, patients, laboratories and other regulatory data reporting boards such as public health organisations, or it can improve pharmaceutical dispensing by electronic prescribing when a health worker can directly communicate digitally with a pharmacy (Choi, 2019). Moreover, effective communication improves safe and ethical prescribing and reduces errors in eligibility of handwritten scripts that can be fraudulently duplicated or adjusted. According to Wilson (2019), improved communication will also lead to easier compliance with regulatory boards as EHR will make it easier to adopt new regulations, policies and guidelines imposed by the government.

2.4.3. Quality Patient Care

In the sphere of service delivery, EHR can significantly shift clinical focus to more patient care, less administration, while creating or contributing to a more accurate and meaningful health record (King *et al.*, 2014). Patient experience is also improved with a transparent and accessible health record that is conveniently available at any point of health service (Wilson, 2019). Transparent and accessible health records also create an opportunity for two-way communication between patients and health providers that can be instrumental for patient education (Wilson, 2019). Therefore, the literature pertains to EHR focussed on the service delivery platform between patient and health provider.

The following section will review and discuss the benefit of electronic health records on a grand scale- national and global.

2.4.4. Data Management

Data and data management plays a significant role in the equitable distribution of resources (Kaipio *et al.*, 2020). However, in resource constraint countries, commonly seen in Africa,

the perception of data management deserves more attention (Thorpe, Gray & Cartwright-Smith, 2016). For example, small health practices believe that their EHR does not contribute to the global scale phenomenon; however, one should consider the benefit of multiple small contributions to global research. EHRs can empower informed decision making in critical situations of public health.

EHR contributions can elicit trends in healthcare that might emerge and provide meaningful information (Kaipio *et al.*, 2020). Organisations in public health epidemiology, such as the WHO and the Centre for Disease Control (CDC), can utilise the information for valuable decision-making in world epidemiology. The organisations' practice and purpose prove the utmost importance and power of data (WHO, 2015). For example, the COVID-19 pandemic that spread globally at an alarming rate.

The pandemic is a relatable example of the benefit of data capturing, of which EHRs can contribute to with less error, timeously and already coded for computerised interpretation, saving hours of human resource efforts. Therefore, EHRs can contribute to research on a global scale that can create meaningful information once again in health or disease trends. Thus, the need for cures and new research trials can be identified early and produced quicker.

The next section reviews the situation in developing countries and how EHR could potentially benefit such countries.

2.5. Public Healthcare in Developing Countries

The public healthcare sector in developing countries faces many challenges, including weak healthcare systems and under-resourced facilities that deliver poor outcomes (Cline & Luiz, 2013). According to a study based on the South African health systems, it is revealed that implementing IT had many advantages in terms of cost and strategic value (Cline & Luiz, 2013). It yielded advantages to workflow, staff morale and quality of service delivery (Cline & Luiz, 2013). Another study conducted to depict the role of health information systems, specifically to monitor universal health coverage in Rwanda, mentions that the adoption of such systems enabled them to monitor health insurance aspects of hospitals (Karara, Verbeke & Nyssen, 2015). Consequently, this provided evidence of the number of patients without coverage and how policy can be implemented to standardise pricing for essential healthcare (Karara *et al.*, 2015).

According to Thorpe, Gray and Cartwright-Smith (2016), without an interoperable electronic information exchange capability that supports sharing patient health information across the healthcare delivery system and, increasingly, outside of the healthcare delivery system, real transformation remains out of reach. Krickeberg (2017) describes the eleven essential principles for successful Healthcare Information Systems (HIS). These principles in HIS hold six main characteristics are namely planning and managing the health system (including health insurance), publishing health-related information, epidemic surveillance, supporting and improving daily clinical work, obtaining information for local use, and conducting studies. Concerning this study, it is relevant to note HIS as EHR would inevitably contribute to operations and data-driven decision- making of the entirety of a health information system.

In developing countries, such as African countries, the role of HIS is vital for healthcare service delivery (Katurura & Cilliers, 2018). It is used to influence decision-making that will govern how limited resources are distributed as equitably as reasonably possible. For example, the data derived from HIS could elicit certain health trends or determine higher disease burdens in certain areas. This means that an evidence-based decision, that is driven by data, can motivate for certain resources to be prioritised to address the actual need in healthcare in such areas. HIS become complicated and challenging to implement in the healthcare system that is already volatile and unstable due to factors such as politics, poverty, lack of resources and generalised inequity. However, the information that is brought forward from HIS is inimitable and vital for the fair and informed distribution of already lacking resources (Karara *et al.*, 2015).

2.6. Current Status of Record-keeping Practices in Public Healthcare (Western Cape, South Africa)

One needs to understand the elemental composition of the South African Health System to contextualise the literature for South African record-keeping practices. Figure 1 depicts the basic essential information necessary to understand the concept of South Africa's health system, types of health coverage, and types of record-keeping practices within the different types of health coverage and the guiding bodies to regulate health practices.

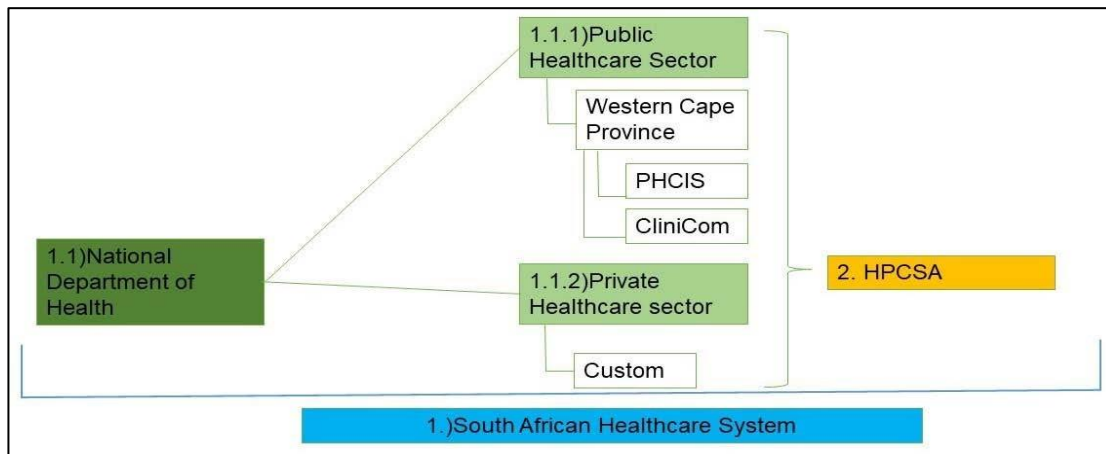


Figure 1: Health Sector of South Africa

As seen above, the South African Healthcare system (1) is governed by the National Department of Health (1.1). There are two major sectors governed by 1.1 namely the public (1.1.1) and the private (1.1.2) sector. These two sectors, although governed by 1.1, adhere to guidelines for healthcare practices from Health professional’s council of South Africa (HPCSA as number 2 in the above image). The information systems used by the public health service specifically in Western Cape province includes PHCIS and Clinicom. In the private sector, there is no set standard and any information system may be used.

2.6.1. The South African Healthcare System

As seen in Figure 1, EHR is an existing concept in South African healthcare. The South African healthcare system consists of the private and public sectors. The public healthcare sector is further subdivided into provinces, areas and municipalities due to the extensive geographical coverage provided. The private healthcare sector is not divided in any specified way as this sector follows custom trends to suit specific business needs.

2.6.2. The Private Healthcare System

The private health sector has numerous EHR systems in use, each custom to the preferences and needs of each private practitioner paying for the system (Rossouw, 2014). These systems may be vastly diverse in complexity, data indicators being captured and are most often integrated with a reliable billing system that will be approved by medical aids for payment (Rossouw, 2014).

2.6.3. The Public healthcare information systems

As depicted, the Western Cape (WC) public health sector has two existing EHR systems, namely, Primary Health Care Information Systems (PHCIS) and CliniCom (Chowles, 2018).

However, the systems are custom to the province and are not interchangeable. The technology exists, but it remains underutilised due to multiple factors such as limited skills, IT infrastructure, and IT support, training and workload concerns.

Furthermore, these systems are interoperable within clinical settings. For example, PHCIS is used to mainly storing primary healthcare data, and CliniCom is used to storing data from tertiary healthcare (Rossouw, 2014). However, neither of these systems could adequately feed their information into Sinjani, which is the only national data capturing system (Chowles, 2014). Some of the data derived from CliniCom and PHCIS still needs to be captured manually (Chowles, 2014). As a result, the patient record-keeping system predominantly remains paper-based (Rossouw, 2014). The problem of mismanagement of physical files is the main administrative cause of the break in the continuation of patient care. Therefore, the Western Cape public health system is not entirely digitised and leaves much space for human error in the process of data collecting and reporting.

The mismanagement of health information can cause treatment to be compromised so severely that it can lead to total failure of patient management (Carnicero, Blanco & Mateos, 2006). Mismanagement of health information is a comprehensive concept and can be attributed to many factors. In usual circumstances, missing or misplaced patient folders will lead to the creation of duplicate temporary folders in an attempt to prevent withholding treatment from the patient and patient dissatisfaction due to long waiting times that attributes to poor service delivery (Carnicero, Blanco & Mateos, 2006).

2.6.4. The Guidelines for Record-keeping

The private and the public healthcare systems, despite their differences, have guidelines provided by the HPCSA about record-keeping (Gray & Vawada, 2017). The guidelines are basic and do not suggest a standard of record-keeping, besides stipulating the principles for proper record-keeping. Moreover, the legal timeframe information should be stored, which is six years in South Africa, as per HPCSA guidelines (Marais, 2016). In addition, the National Department of Health also provides standards of compliance for health records about creation, usage and storage. It uses policies such as the Protection of People Information (POPI) Act to ensure ethical and confidential usage of sensitive information. Only healthcare workers employed in public service are technically subjected to adhering to these record-keeping practices, as the private practitioners are relatively independent. However, they are required to adhere to basic guidelines (Marais, 2016).

