NELSON MANDELA
UNIVERSITY

UNDERSTANDING FACTORS THAT INFLUENCE THE ACCEPTANCE OF ELECTRONIC MEDICAL RECORDS BY NURSES IN HOSPITALS: A FRAMEWORK

By

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DECLARATION:

In accordance with Rule G4.6.3, I hereby declare that the above-mentioned thesis is
my own work and that it has not previously been submitted for assessment to
another University or for another qualification.

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ABSTRACT

Globally, unlike in the past, it is rare for a patient to consult the same healthcare provider throughout his or her lifetime. However, this makes it difficult to maintain informational continuity of care. Researchers have confirmed that paper-based methods of record keeping do not meet the needs of informational continuity of care.

As a result, the popularity of electronic means of recordkeeping, specifically, electronic medical records (EMRs), is growing. However, the implementation of EMRs in hospitals is not without challenges with these challenges playing a significant role in the failure of EMRs. One such challenge is a lack of user acceptance.

Research reveals that nurses comprise the largest user group of EMRs in the hospital setting. However, there is inadequate literature that focuses on the factors contributing to EMR acceptance with nurses as the user group. Hence, the main problem addressed in this research study relates to the inadequate understanding of the factors that influence the acceptance of EMRs by nurses.

In order to address this problem, a literature review and a case study were conducted to ascertain and investigate the factors that influence the acceptance of EMRs by nurses. A total of 39 factors were formulated. Subsequent to the formulation of these factors, knowledge on the impact of each factor on EMR acceptance was collected. Socio-technical Systems Theory (STS) was used as a theoretical lens through which to view the resulting factors. The STS dimension from which each factor originates as well as the STS dimension influenced by the factor were identified. The analysis of the different stages of acceptance as well as the STS analysis resulted in a framework that could play an important role in providing a better understanding of EMR acceptance by nurses in hospitals.

It was anticipated that this study would contribute to a better understanding of the factors that hospitals should address in order to create a conducive environment for EMR acceptance by nurses within the hospitals.

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ACRONYMS AND ABBREVIATIONS

ANM   : Assistant Nursing Manager

CoC   : Continuity of care

DoH   : Department of Health

EHR   : Electronic health record

EMR   : Electronic medical record

EN   : Enrolled nurse

HI   **:** Health Informatics

HIS   : Health Information Systems

IALCH   : Inkosi Albert Luthuli Central Hospital

ICU   : Intensive care Unit

IT   : Information technology

KZN   : KwaZulu-Natal

NA   : Nursing assistant

NHI   : National Health Insurance (NHI)

NM   : Nursing manager

NMU   : Nelson Mandela University

OM   : Operational manager

O & G   : Obstetrics and gynaecology

OPD   : Out Patient Department

PAEDS   : Paediatrics

PHR   : Personal health record

PHRC   : Provincial Health Research Committee

RN   : Registered nurse

RO   : Research objective

RQ   : Research question

SA   : South Africa

STS   : Socio-technical Systems Theory

TAM   : Technology Acceptance Model

UTAUT   : Unified Theory of Acceptance and Use of Technology

CHAPTER 1

1. INTRODUCTION

Ch. 1
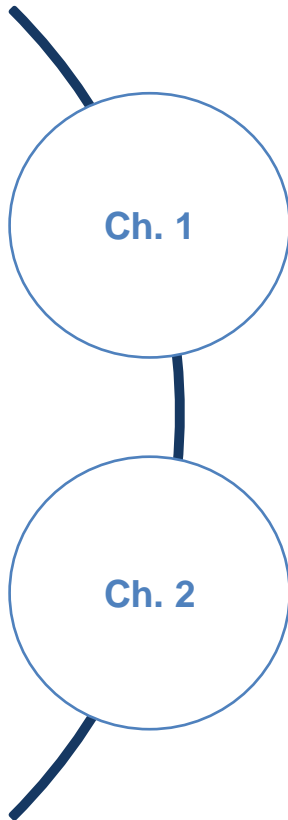
The purpose of this chapter is to provide a brief introduction and context to the study. This is done by discussing the background of the study as well as stating the problem addressed in the study. The research problem is linked to an overarching research question and research objective. The chapter is concluded by defining the scope of this research study; the ethical considerations taken into account and the chapter layout.