2.7. Conceptual Model

The conceptual framework (Figure 2) depicts two main circles, the inner representing perception, while the outer represents readiness. The framework aims to inform the reader how elements mentioned on the inner spheres, may influence perceptions and ultimately how perceptions may impact readiness.

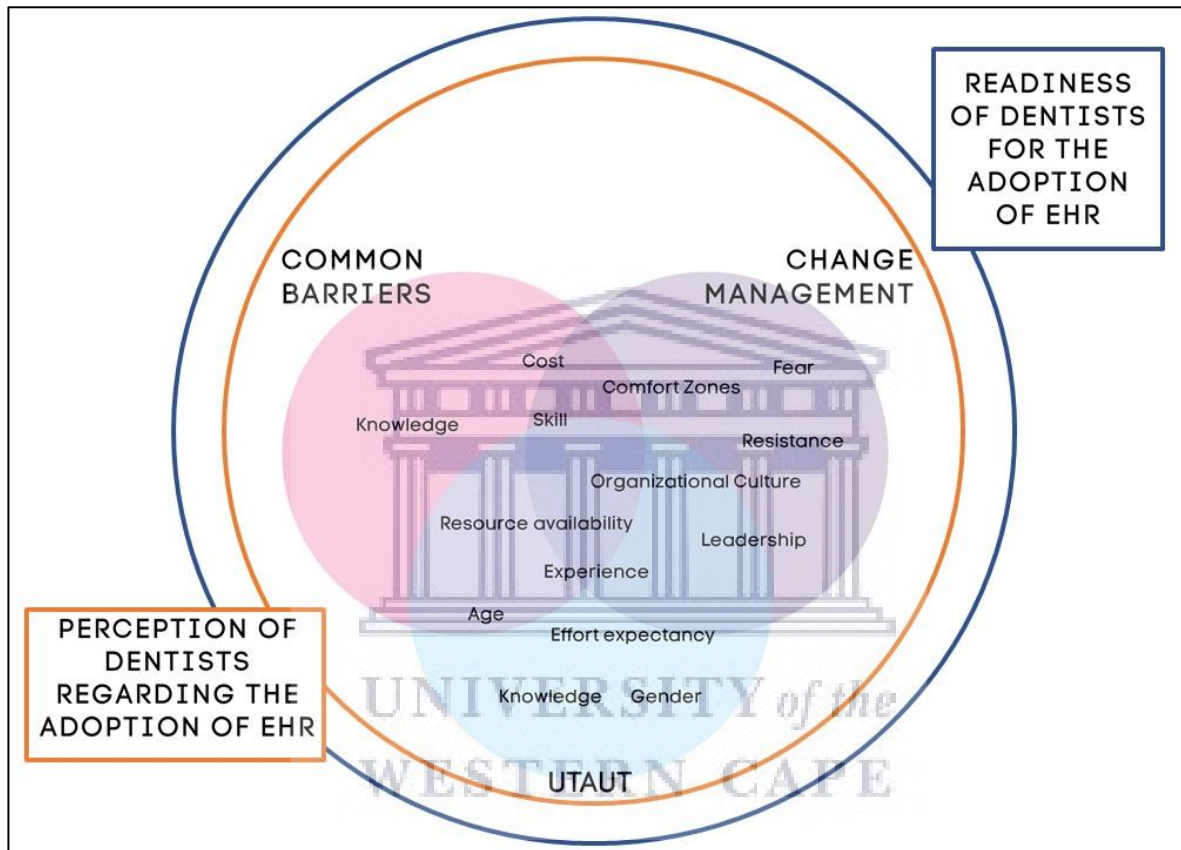


Figure 2: Conceptual Model

CHAPTER 3: METHODOLOGY



3.1. Introduction

Chapter 3 aims to inform the reader of the methodological approach in this study. The researcher will mention the approaches utilised in this study, as well as elaborate on definitions of such approaches to show understanding. The researcher will provide insight through thorough qualitative research. Lastly, the researcher will use scientific definitions to justify the use of specific methodologies.

3.2. Research Objectives

As depicted in Table 1, the research objectives were determined as follow:

Table 1: Research question, sub-questions, methodology, and objectives

Research Questions	Methodology	Objective
Research Question: What is the readiness and perception of public health dentists on EHR adoption?		
SQ 1: What are the factors that could potentially influence the readiness and perception of EHR adoption?	Literature review	Identify the factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption.
SQ 2: How could the identified factors potentially influence EHR adoption among dentists?	In-depth semi-structured interviews	Understand the identified factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption among dentists in public health in the Western Cape.

The objectives of this study were to identify the factors potentially restricting the readiness and perceptions of EHR adoption amongst dentists and to understand the identified factors and how they could potentially influence the readiness and perception of EHR adoption amongst dentists. Once the researcher established the specific factors, and understand how these factors could potentially have an influence on the study population's readiness

and perception regarding EHR, the main research question can be addressed and supported by the literature and the actual lived experiences of the participants in this study. Lastly, the researcher made correlations between the existing literature and own findings during interviews with participants to support assumptions and conclusions drawn from the data analysis process.

3.3. Research Paradigm

An interpretivist research paradigm was applied. The word paradigm originates from the word *paradeigma*, which is a Greek term meaning *pattern* (Kuhn, 1962). Kuhn (1962) further defines *paradeigma* as a unified collection of functional notions, variables and difficulties attached with conforming methodological approaches and tools. According to Wray (2010), a paradigm refers to a research culture with set principles, standards, and norms, shared among a group of researchers concerning the nature and manner of research. Thus, a paradigm implies a pattern, framework, structure, or system of evidence-based, academically sound ideas, norms, and standards (Olsen, Lodwick & Dunlap, 1992).

According to Reeves and Hedberg (2003), researchers who research with an interpretive paradigm believe that reality entails individuals' subjective experiences of the external world. Researchers are also of the belief that there is no single way or path to reach certain knowledge; thus, there are no right or wrong theories. The interpretivist paradigm highlights the need to put analysis into context (Reeves & Hedberg, 2003). According to Boland (1985), interpretivism cannot be defined as a single paradigm, but rather a cluster of diverse paradigms. One of the philosophical bases of interpretivism is phenomenology. Phenomenology is the study of certain phenomena that includes the appearance of things or how they appear in ones lived experiences (Ryan, 2018). In this research, the phenomena to be understood concern the readiness and perceptions of dentists regarding the adoption of EHRs.

3.4. Research Design and Methodology

A qualitative design was chosen due to a lack of understanding about the readiness and perceptions of dentists regarding the adoption of EHRs (Flick, 2014). Qualitative research was conducted in a real-life setting. According to Leedy and Ormrod (2010), one needs to dig deeper to find the answer to certain research questions, which is the precise and lamented concept and purpose of qualitative research designs. These methods focus on understanding human experiences and aspects of meaning. Van der Walt, Brink & Van Rensburg (2012) referred to the latter as the insider's view or emic perspective. Therefore,

as mentioned in point 2.3.4., it is vital to understand the phenomena concerning the readiness and perceptions of dentists regarding the adoption of EHR.

Phenomenological research is a concept and method that is used in qualitative research designs (Arslan & Yildirim, 2015). It aims to seek a reality from the individuals investigated by describing their feelings, experiences, attitudes, perceptions and opinions in an academic narrative that is relevant to the research question and that can potentially guide the researcher to make concluding assumptions towards an answer to the research question (Arslan & Yildirim, 2015). Phenomenological studies examine human experiences through detailed descriptions from participants (Flick, 2014). The actions taken in this research approach included horizontalization but was not limited to, bracketing, sensing, analysing and describing (Flick, 2014). Descriptive in nature since no intervention occurred and the primary purpose was not to examine relationships, but rather to provide a more in-depth understanding of the phenomenon identified as the readiness and perceptions of dentists regarding the adoption of EHR (Flick, 2014).

3.5. Study Population and Sampling Defined

Many authors have defined the concept of a study population as a group of individuals that interest a researcher often because they have a particular type of character that relates to phenomena being investigated (Van der Walt, Brink & Van Rensburg, 2012). These characteristics are further defined as inclusion and exclusion criteria that eventually will assist in defining the boundaries of the research at hand (Flick, 2014). By further definition, a sample is only a representation, a part or fraction of a whole or more extensive set selected by a researcher.

In qualitative research, there are multiple methods of sampling that can be used. For relevance to this paper, there will only be focused on non-probability type sampling. The significant techniques of non-probability sampling include convenience sampling, quota sampling, purposive sampling, and theoretical sampling (Van der Walt, Brink & Van Rensburg, 2012). This study uses purposive sampling. This type of non-probability sampling was used as it focuses on participants particularly knowledgeable about the research phenomena at hand, which is a great advantage to the study (Van der Walt, Brink & Van Rensburg, 2012).

The population was selected on the common characteristic that all were full-time dentists employed by the Department of Health Western Cape in the Western substructure. The population of the study shares the common trait of being full-time dentists employed by the

Department of Health Western Cape in the Western Substructure. A sample population of seven dentists were selected.

3.6. Research Instruments Defined

Research instruments defined refer to those tools a researcher might use to obtain data and information (Van der Walt, Brink & Van Rensburg, 2012). Research instruments are also referred to as fact-finding strategies (Annum, 2014). The validity and reliability of any research are much dependent on the researcher choosing the correct data collection tool to guide the research (Annum, 2014). As qualitative research requires rich and insightful data to analyse and describe a phenomenon, in-depth semi-structured interviews are used in this study as the

research instrument of choice. The questions were designed around the usage of EHR and participants could further discussions regarding a question topic.

3.7. In-depth, Semi-structured Interviews

Interviews are data collection instruments mainly used in qualitative research when a researcher aims to describe or explore a phenomenon at hand (Van der Walt, Brink & Van Rensburg, 2012). Interviews conducted for data collection purposes are mostly classified as either structured or unstructured. However, most interviews tend to fall somewhere in the middle (Flick, 2014). These 'in-between' types of interviews are also referred to as semistructured during which a certain number of questions while the researcher may pose supplementary probing questions to extract sufficient information without leading participants (Van der Walt, Brink & Van Rensburg, 2012). In-depth, semi-structured interviews are used in this study. Semi-structured interviews allow for more sensitive topic exploration and provide data that are more abundant when participants are freer to express themselves in a private setting without judgement or fear of creating volatile inter-colleague relationships. Detail regarding the guiding questions to interviewees can be obtained in Appendix A.

3.8. Data Analysis: Moustakas 1994 combined with Inductive analytic approach

3.8.1. Moustakas Approach 1994

This study will apply Moustakas' 1994 approach to qualitative data analysis. Moustakas guide to qualitative data analysis starts with bracketing, which is also referred to as Epoché

and will be discussed at point 3.9.2. The illustration below will provide a short overview of

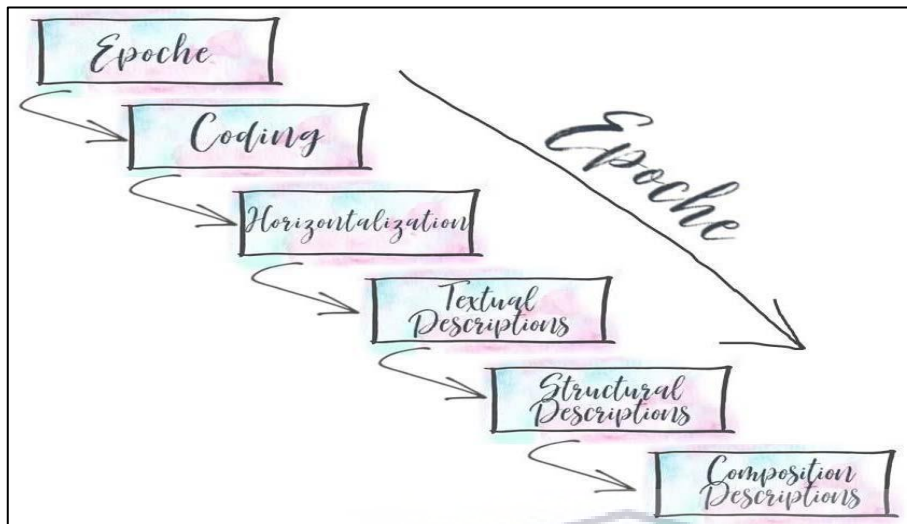


Figure 3: Epoché (Source: Moustakas, 1994.)

3.8.2. Epoché

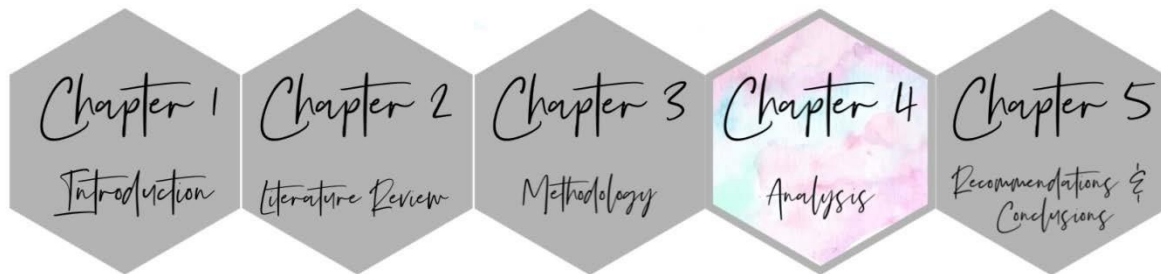
The *Epoché* is derived from Greek, which means to abstain from presumption and preconceived judgement (Moustakas, 1994). When considered in the contexts of qualitative research data analysis, it is a measure put in place by the researcher to prevent bias and ensure reliability and validity. (Arslan & Yildirim, 2015). In this study, the researcher has engaged Epoché by setting aside all prejudgments and prejudice predispositions. Concept driven coding was used to identify thematic ideas or similarities within the information and statements given by participants. After relevant codes were assigned, the most relevant statements from participants were treated with similar value and replications were removed. Horizontalization guided the process to eventually reach composition descriptions comprising of textural and structural descriptions.

3.8.3. Inductive Analysis

This method of logical reasoning will be used in conjunction with Moustakas guideline of 1994 to develop theory and/or generalisations and identify themes by critically studying the collected transcribed documents, recordings and other printed and verbal material (Flick, 2014). The analysis will include determining common trends to 'code' commonalities accordingly to interpret the information collected.

This concludes Chapter 3: Methodology. Chapter 4 follows with a more detailed and in-depth discussion on the analysis process.

CHAPTER 4: ANALYSIS



4.1. Introduction

The chapter aims to review and apply the Moustakas' (1994) analysis process. Thus, the chapter will discuss and interpret the relevant data collected and analyse the data through Moustakas' (1994) analysis process.

4.2. Analysis Process – Moustakas 1994

According to Moustakas (1994), methods and procedures for conducting human science research include various factors. These factors refer to elements in research such as discovering, conducting, constructing, developing, organising and analysing (Moustakas, 1994). The following paragraph will explain Moustaka's analysis process.

Firstly, researchers should discover (or explore) a topic and question rooted in autobiographical meanings and values, as well as involving social meanings and significance. Secondly, researchers should conduct a comprehensive review of professional and research literature. Thirdly, researchers should contract a set of criteria to locate appropriate co-researchers. Therefore, the researcher must provide the co-researchers with instructions on the nature and purpose of the investigation, and developing an agreement that includes obtaining informed consent, ensuring confidentiality, and delineating the responsibilities of the primary researcher and research participants, consistent with ethical principles of research. Fourthly, the researcher should develop a set of questions or topics to guide the interview process. Conducting and reporting a lengthy person-to-person interview that focuses on a bracketed topic and question. A follow-up interview may also be needed. Lastly, the researcher should organise and analyse the data to facilitate the development of individual textural and structural descriptions, a composite textural description, a composite structural description, and a synthesis of textural and structural meanings and essences. See Appendix B for a full list of participant statements.

4.3. Identifying Emerging Themes

A total of six themes emerged from the data that was collected. The experiences, opinions and feelings towards EHRs have been clustered into the following themes namely effort expectancy, age/years of service/experience, availability of- and access to IT, fear of change (resistance), computer literacy (skills training), perception of time consumption. These themes have been listed from most – to less frequently recorded.

Table 2: List of Themes

Theme 1	Cost (accessibility to- and availability of IT)
Theme 2	Fear of change (resistance)
Theme 3	Computer literacy (skills training)
Theme 4	Effort expectancy
Theme 5	Age/years of service/experience
Theme 6	Perception of time consumption

4.4. Theme Description

4.4.1. Theme 1: Cost

The first theme, cost, also refers to the accessibility to IT, as well as the availability of IT. Therefore, this theme also includes other themes. All the participants reported that there is a severe lack of access to IT, as well as the availability of IT and that the umbrella excuse for lacking resources comes down to acquisition costs. The topic emerged further information such as existing network issues, lack of funding for IT infrastructure, lack of IT support services available, stagnant way of performing duties that block the introduction of digitalisation of the public healthcare sector in South Africa.

Participants linked the availability of IT to the general lack of resources; *“We don’t even have a computer in the dental clinic that I work.”* Some participants reported that they have never accessed a computer at their workstation merely because there is no one available; *“Electronic record won’t work because we only have 1 computer for 3 clinicians.”* and *“The closest computer to my workstation is in the reception area of admin. I will have to leave my unit to access a pc that will be in use already by another staff member whose actual workstation it is.”* Some participants also reported that all administrative duties are performed manually, excluding the use of telephones.

Therefore, the mere idea of EHR seems elusive to them considering the challenges they face with basic resource requirements. Most participants said that EHR could work for the greater good if every clinician has access to a working computer that is connected to an integrated and interactive network, all the time. They also mention with great disappointment that *“this will probably never happen”*.

Participants once more alluded to the fact that management structures remain misinformed of the operations of dentistry. According to participants, dentistry is perceived to be a labour-intensive clinical job. Therefore, the priority for IT is exceptionally low on the list when the core function is hands-on patient care.

Participants also mentioned other spheres in dentistry where IT should be utilised, such as digital radiography. Some participants mention they are aware of service points in dentistry where there is complete mismatched resource distribution. For example, the facilities for digital radiography is expensive, and the facilities are installed without the appropriate computer monitors and hard drives to run the software and view radiographic images. These examples provide evidence; once again, that the management structures have a misconception of the profession. Moreover, these examples often come to light, and the emotional state of participants are perceived as frustrated and aggravated when this matter was discussed. Thus, participants felt EHR could not be implemented if the resource distribution for their basic service delivery and tools of their trade cannot even be met.

4.4.2. Theme 2: Fear of Change (Resistance)

The concept of this theme, fear of change, emerged throughout participants of the entire sample population. Some bluntly mentioned that they fear change and do not like things to change as it caused instability and discomfort; *“Paper-based records have worked for the 20 years I’ve been in this service, why do you want to change things and confuse everyone?”*. Others tried to shy away from admitting to fearing change by hiding behind other possible challenges such as availability of resources, existing workload and lack of support but later alluded to the fact that they liked how things are being done currently; *“I am used to making clinical decisions on the spot; why must I use a computer to help me?”*.