Ch. 2

Chapter 2 focuses on the theoretical framework that influenced the execution of this research study.

1.1. Background

Globally, unlike in the past, it is rare for a patient to consult the same healthcare provider throughout his or her lifetime, often referred to as healthcare provision "from the cradle to the grave" of a patient (Mostert-Phipps, Pottas & Korpela, 2012; Shapiro & Kuperman, 2011). However, patients today tend to move between healthcare providers because of a variety of reasons (Masango-Makgobela, Govender, & Ndimande, 2013; Medical School, 2003; National Transitions of Care Coalition, 2010; Naylor & Keating, 2008; Picton & Wright, 2012). The Joint Commission (2013) terms this movement the "transition of care". However, this transition of care is resulting in fragmentation in the provision of patient healthcare and, thus, challenges to the continuity of care (CoC) (Cebul, Rebitzer, & Lowell, 2008; Haggerty et al., 2003; Olsen, Hellzén, Skotnes, & Enmarker, 2014).

Although various researchers describe CoC in different ways, it is, nevertheless, possible, from their descriptions, to establish that CoC revolves around three common important dimensions, namely, the informational, interpersonal and longitudinal dimensions (Stumberg, 2003; Freeman et al., 2001; Bowen, et al., 2015).

Traditionally, the exchange of information between healthcare providers regarding the needs of a patient was of a verbal nature. However, this mode of information exchange is becoming "obsolete" over time (Bjorvell, 2002). According to Stumberg (2003) and Mostert-Phipps et al. (2012), the informational dimension of CoC revolves around maintaining accurate patient health records as well as the communication that takes place between various healthcare providers regarding a patient. The Health Professions Council of South Africa (HPCSA) (2008) defines a health record as "any relevant record made by a health care practitioner at the time of or subsequent to a consultation and/or examination or the application of health management" (p. 5). The council further indicates that the following documents are deemed to be essential components of a health record (HPCSA, 2008):

- Audio-visual records;
- Clinical research forms and clinical trial data;
- Death certificates and autopsy reports;
- Hand-written synchronous notes captured by the healthcare provider;
- Laboratory reports and other laboratory evidence;

- Notes taken by previous healthcare providers, including a typed patient discharge summary;
- Other forms completed during the healthcare interaction; and
- Referral letters to and from other healthcare providers.

Thus, a health record, also referred to as a "medical record", is a record that contains critical information and, hence, it ensures the continuity of care (HPCSA, 2008).

The interpersonal dimension of CoC involves the various relationships between all participants who directly interact with the patient during the provision of care. This interaction may be professional or personal, such as the professional relationship between the patient and the healthcare provider(s); the personal relationship between the patient and his or her family member(s); and the professional relationship between the healthcare provider(s) and the family member(s) of the patient.

The longitudinal dimension involves documenting the healthcare provided to a patient over a period of time. This dimension revolves around the fact that the patient will consult with the same healthcare provider over a prolonged period, therefore leading to the existence of a full patient record. Thus, the longitudinal dimension aims to provide a healthcare provider with extensive knowledge about a patient that was accumulated over a period of time, therefore enabling the healthcare provider to meet the healthcare needs of the patient appropriately.