As the concept of change was probed, participants became offensive and reluctant to participate. There was a general feeling of discomfort when suggesting that paper-based record-keeping systems should cease to exist and that the future is digital; *“Don’t change a thing that works. It creates instability and service disruptions.”* Some participants simply were open to converse about impending change that might include EHR and only became

defensive later in the conversation. Others were opposed to the idea of changing their current working methods from the beginning; *“I like how our system works now.”*

The general assumption by the researcher is that the concept of change causes a feeling of discomfort and negativity among participants, in some more so than in others. Some are open to the idea of a slow transition but completely disagrees with a sudden change. Others disagree completely with change and prefer to remain in a state of stagnant comfort. When probed regarding the fact that comfort might lead to stagnation, some participants did not seem bothered in the least.

4.4.3. Theme 3: Computer Literacy (Skills Training)

Most participants have basic computer literacy skills. When asked about IT as such, it was immediately linked to computers and intricate internet networks. When Information Technology was referred to as technology, participants could more easily relate and converse about smartphones and new-age applications that they use on a daily base. Some used examples of IT devices, such as step trackers on their smartphones and pulse monitors on their smartwatches. The participants also use health records without realising that they are already utilising EHRs towards their health record. All participants mentioned that they use personal emails to complete various functions in their capacity; *“I use my pc at home, but I often ask my children to help me when I don't know what to do. The printer is, of course, a nightmare.”*

The interest in learning new skills was evident in most participants. “Maybe if government dentists were given the opportunity to evolve with technology, introducing new concepts like this won't be such a hassle. We have been neglected.” They showed an in-depth understanding of technology, especially that technology evolves inevitably and that healthcare professionals should keep up with trends in IT (as they keep up with the trends in the development of new pharmaceuticals and treatment regimens as research progresses daily). However, concerns were raised regarding the access to training should EHR be implemented. When probed further, it became known that access to training has been a negative experience for most participants. The participants who had positive attitudes towards EHR had fears related to experiences. These experiences relate to systems that have been ‘dumped’ on the participants with expectancy to provide output without training. The participants also mentioned that they are being reprimanded when the system fails. A keenness for evolving into a digital era is evident among some participants. However, the concern of training challenges creates scepticism.

4.4.4. Theme 4: Effort Expectancy

During the data collection process, it became evident that effort expectancy is of great concern; *“I think it will be difficult. I don’t have much experience with computer stuff.”* By probing into this emerged theme, it became apparent that the entire sample population felt the same. Therefore, the researcher decided to unpack the statements relating to effort expectancy. By unpacking the statements, the participants elicited to current issues in the working environment. These issues referred to high workload, high patient demand for services, poor support from management to support the human resource shortages and a lack of funding for basic resources to fulfil daily duties; *“I have enough work; I’m not interested in the computer also.”*

Besides the concern of effort expectancy, placing extended functions on top an already overburdened workforce, the mere fact that implementing costly and effort consuming software such as EHRs simply should not be a priority when the basics of service delivery materials and equipment cannot be met. In addition, while probing into this theme, participants spoke more openly about the existing service inequalities and how they often must take administrative work home to complete after hours as the clinical requirements of patient care are simply too high. The concern of effort expectancy looped around a lack of support from management structures to understand their working and operational processes.

The fear with expecting output from EHR originates from management seeking quantity in numbers of patients seen and not necessarily the quality of records kept, as that does not count towards the statistical measures the department requires. Nonetheless, record-keeping is an ethical requirement for patient management of all spheres of medicine and healthcare. Participants also often linked effort expectancy to fruitless labour as misinformed management structures do not recognise the time and effort required to maintain patient records manually, not to mention electronically; *“If support services for electronic health records take as long as for other things in government, it will fail definitely.”*

The researcher also found that participants fear accountability relating to effort expectancy. Therefore, the participants fear accountability concerning ERH systems. As some participants have mentioned the lack of informed management regarding the operational workings of dentistry, some seemed quite comfortable with the idea of management not completely being aware of their operations as clinicians. As more probing was done into

this assumption of “comfort in chaos”, the more resistant and offensive some participants became.

4.4.5. Theme 5: Age/Years of Service/Experience

The theme, age/years of service/experience, triggered the participants to feel overwhelmed and anxious. It also causes some participants to reflect on past experiences; *“A challenge will definitely be getting the older generation out of their comfort zones.”* Therefore, the researcher connected the response directly to fear or resistance to change (see point 4.5.2).

However, according to the data, participants who had qualified more recently responded more positively to the adoption of EHR than those participants who have been in the service for longer with more years of experience; *“This paper-based record-keeping needs to change. This is 2019- people are doing brain surgery with remote control, why can’t dentists’ type in what tooth they extracted on a computer?”*. Therefore, the generation gap is significant. The older generation bluntly shows disinterest and shoves the responsibility of new technology onto the younger generation participants, accepting their comfort and competence with adapting to new technology. Moreover, the data also revealed that participants who served in the private sector prior to their commencement in the public sector were more positively responding to the idea of EHR adoption. Therefore, one can assume that willingness or resistance to change is because of lived experiences in the service difference between the public and private sectors.

Inevitably, the negative lived experiences of long-serving participants in the public sector have formed perceptions that are less likely to be conducive to a state of readiness when considering adoption of EHR. However, experiences might not be the only reasoning behind the negative perceptions. The researcher has made a connection to fear of change as participants make statements that suggest states of stagnation through comfort zones and lack of progression. Participants who are in the service for fewer years and have a smaller frame of reference regarding lived experiences through the political history of South Africa mentioned feeling oppressed by the participants with longer years of service; *“I don’t understand why people won’t be able to use electronic records if everyone is confident to use a smartphone with apps.”* The participants mentioned that often they are reprimanded when suggesting new ideas for service delivery or innovations to improve current systems. The emotional state of these participants seems frustrated and hopeless.

When considering the participants with longer years of service, a sense of seniority and a hierarchy or chain of command comes across strong when referring to the participants newer to the public service. Statements such as “newbies” and “babies” are used to describe qualified professionals entering the public service. The emotional state of longer service participants comes across as paternalistic and authoritarian with little space to convince otherwise. Others simply showed no interest as they mentioned their career is ending, and they have no interest in learning new skills to advance the career at this point; *“My years are almost over. Maybe the young ones who take over will be keener on it.”*

4.4.6. Theme 6: Perception of time consumption

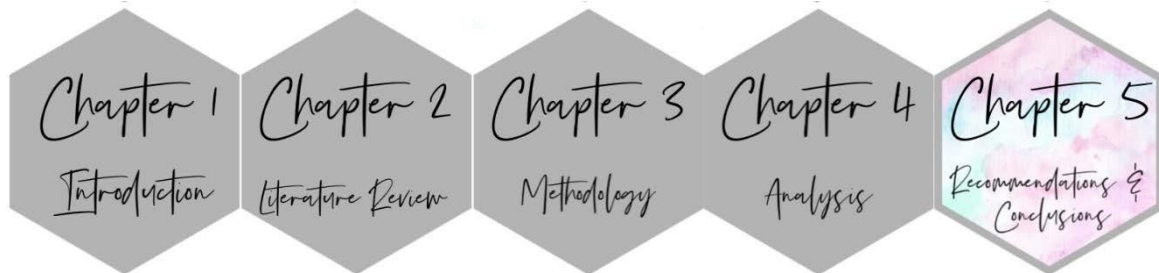
The theme of perception of time consumption closely relates to the theme of computer literacy (see point 4.5.3.) and the theme of effort expectancy (see point 4.5.4.). Participants who admitted to lower computer literacy skills linked EHR usage to longer times spent on record-keeping: *“I think using electronics to record patient treatment will take much longer.”* Therefore, time and effort are also used as interchangeable concepts. For example, the participants’ perceptions are that more effort is required if something takes longer than necessary. Thus, participants are reluctant to accept the idea of EHR due to the perception of it consuming more time than necessary.

The participants mentioned the issue of workload and time spent per patient, which is already time-consuming. The participants explained that there is limited time to use EHRs in between patient care and the workload. While some participants negatively linked time to effort, others positively linked time-saving innovations such as EHR to make the workload of record-keeping practices much more accessible and effortless compared to paper-based systems. Therefore, some participants are comfortable with change, while others are not ready for change yet.

The researcher connected these contradicting statements from participants with theme 5; age/years of service/experience (see point 5.5.5.). Participants newer to the service has more positive feelings, while the longer serving participants immediately connected time and effort to fruitless labour practices.

In summary of Chapter 4: Analysis, the focus was on describing the analysis process in short and then applying it practically to the research completed. The chapter concludes with thematic descriptions that will link to assumptions and conclusions that will follow in Chapter 5.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS



5.1. Introduction

Chapter 5 serves as the final chapter of this study and concludes the research by making recommendations, discussing limitations, and reviewing the conceptual framework that was designed for this study. The aim of Chapter 5 will focus on connecting all the elements of the thesis. Thus, the researcher will strive to add meaning to the discussions in the previous chapters. Lastly, the researcher will conclude the research with final assumptions and thoughts.

5.2. The Objective of the Study

The objectives of this study were to firstly, identify the factors potentially restricting the readiness and perceptions of EHR adoption amongst dentists; and secondly to understand the identified factors and how they could potentially influence the readiness and perception of EHR adoption amongst dentists. Once the researcher established that there are factors, and understood how these factors could potentially influence the study population's readiness and perception regarding EHR, the main research question can be addressed and supported by the literature and the actual lived experiences of the participants in this study. Lastly, the researcher made correlations between the existing literature and own findings during interviews with participants to support assumptions and conclusions drawn from the data analysis process.

5.3. The Thought Pathway of How Objectives were Used to Support Main and Sub Research Questions:

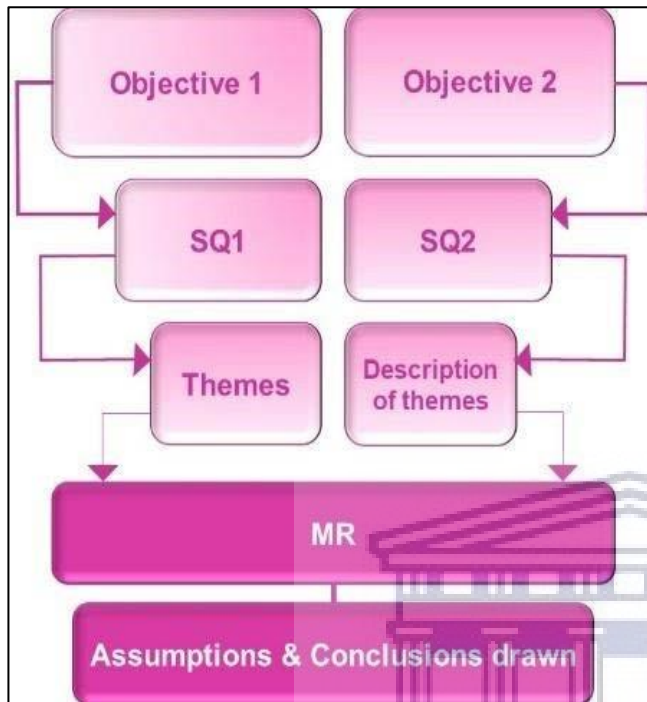


Figure 4: Questions answered

Table 5 allows for a better understanding of the visual presented in figure 4 regarding the path and reasoning that link objectives with research questions. These correlations assist in better linking the existing literature to the discoveries that emerged from the researcher’s findings, as well as pulling the theory and lived experiences together throughout the research.

Table 3: Description and linkage of objectives ¹

Component	Reference to place in the document	Description and linkage
Objective 1	As stated in point 1.2.: Table 2: Research question, sub-questions, methodology, and objectives “Identify the factors that could potentially influence (restrict	To have met objective 1, it was important first answer SQ2. Thus, before being able to identify FPI, it was vital to

¹ *For context of the following table, to avoid lengthy repetition and ease of reading, ‘factors that could potentially influence the readiness and perception of EHR adoption among dentists’ will be referred to as FPI.

	or enable) the readiness and perception of EHR adoption amongst dentists.”	determine whether there were any FPI.
SQ 1	As stated in point 1.2.: Table 2: Research question, sub-questions, methodology, and objectives “Are there factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption among dentists?”	<p>The themes that were identified throughout the analysis of participants responses were:</p> <ul style="list-style-type: none"> • Cost • Fear of change • Effort expectancy • Computer literacy and skills • Age/ Years of service • Perception of time spent <p>These themes in turn can be identified as the most common emerging FPI; thus answering SQ1 and meeting Objective 1.</p>
Themes	Stated in 4.2.2: Table 4: Themes	
Objective 2	As stated in point 1.2.: Table 2: Research question, sub-questions, methodology, and objectives “Understand the identified factors that could potentially influence (restrict or enable) the readiness and perception of EHR adoption among dentists.”	Objective 2 was subsequently met by linking onto Objective- and SQ1. After a) confirming the existence of FPI, b) identifying what those factors are and classifying them as themes, it was then necessary to create an understanding of these factors classified as themes by describing each after data analysis. Only then would it make sense to determine “how” the identified factors could potentially influence readiness and perceptions of EHR adoption among dentists.
SQ2	As stated in point 1.2.: Table 2: Research question, sub-questions, methodology, and objectives “How could the identified factors potentially influence EHR adoption among dentists?”	<p>After the researcher a) established that FPI exists, b) determined what the FPI were, c) creating an understanding of FPI by d) describing all FPI mentioned in emerging themes to determine the ‘how’ as</p>
Description of themes	As stated in point 4.2.4.	
MR (Main research)	As stated in point 1.2.: Table 2: Research question, sub-questions, methodology, and objectives “What is the readiness and perception of dentists in the Western Cape public health sector to implement Electronic Health Records (EHR)?”	

Assumptions and conclusions	As stated in point 5.9.	mentioned above, the main research could be answered and relevant conclusions could be drawn.
-----------------------------	-------------------------	---

5.4. Relooking at the Original Conceptual Framework

The conceptual framework (Figure 2) mentioned in point 2.7., depicted how possible variables described in the chosen theories might affect perception and readiness of dentists regarding the adoption of EHR. After data analysis and reflecting on responses from the participants, the researcher applied the conceptual framework to assist in the development of appropriate themes. The emerging themes were related to most of the elements depicted in the conceptual framework.

Figure 5 indicates the relevant elements from the conceptual framework are ticked in green to specify that it was used in the data analysis process and shows how to relate to the data analysed. The conceptual framework depicts two main circles. The inner-circle represents perception, while the outer circle represents readiness. The figure aims to inform the reader how elements mentioned on the inner spheres, may influence perceptions and ultimately how perceptions may influence readiness.

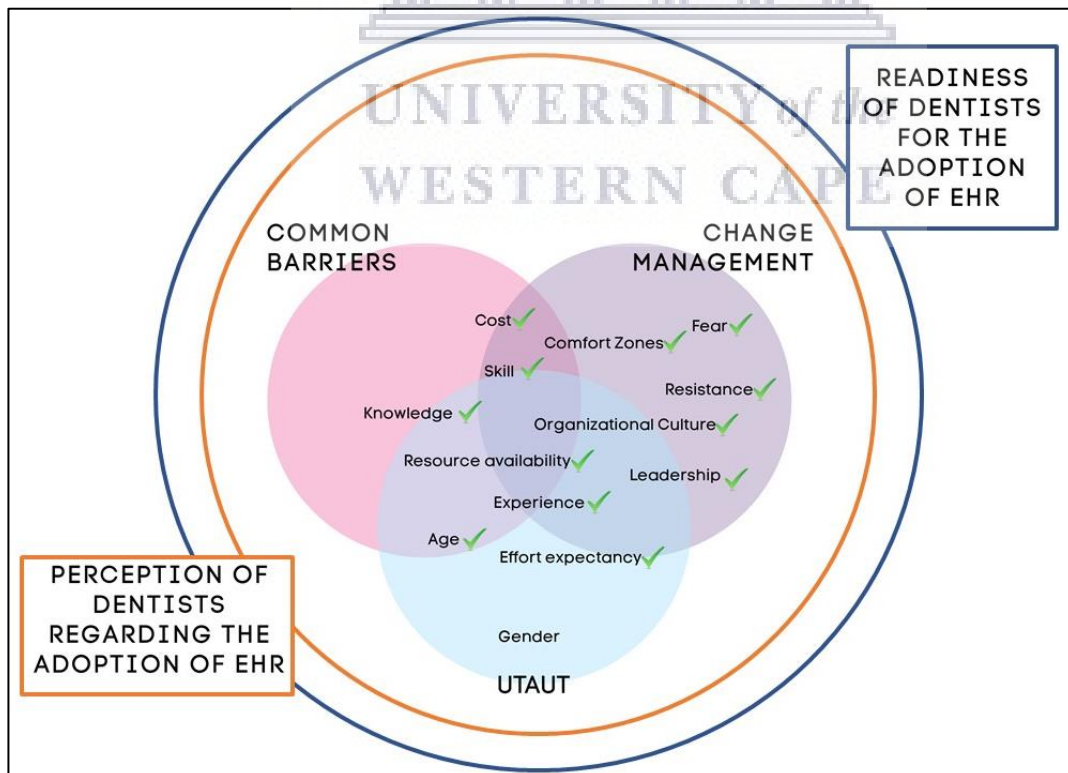


Figure 5: Conceptual Model Review

5.5. Recommendations

5.5.1. Management and Leadership Structures

In point 2.3., the researcher referred to how perceptions may affect readiness status. Therefore, it can be recommended that management and leadership structures probe into the reasons behind the negative perceptions that the research has conducted.

The recommendation is aimed at management and leadership structures, as they are often the enforcers of policies, guidelines, and service reforms. Most participants linked negative experiences in their service areas directly to insufficient support and understanding from management. An intervention might be required to re-establish a working relationship between the dental fraternity and management that aims to understand the service expectations and challenges and address the basic needs of service delivery before attempting to implement EHR. This recommendation ties in with many participants' responses alluding to the lack of managerial support and leadership.

The researcher also strongly recommends probing into the management and leadership aspect of the findings. As many responses mentioned, management does not carry explicit knowledge of dental practices in general. Last mentioned raises the question of whether the dental fraternity being led by non-dental personnel, such as previously practising nurses, is conducive of optimal efficiency in the delivery of dental services.

5.5.2. Resource Distribution

Resource distribution, in terms of procurement and distribution, should be considered that a dental professional is authorised in a consulting capacity to assist the overseeing of procurement. The support could potentially reduce wasteful expenditure and provide dental staff with the correct combination of resources, i.e. a digital radiography system with the correct monitors and software needed to utilise the costly equipment

5.5.3. Record-keeping in public sector

As mentioned in point 2.6.1. – 2.6.3., the public and private healthcare sectors of South Africa function fundamentally different when it comes to record-keeping practices. Focusing on the dental fraternity of both public and private sectors, the fundamental difference of record-keeping practices is also evident. From the researcher experience of serving the public as an employee of both sectors, most private practising dental surgeries are more inclined to have adopted an EHR system of some sort. However, there is no standard of

functionality, which leave the choice of the system entirely up to the preference of each private dental practitioner.