Together the three dimensions of CoC make the continuity of patient care possible. Informational continuity is a pre-requisite to longitudinal continuity because it is impossible to have an extensive medical record of a patient over a period of time without information. On the other hand, longitudinal continuity is also a pre-requisite to interpersonal continuity because, the longer the duration of healthcare provision, the more knowledge a healthcare provider acquires about the patient. This knowledge then informs the healthcare offered to the patient. Consequently, these dimensions may be likened to "gears" that work together in order to perform their intended task – See Figure 1-1. In this case, unless the informational "gear" moves, the longitudinal and interpersonal "gears" will lack mobility.
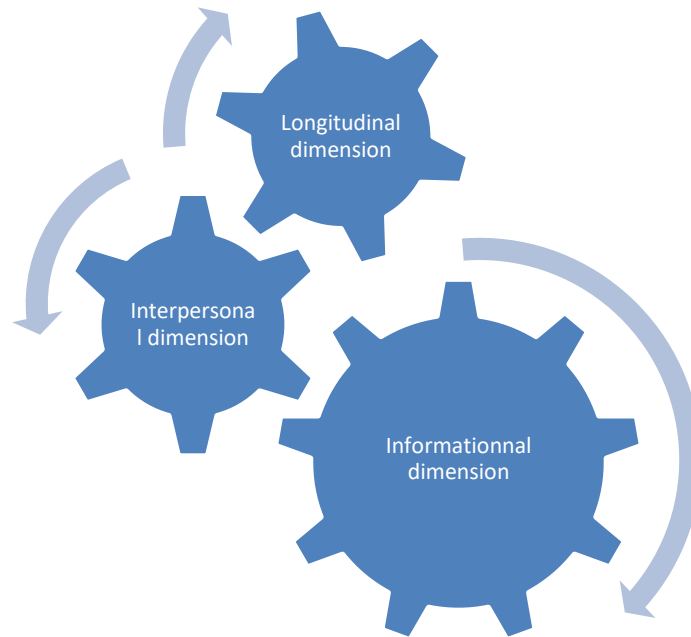
Figure 1-1: Three common important dimensions of continuity of care (CoC)

As already noted, it is rare for a patient to consult the same healthcare provider over his or her lifetime, thus making it difficult to achieve both interpersonal and longitudinal continuity of care. Accordingly, in order to set these gears in motion, it is important to achieve informational continuity (Donaldson, 2000; Freeman, Olesen & Hjortdahl, 2003; Mainous III & Gill, 1998; Olsen et al., 2014). However, to achieve this, it is imperative that accurate patient health records are maintained.

Previous research has established that, at the time of the study, many healthcare providers were still relying on paper-based records to capture and store crucial patient information (Cochrane & Ramokolo, 2007; Harman & Cornelius, 2015; Job, Bachmann, Schmid, Thiel, & Ivic, 2013; Mostert-Phipps et al., 2012; US Department of Health and Human Services, 2011). However, Tsai and Bond (2008) maintain that the use of paper-based records may negatively affect CoC and, subsequently, negatively impact on the quality of care patients receive. These writers link problems such as illegibility, incompleteness and poor organisation to paper-based records.

The following additional problems have been linked to the use of paper-based records (Abrams, Bowden, Chamberlain, & MacCallum, 1968; Adesina, Agbele, Februarie, Abidoye, & Nyongesa, 2011; Boonstra & Broekhuis, 2010; De la Harpe, 2008; Dick, Steen, & Detmer, 1997; O'Mahony, Wright, Yogeswaran, & Govere, 2014; Sibanyoni, 2011):

- Consumption of storage space

- Healthcare providers run out of stationery

- Inaccurate data

- Misinterpretation of standard medical jargon and the standardisation of abbreviations

- Negative impact on time available for patient care

- Records are unavailable where and when they are needed

- Time wasted when patients complete duplicate forms, and

- Unnecessary costs due to duplication of tests.

Researchers who understand the importance of maintaining adequate patient records have conducted research that has confirmed that paper-based methods of record keeping do not meet the needs of informational continuity (Helleso & Lorensen, 2005; Schers, Van den Hoogen, Grol, & Van den Bosch, 2006; Sikhondze & Erasmus, 2016). Thus, instead of paper-based records, these researchers have recommended the use of electronic methods to ensure that proper patient records are kept.