In the public health dental set up, there was the fragmentation of information due to unstandardized practices across the board. In the setting where this research was conducted, PHCIS is not utilised for record-keeping, and paper-based files remain the norm. The potential to utilise the existing EHR system for dental record-keeping exists. However, this would require additional features and interfaces to be engineered into PHCIS according to dental-specific requirements.

Making use of a real-life experience of the researcher by observation and participation over years of service, the following example sheds light on the challenges of a paper-based record-keeping system on the service delivery platform. The clinician receives a duplicate folder with no medical history; thus, management of the patient is compromised by the loss of vital health information relating to the patient's health status. The lack of medical history is the first obstacle that contributes to this problem. After the duplicate folder returns to the administration for filing, there is a failure to merge the duplicate folder with the original folder that is often found later. Thus, the second obstacle arises. Failure to merge duplicate and original folders will contribute to the problem of lost patient history. It will once again create compromised clinical decision making and treatment when the patient returns for the next visit. Compromised clinical decision making and treatment strategies resulting from loss of patient records or a disruption in the continued management of patients can significantly attribute to service delivery becoming compromised as well.

From the experience of the researcher, the misplacement of patient folders begins and ends with administration staff. Often a lack of human resource support creates delays in service delivery and creates room for filing errors to occur. Other issues exist that relates to the low work ethic of admin staff due to a lack of enforced accountability. Accountability can only be enforced by leadership structures such as the supervisor of administration or the facility manager. Poor governance will have challenges in fostering good work ethics and accountability among staff members, even though it is in the interest of facility leadership to have efficient admin processes to contribute to proper service delivery.

The process of manual information management is linear. It has three major role players – File collecting clerk, Filing Clerk, and the Retrieval Clerk. Should the file collecting clerk fail to collect the files, the filing clerk cannot file records and retrieval cannot be done. This will, in turn, impact the quality of service delivery in terms of patient waiting time when folders

need to be retrieved as well as on a clinical level where clinical decision making becomes compromised when a disruption exists in flow of patient history. This information management problem faced can cause patients to lose trust within the system and become despondent that leads to poor compliance or complete default. Even though this conclusion is derived from personal experience within the field also focussed on in this study, researcher bias was mitigated as much as reasonably possible by drawing conclusions that strongly represents the voices of the majority of respondents.

5.5.4. Future Research

The researcher noted that there is a gap in research regarding the business operational aspect of dental practices in South Africa, such as EHR adoption studies. The researcher anticipates that this study could potentially serve as motivation or commencing point of future researchers to indulge in the research of the same nature. The research could potentially assist in uplifting the occupation by enabling research-based conversation on a larger platform when discussing IT regarding primary or holistic healthcare

5.6. Limitations

Time constraints were a significant limitation. Furthermore, the willingness of participants to take part in the study hindered the progression of the research. Only five out of the seven identified samples agreed to partake in the study. The reasons for non-responding partakers

are unclear.

5.7. Declaration of Interest

The researcher has no interests in any corporate entities. Thus, there was no financial gain or other advantages derived from researching the respective topic. The researcher held no position in any entities. The funding of the research was exclusively dependent on the researcher self. The research was conducted for academic exploration in the field of advanced research for writing thesis papers on the masters' level.

5.8. Relevance Statement

By understanding the readiness and perceptions of dentists regarding the adoption of EHRs, it could provide useful insights into the efforts and strategies that could be considered for the successful adoption of EHRs.

5.9. Conclusion

In conclusion, when considering the literature reviewed, it becomes clear how perceptions and readiness are interlinked and how one cannot be achieved entirely without being dependent on a positive version of the other. The findings of this study bare a strong correlation to the

literature reviewed in respect of common barriers that emerged strongly throughout the data analysis as in the literature reviewed. Regarding the correlation between the study and the literature reviewed, it is noted that a limited amount of credible research exists that pertain to dentistry, especially regarding the adoption of EHRs within the public health sector in the South African context.

The overall assumption drawn from the research is that the sample population have more negative perceptions than positive ones regarding the adoption of EHRs. Therefore, it can be further assumed that they are in fact, not ready for the adoption of EHR. The readiness status had main categories that affected it. The researcher has classified it, namely resource and personal factors about existing perceptions of dentists. Resource factors that affect the readiness status include the availability of and access to IT, fear of change leading to resistance and computer literacy issues. Personal factors of existing perceptions of dentists included age, years of service and experience, effort expectancy and perception of time consumption.

Resource factors that affect the readiness status can be addressed with less effort than changing the perception of the dentists to prepare themselves for a state of readiness.

The challenge for success lies in the strategies that need to be put in place to change the existing negative perceptions regarding the adoption of EHR to have a more positive readiness status. The change in management regarding data collection by using EHRs will only be achieved through leadership and management efforts that strategically aim to include all stakeholders, especially end-users, in the process of service reforms to ensure a pleasant introduction to change and change management strategies that will address the specific fears existing among dentists regarding the adoption of EHR.

6. REFERENCE LIST

- Aceto, G., Persico, V. & Pescapé, A. 2020. Industry 4.0 and Health: Internet of Things, Big Data, and Cloud Computing for Healthcare 4.0. *Journal of Industrial Information Integration*, 18, p.100129.
- Akbal, A. and Akbal, E., 2016. Scalable Data Storage Analysis and Solution for Picture Archiving and Communication Systems (PACS). *International Journal of Information and Electronics Engineering*, [online]6(5), pp.285-288. Available at:<https://www.researchgate.net/publication/316533120_Scalable_Data_Storage_Analysis_and_Solution_for_Picture_Archiving_and_Communication_Systems_PACS> [Accessed 14 May 2020].
- Anderson, M. 2017. Risk vs. Reward: The Psychology of Bitcoin — Integrated Psych Solutions. [Online] Integrated Psych Solutions. Available at:<<https://www.integratedpsychsolutions.com/ipsblog/2017/12/12/risk-vs-reward-the-psychologyof-bitcoin>> [Accessed 17 April 2020].
- Annum, G. 2014. Research Instrument for Data Collection. Ghana: Kwame Nkrumah University of Science and Technology.
- Arslan, P. & Yildirim, S. 2015. Theoretical Frameworks, Methods, and Procedures for Conducting Phenomenological Studies in Educational Settings. *Turkish Online Journal of Qualitative Inquiry*.6.1=20.10.17569/tojqi.59813.
- Bakker, A.R. 2007. The need to know the history of the use of digital patient data, in particular the EHR. *International Journal of Medical Informatics*, 76(5-6), pp.438-441
- Biruk, S., Yilma, T., Andualem, M. & Tilahun, B. 2014. Health Professionals' readiness to implement an electronic medical record system at three hospitals in Ethiopia: a cross-sectional study. *BMC Medical Informatics & Decision Making*, 14(1), pp. 1-14.
- Boland, R. 1985. Phenomenology: A Preferred Approach to Research in Information Systems. In E. Mumford, R. A. Hirschheim, G. Fitzgerald, & A. T. Wood-Harper (Eds.), *Research Methods in Information Systems* (pp. 193-201). Amsterdam: North-Holland.
- Borgman, C. L. 2010. The Digital Future is Now: A Call to Action for the Humanities. *Digital Humanities Quarterly*, 3(4).
- Bovey, W.H. & Hede, A. 2001. Resistance to organizational change: the role of cognitive and affective processes, *Leadership and Organization Development Journal*, Vol. 22 No. 8, pp. 372382. <https://doi.org/10.1108/01437730110410099>.
- Brad Wray, K., 2010. Kuhn and the Discovery of Paradigms. *Philosophy of the Social Sciences*, [online] 41(3), pp.380-397. Available at:<<https://journals.sagepub.com/doi/10.1177/0048393109359778>> [Accessed 8 April 2020].
- Brooks, A., 2015. *Health Information Management History: Past, Present & Future* | Rasmussen College. [online] Rasmussen.edu. Available at:

<<https://www.rasmussen.edu/degrees/healthsciences/blog/health-information-management-history/>> [Accessed 19 April 2020].

- Bruner, J. and Postman, I., 1949. On the perception of incongruity: a paradigm. *Journal of Personality*, [online] 18(2), pp.206-223. Available at: <<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-6494.1949.tb01241.x>> [Accessed 12 March 2020].
- Buchanan, F. and DeVito, J., 2009. *Communication Skills in Social Work and Human Services*. 12th ed. New York: Pearson, pp.62-71. C. Van der Walt, H.I. Brink & G. Rensburg. 2012. *Fundamentals of Research Methodology for Healthcare Professionals*. 3rd ed. Cape Town: Juta & Company Ltd.
- Carnicero, J., Blanco, O. & Mateos, M. 2006. The application of information and communication technologies to clinical activity: Electronic health and clinical records. *Pharmaceuticals Policy & Law*, 8(1), pp. 69-82.
- Cherny, A. 2010. Risk-reward optimizing with discrete-time coherent risk. *Mathematical Finance*, 20(4), pp.571-595.
- Cline, G. B. & 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), pp. 13-13.
- Choi, K. 2019. *The Cost Benefits of EHR Software*. [Online] Recordnations.com. Available at: <<https://www.recordnations.com/2017/08/cost-benefits-ehr-software/>> [Accessed 17 April 2020].
- Chowles, T. 2014. *Western Cape Leads the Continent with PHCIS - Ehealth News ZA*. [Online] eHealth News ZA. Available at: <<https://ehealthnews.co.za/western-cape-leads-continent-primary-caresolution-2/>> [Accessed 17 April 2020].
- Chowles, T. 2018. *To Build or Buy, That Is the Question - Ehealth News ZA*. [Online] eHealth News ZA. Available at: <<https://ehealthnews.co.za/build-buy-question/>> [Accessed 17 April 2020].
- Cohen, R., Lynch, S., Bygrave, H., Eggers, E., Vlahakis, N., Hilderbrand, K., Knight, L., Pillay, P., Saranchuk, P., Goemaere, E., Makakole, L. & Ford, N. 2009. Antiretroviral treatment outcomes from a nurse-driven, community-supported HIV/AIDS treatment programme in rural Lesotho: observational cohort assessment at two years. *Journal of the International AIDS Society*. [Online] 12(1), p.23. Available at: <<https://onlinelibrary.wiley.com/doi/full/10.1186/1758-2652-12-23>> [Accessed 7 December 2019].
- Conmy, A. 2018. South African health care system analysis. *Public Health Review*. [Online] 1(1), pp.1-8. Available at: <http://file:///C:/Users/56213051/Downloads/1568-Article%20Text-4255-1-1020181130.pdf> [Accessed 17 April 2020].
- Eriksson, M. and Lindstrom, B., 2008. A salutogenic interpretation of the Ottawa Charter. *Health Promotion International*, [online] 23(2), pp.190-199. Available at: <<https://pubmed.ncbi.nlm.nih.gov/18356285/>> [Accessed 13 February 2020].
- Evans, R. S. 2016. Electronic Health Records: Then, Now, and in the Future. *Yearbook of medical informatics, Suppl 1(Suppl 1)*, S48–S61. <https://doi.org/10.15265/IYS-2016-s006>.

- Fenton, S. H., & Smith, D. H. (2019). Evidence-based Operations Management in Health Information Management: A Case Study. *Perspectives in health information management*, 16(Fall), 1f.
- Flick, U., n.d. *An Introduction to Qualitative Research*. 4th ed. London: SAGE Publication, pp.18-25.
- Flite, C. A., & Harman, L. B. 2013. Code of ethics: principles for ethical leadership. *Perspectives in health information management*, 10(winter), 1d.
- Galletta, A., 2013. *Mastering the Semi-Structured Interview and Beyond*. 1st ed. New York: New York University, pp.26-38.
- Ghazisaeidi, M., Ahmadi, M., Sadoughi, F. & Safdari, R. 2014. An assessment of readiness for preadoption of the electronic health record in Iran: a practical approach to adoption in general and teaching hospitals. *Acta Medica Iranica*, 52(7), pp. 532-544.
- Giovagnoli, R., Crucitti, A. & Dodig-Crnkovic, G. 2019. Robotics and the quality of life : the case of robotics-assisted surgery. *Philosophical Inquiries*, 7(1), 77–87.
- Gray, A. & Vawda, Y. 2017. Health Policy and Legislation. In: Padarath A, Barron P, editors. South African *Health Review*. Durban: Health Systems Trust; 2017. URL: <http://www.hst.org.za/publications/south-african-health-review-2017>.
- Griffith, J. 2001. Why change management fails. *Journal of Change Management*, 2(4), pp. 297-304.
- Hailey, D., Yu, P. & Munyisia, E. 2014. Pre-adoption investigation of the readiness of allied health professionals to adopt electronic health records. *Studies in health technology and informatics*, Volume 204, pp. 47-53.
- Hollander, J.E. & Carr, B.G. 2020. Virtually Perfect? Telemedicine for Covid-19. *N Engl J Med*, 382(18), pp. 1679-1681.
- Jacobs, L. Interview with Lawrence Weed, MD- The Father of the Problem-Oriented Medical Record Looks Ahead. *Perm J*. 2009; 13(3):84-89.
- Kaipio, J., Kuusisto, A., Hyppönen, H., Heponiemi, T. & Lääveri, T. 2020. Physicians and nurses' experiences on EHR usability: Comparison between the professional groups by employment sector and system brand. *International Journal of Medical Informatics*, 134, p.104018.
- Kallio, H., Pietilä, A.-M., Johnson, M. & Kangasniemi, M. (2016) Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing* 72(12), 2954– 2965.
- Karara, G., Verbeke, F. & Nyssen, M. 2015. The Role of Hospital Information Systems in Universal Health Coverage Monitoring in Rwanda. *Studies in Health Technology & Informatics*, Volume 216, pp. 193-197.
- Katurura, M. & Cilliers, L. 2018. Electronic health record system in the public health care sector of South Africa: A systematic literature review. *African Journal of Primary Health Care & Family Medicine*, 10(1).

- Katuu, S. 2016. Transforming South Africa's health sector. *Journal of Science and Technology Policy Management*, [online] 7(3), pp.330-345. Available at: <https://www.researchgate.net/publication/309540853_Transforming_South_Africa's_health_sector_The_eHealth_Strategy_the_adoption_of_electronic_document_and_records_management_systems_EDRMS_and_the_utility_of_maturity_model> [Accessed 23 March 2020].
- Keyworth, C., Hart, J., Armitage, C. & Tully, M. 2018. What maximizes the effectiveness and adoption of technology-based interventions to support healthcare professional practice? A systematic literature reviews. *BMC Medical Informatics and Decision Making*, 18(1).
- Khan, S.Z., Shahid, Z., Hedstrom, K. and Andersson, A. (2012), Hopes and Fears in Adoption of Electronic Health Records in Bangladesh. *The Electronic Journal of Information Systems in Developing Countries*, 54: 1-18.
- King, K., Patel, V., Jamoom, E. W. & Furukawa, M. F. 2014. Clinical Benefits of Electronic Health Record Use: National Findings. *Health services research*, 49(1), pp. 392-404.
- King, J., Patel, V., Jamoom, E. & Furukawa, M. 2013. *Clinical Benefits of Electronic Health Record Use: National Findings. Health Services Research*. [Online] 49(1pt2), pp.392-404. Available at: <<https://onlinelibrary.wiley.com/doi/abs/10.1111/1475-6773.12135>> [Accessed 17 April 2020].
- Krickeberg, K. 2007. Principles of health information systems in developing countries. *The HIM Journal*, 36(8), pp. 8-20.
- Kruse, C., Kristof, C., Jones, B., Mitchell, E. & Martinez, A. 2016. Barriers to Electronic Health Record Adoption: A Systematic Literature Review. *Journal of Medical Systems*, 40(12).
- Kuhn, T., 1962. *Structure of Scientific Revolutions, The*. 1st ed. Chicago: University of Chicago Press, p.111.
- Leedy, P. D. & Ormrod, J. E. 2010. *Practical Research: Planning and Design*. 9th ed. Boston: Pearson education.
- Levin, S. 2018. Successes & Barriers with EHR Adoption – Q&A: Question: utline the Key Barriers to Successful EHR Adoption in Hospitals and Medical Practices? [Online] [Beckershospitalreview.com](https://www.beckershospitalreview.com). Available at: <<https://www.beckershospitalreview.com/healthcareinformation-technology/successes-barriers-with-ehr-adoption-q-a.html>> [Accessed 17 April 2020].
- Liebenberg, J., Benadé, T. & 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.
- Marais, M. 2016. *ProfNet Medical*. [Online] Profnetmedical.co.za. Available at: <<https://www.profnetmedical.co.za/news/2018/hpcsaguidelines-on-record-keeping/>> [Accessed 17 April 2020].

- McClanahan, C. 2012. *The Medical Record (R) Evolution*. [Online] Forbes. Available at: <<https://www.forbes.com/sites/carolynmcclanahan/2012/02/21/the-medical-recordrevolution/#6fb34d894933>> [Accessed 7 July 2020].
- Mcdonald, C.J., Marc Overhage, J., Barnes, M., Schadow, G., Blevins, L., Dexter, P.R., Mamlin, B., The Inpc, M.C. And The Inpc, M.C., 2005. The Indiana Network For Patient Care: A Working Local Health Information Infrastructure. *Health Affairs*, **24**(5), Pp. 1214-1220.
- McDonald, C. J., Marc Overhage, J., Tierney, W. M., Dexter, P. R., Martin, D. K., Suico, J. G., Zafar, A., Schadow, G., Blevins, L., Glazener, T., Meeks-Johnson, J., Lemmon, L., Warvel, J., Porterfield, B., Warvel, J., Cassidy, P., Lindbergh, D., Belsito, A., Tucker, M., ... Wodniak, C. (1999). The Regenstrief Medical Record System: A quarter century experience. *International Journal of Medical Informatics*, *54*(3), 225-253.
- Menachemi, N. 2006. Barriers to ambulatory EHR: who are 'imminent adopters' and how do they differ from other physicians? *Journal of Innovation in Health Informatics*, *14*(2), pp.101-108.
- Menachemi, N., Ford, E. W., Beitsch, L. M., & Brooks, R. G. (2007). Incomplete EHR Adoption: Late Uptake of Patient Safety and Cost Control Functions. *American Journal of Medical Quality*, *22*(5), 319–326.
- Moustakas, C. 1994. *Phenomenological Research Methods*. 1st ed. United Kingdom: SAGE Publications Inc, pp.103-190.
- Olsen, M.E., Lodwick, D.G., Dunlop, R.E. 1992. Viewing the world Ecologically. Westview Press, Boulder, CO. 214 pages. ISBN: 0-8133-8298-X. \$28.00' (1993) *Bulletin of Science, Technology & Society*, *13*(4), pp. 245–246
- Omachonu, V. & Shatlock, K. 2012. Adoption of Electronic Health Record System at a Community Healthcare Organization. *International Journal of Innovation in the Digital Economy*.
- Paek, H.J. & Hove, T., 2017. Risk perceptions and risk characteristics. In *Oxford Research Encyclopaedia of Communication*.
- Reeves, T.C. & Hedberg, J.C. 2003. *Interactive Learning Systems Evaluation*, Educational Technology Publications, Englewood Cliffs, New Jersey.
- Rossouw, H. 2014. Province's Award-Winning Patient Database Shares Information Across Clinics. [Online] Western Cape Government. Available at: <<https://www.westerncape.gov.za/news/province%E2%80%99s-award-winning-patientdatabase-shares-information-across-clinics>> [Accessed 15 April 2020].
- Ryan, G. 2018. Introduction to positivism, interpretivism and critical theory. *Nurse Researcher*. 25. 1420. 10.7748/nr.2018.e1466.
- Schleyer, T., Song, M., Gilbert, G. H., Rindal, D. B., Fellows, J. L., Gordan, V. V. & Funkhouser, E. 2013. Electronic dental record use and clinical information management patterns among practitionerinvestigators in The Dental Practice-Based Research Network. *Journal of the American Dental Association (1939)*, *144*(1), 49–58.
- Seeley, B. 2009. Introducing a Computer-Based Electronic Record: Perceptions of Clinicians. *Urologic Nursing*, *29*(5), pp. 329-352.