There are various electronic methods of keeping patient records. All of these methods play a role in improving informational continuity and, thus, contribute to the improved continuity of patient care (Mostert-Phipps et al., 2012):

- Personal health record (PHR)

  A personal health record (PHR) is an electronic medium that is used by a patient to capture and store his or her own health record. It is possible for this type of record to share information with an electronic medical record (EMR) (Reid, Compton, Grossman, & Fanjiang, 2005).

- Electronic medical record (EMR)

  An electronic medical record (EMR) is an electronic patient medical record that is kept by a specific service provider, e.g. a GP, or clinic or hospital. It is not globally accessible (Research Porter, 2007). These electronic systems may provide medical data in respect of "patient treatment, diagnosis, lab test, history, prescription and allergies that can be accessed from various sites within the organisation" (Mohd, Mastura, & Mohamad, 2005, p. 78). Within hospitals, EMRs may be used for both outpatient and inpatient medical records (Hillestad et al.,

2005). An EMR may exchange information with other electronic methods of keeping patient records, such as an EMR, a PHR and an electronic health record (EHR) (Gasch & Gasch, 2010).

- Electronic health record (EHR)

   An electronic health record (EHR) is similar to an EMR but, unlike an EMR, it is accessible to a broader scope of authorised healthcare providers as patient records are accessible nationally (Boonstra & Broekhuis, 2010; Garets & Davis, 2006). However, to enable this national type of patient medical records it is necessary first to implement EMRs (Graser, 2011). An EHR uses the information that is fed into it, via a health information exchange from EMRs, to form an aggregated patient medical record. Thus, it is essential that efforts be made to institute EMRs in order to eventually aim for an EHR at a national level.

This research study focused on EMRs as kept by a specific service provider, namely, hospitals.

The use of EMRs introduces a number of benefits, including the following (Goodman, 2009; Jackson, 2004; Miller & Sim, 2004; Mills, Vavroch, Bahensky & Ward, 2010):

- Aids in protecting patient confidentiality
- Allows for easier recordkeeping and patient billing.
- Contributes to access to and utilization of patient records
- Enhances CoC
- Improves efficiency of healthcare providers
- Medication reconciliation
- Reduces billing and medical errors, and
- Reduces costs
- Reduces storage needs

Nevertheless, despite these benefits, the implementation of EMRs in hospitals is not without challenges with research revealing that the successful implementation of EMRs in hospitals has been limited (Lapointe & Rivard, 2005; Scott, Rundall, Vogt, & Hsu, 2005). Smelcer, Miller-Jacobs, and Kantrovich (2009) maintain that documentation on failed EMR implementations is limited as institutions are reluctant to publish their failures. The few publications on such failures cite a lack of user

acceptance as an important contributing factor to these failures (Khalifa, 2013; Kumar & Aldrich, 2010; Sumner, 2015; Zaheer & Sayed, 2013). Nurses are the largest user group of EMRs in the hospital setting (Acton, 2013; Furukawa, Raghu, & Shao, 2010; Nelson & Staggers, 2014; Strudwick, Tanimizu, Saraswathy, Yousef, & Nickerson, 2015). In addition, Boone (2010) asserts that "EMR adoption places nurses in a key end-user role" (p. 14). Although all healthcare providers are affected, it would appear that it is the nurses, in particular, who are affected by changes in recordkeeping methods and thus gaining the acceptance from nurses should be the main focus of any such initiatives (Katterhagen, 2013). Nevertheless, there is a lack of literature that explores the factors contributing to the acceptance of EMRs by nurses and, hence, this research study focused particularly on nurses. It is important to note that, for the purposes of this study, "acceptance" is defined as the "willingness within a user group to employ [use] information technology to the tasks it is designed to support" (Dillon & Morris, 1996, para. 4).

1.2.   Problem description

Kirkley and Stein (2004) highlight that there is a lack of literature that focuses on the factors contributing to EMR acceptance with nurses as the targeted user group. Top, Yilmaz, and Gider (2013) echoed the same sentiments. In fact, Acton (2013) goes so far as to state that the lack of literature that investigates the views of nurses on EMRs is lacking globally. Furthermore, a review of existing literature revealed that studies related to the use of EMRs by nurses do not explicitly and comprehensively identify factors affecting EMR acceptance by nurses. This leads to a lack of understanding on the reasons for the acceptance or lack of acceptance of EMRs on the part of nurses.