- South African Department of Health. 2004. *National Health Act 61 of 2003*. Cape Town: Government Gazette, pp.1-48.
- Tavares, A.I. 2018. EHealth, ICT and its relationship with self-reported health outcomes in the EU countries. *International journal of medical informatics*, 112, pp.104-113.
- The University of Scranton Online. 2017. *7 Benefits of Electronic Health Records for Hospitals*. [Online] Available at: <https://elearning.scranton.edu/resource/health-human-services/7-benefitselectronic-health-records> [Accessed 17 April 2020].
- Thorpe, J., Gray, E. & Cartwright- Smith, L. 2016. Show Us the Data: The Critical Role Health Information Plays in Health System Transformation. *Journal of Law, Medicine & Ethics*, 44(4), pp. 592-597.
- Urowitz, S., Wiljer, D., Apatu, E., Eysenbach, G., Delenardo, C., Harth, T., Pai, H. & Leonard, K. J. 2008. Is Canada ready for patient accessible electronic health records? A national scan. *BMC medical informatics and decision making*, 8, 33. <https://doi.org/10.1186/1472-6947-8-33>
- Vishwanath, A. & Scamurra, S. 2007. Barriers to the adoption of electronic health records: using concept mapping to develop a comprehensive empirical model. *Health Informatics Journal*, [online] 13(2), pp.119-134. Available at: <https://pdfs.semanticscholar.org/8980/c2cfcec8c8bba7fe23657944a6a941851bfd.pdf> [Accessed 15 April 2020].
- Venkatesh, V. 2016. Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead. *Journal of the Association for Information Systems*, 17(5), pp. 328-376.
- Venkatesh, V., Morris, M. G., Gordon, B. & Davis, F. D., 2003. *User Acceptance of Information Technology: Toward a Unified View*. *MIS Quarterly*, 27(3), pp. 425-478.
- Western Cape Government. 2013. *Healthcare 2030: A Future Health Service for the Western Cape*. [Online] Available at: <https://www.westerncape.gov.za/news/healthcare-2030-future-healthservice-western-cape> [Accessed 20 March 2020].
- WHO. 2015. Minimum data sets for human resources for health and the surgical workforce in South Africa's health systems. [Online] Available at: https://www.who.int/workforcealliance/031616south_africa_case_studiesweb.pdf [Accessed 17 April 2020].
- Wilson, J. 2019. You Searched for Benefits of EHR For Physicians in Improving Quality - Sybrid MD. [Online] Sybrid MD. Available at: <https://sybridmd.com/?s=benefits+of+EHR+for+physicians+in+improving+quality> [Accessed 17 April 2020].
- Yang, P., Chu, F., Liu, H., Shih, M., Chen, T., Chou, L. and Hwang, S., 2019. Features of Online Hospital Appointment Systems in Taiwan: A Nationwide Survey. *International Journal of Environmental Research and Public Health*, 16(2), p.171.
- Yogeswaran, P. & Wright, G. 2010. EHR adoption in South Africa: how do we get it right? *Studies in health technology and informatics*, Volume 160, pp. 396-400.

Appendix A

Table 4: Interview QuestionsThe following was the guiding questions to the interviewees:

1	What type of record-keeping practices do you follow as a clinician prescribed by your facility (paper-based, folders, single sheets, electronic records)?
2	Do you feel that the current record-keeping system is effective? Please mention why said yes/no.
3	Thinking of EHR (electronic health records), only if not already in use, do you think it can benefit or impair your current record-keeping system? 1. Do you think that the EHR helps you to retrieve patient information more rapidly compared to a paper format record?
	<p>2. Do you think that using an EHS would affect the quality of your decision-making process because one can gain access to patient history faster and so forth?</p> <p>3. Do you think that EHR systems are easy or difficult to use?</p> <p>4. Have you gone on training courses with regards to using an EHS?</p> <p>5. If you had a choice, which type of system would you want to use?</p>
OR	QUESTION 4 ONLY APPLICABLE IF EHR IS ALREADY IN USE, PLEASE CONTINUE AT QUESTION 5 IF NOT APPLICABLE TO YOU.
4	Please elaborate on your experience using EHR. 1. Comment on the easiness or difficulty to use. 2. Do you feel it saved time regarding clinician admin time and patient waiting time, or did it prolong the process? 3. Did you have access to support services? Do you feel having support services available would make the experience more pleasant or detrimental?
5	If you can choose, would you prefer EHR or paper-based record-keeping and why?

6	If the public health sector were to implement EHR for dentistry, do you feel the service delivery will generally be improved or worsened and why?
7	If the public health sector were to implement EHR for dentistry, what do you think will be common challenges to the success of it regarding <ol style="list-style-type: none"> 1. Usage of the dental staff 2. Other factors- please mention
8	Imagine a scenario: Integrated patient records available online. Dentists can access a patient record at any workstation and view all past treatments and scripts related to dentistry as well as chronic medication. Do you think this type of information can be helpful to clinical decision making and why?
9	Do you think technological advancement is important for dentistry and other healthcare practices?
10	Do you think that patient information is more secure and confidential with an EHS?
11	Do you think that the patient waiting time to see healthcare professionals has/ will decrease with an EHS?
12	How often do you use your personal / work email? (if you have one)
13	Do you have any IT devices (smart mobile device, laptop, tablet, etc.) and why did you choose to use that specific type of information technology that you have chosen?
14	When last did you attend a workshop or training opportunity related to operating any computer-based systems?
15	Do you have access to IT (information technology) in your work environment? If yes: <ol style="list-style-type: none"> 1. What kind of IT? 2. How easy/ difficult is it to access? 3. How far / close is it to your direct workstation? 4. Do you share IT with other users? If yes, how many more or less?

Appendix B

Table 5: Participant Statements Statements of participants

Selected statements
Statement 1
I have only ever worked with paper folders my entire career as a dentist.
Statement 2
We don't even have a computer in the dental clinic that I work.
Statement 3
I think using electronics to record patient treatment will take much longer.
Statement 4
Entering patient information into a computer will be effort. How will you even find it again?
Statement 5
The last time I worked on a computer for work-related things was in my first year of dental school. That was 37 years ago.
Statement 6
Paper-based records have worked for the 20 years I've been in this service, why do you want to change things and confuse everyone?
Statement 7
The electronic record won't work because we only have 1 computer for 3 clinicians.
Statement 8
A challenge will be getting the older generation out of their comfort zones.
Statement 9
I don't understand why people won't be able to use electronic records if everyone is confident to use a smartphone with apps.
Statement 10

Maybe if government dentists were given the opportunity to evolve with technology, introducing new concepts like this won't be such a hassle. We have been neglected.

Statement 11

IT things are difficult.

Statement 12

I have enough work; I'm not interested in computers also.

Statement 13

It will be time consuming.

Statement 14

I think it will be difficult. I don't have much experience with computer stuff.

Statement 15

It will be wonderful for continuity in patient care if info can be recalled quickly.

Statement 16

I use my personal email weekly.

Statement 17

I am used to making clinical decisions on the spot; why must I use a computer to help me?

Statement 18

I like how our system works now.

Statement 19

My years are almost over. Maybe the young ones who take over will be keener on it.

Statement 20

If support services for electronic health records take as long as for other things in government, it will fail definitely.

Statement 21

I would love to stop working with papers. Writing all notes takes so long.

Statement 22

It would be so much effort to put information in manually.

Statement 23

I can type documents in word, but that is about it.

Statement 24

It can work if people get the right training to work the system.

Statement 25

The closest computer to my workstation is in the reception area of admin. I will have to leave my unit to access a pc that will be in use already by another staff member whose actual workstation it is.

Statement 26

I have never worked with electronic health records. The idea of it makes me a bit nervous because it means I will have to do things differently.

Statement 27

I only used the pc at work once to Google directions to another clinic because my smartphone battery died. I had to wait 45 minutes for a pc to become available.

Statement 28

I use my pc at home, but I often ask my children to help me when I don't know what to do. The printer is, of course, a nightmare.

Statement 29

Don't change a thing that works. It creates instability and service disruptions.

Statement 30

My children tried to teach me how to read emails on my phone, but I'm not there yet. I'm still learning about the WhatsApp.

Statement 31

It can make patient care so much easier and make record-keeping effortless. I think it will be easy to use.

Statement 32

This paper-based record-keeping needs to change. This is 2019- people are doing brain surgery with remote control, why can't dentists' type in what tooth they extracted on a computer?

Statement 33

It doesn't bother me because my assistant does the record-keeping.

Statement 34

The paper-based system has worked for me, I can't complain.



UNIVERSITY of the
WESTERN CAPE