1.3.   Problem statement

The main problem addressed in this research study related to the inadequate understanding of the factors that influence the acceptance of EMRs by nurses in hospital settings.

1.4.   Research questions (RQs)

The study addressed the following primary research question, namely, what are the constituents of a framework to promote a better understanding of the factors that influence EMR acceptance by nurses?

The following sub-questions were addressed in an effort to answer this main research question:

1. What is the role of nurses in recordkeeping in hospital settings?
2. What factors influence the acceptance of EMRs by nurses?
3. How can these factors be analysed to clarify their influence on EMR acceptance by nurses?

1.5. Research objectives (ROs)

The primary objective of this research study was to create a framework that would contribute to a better understanding of the factors that influence the acceptance of EMRs by nurses.

The sub-objectives of the research included the following:

1. Analyse the role of nurses in recordkeeping in hospital settings;
2. Identify the factors that influence the acceptance of EMRs by nurses; and
3. Analyse these factors in order to clarify their influence on EMR acceptance by nurses.

The theoretical framework and research methodology used in this research study is discussed in detail in Chapters 2 and 3 respectively.

1.6. Research scope and delineation

As noted in section 1.1, research has revealed that the successful implementation of EMRs in hospitals is limited and that the lack of user acceptance is cited as an important contributory factor to such failure. Hence, this research study endeavoured to identify the factors that contribute to EMR acceptance/non-acceptance within hospitals. Furthermore, in view of the fact that research has established that nurses are the largest user group of EMRs in hospitals, in order to realise the objective of this study, the study focused on nurses within a hospital setting. In addition to the reviewing of relevant literature, including international literature, the study also used a case study. This is elaborated on in Chapter 3, section 3.3, but it is important to note that the case study was conducted in South Africa.

1.7.   Ethical considerations

Ethical approval was sought and received from the Nelson Mandela University (NMU) before the research proceeded. In addition, prior to commencing the research at the participating public hospital, permission was sought from, and granted by, the Department of Health (DoH) and the hospital in question. The ethical clearance is presented in Appendix 1 (see CD).

1.8.   Chapter layout

This section presents the layout of the research chapters.

- **Chapter 1: Introduction**

This chapter presented the following topics:
  - Research background or problem areas
  - Problem statement
  - Research questions
  - Research objectives
  - Research scope and delineation
  - Research ethical considerations.

- **Chapter 2: Theoretical framework**

This chapter discusses the theoretical framework that was used when conducting this research study.

- **Chapter 3: Research methodology**

This chapter describes the research process that was followed during the execution of the study as well as the methods that were employed.

- **Chapter 4: Nursing profession in hospitals (Literature review)**

This chapter may be seen as a background chapter, describing the role of nurses in recordkeeping within a hospital setting. This is done through a literature review.

- **Chapter 5: Factors that influence the acceptance of EMRs by nurses (Literature review)**

This chapter identifies the factors that influence the acceptance of EMRs by nurses, as identified in the literature review.

- **Chapter 6: Case study context**

This chapter describes the case study that was conducted as part of this research.

- **Chapter 7: Factors that influence the acceptance of EMRs by nurses (Case study-based)**

This chapter identifies and presents the validated factors that influence the acceptance of EMRs by nurses, as identified by means of a case study.

- **Chapter 8: Understanding EMR acceptance by nurses: A framework**

The purpose of this chapter is to present the findings of the study in the form of a framework. Thus, the factors presented in Chapter 5, gathered from the literature, review, and the factors presented in Chapter 7, gathered by means of a case study, are incorporated into a framework for the purposes a better understanding of the acceptance of EMRs by nurses.

- **Chapter 9: Conclusion**

This chapter concludes the research study by

   o presenting a summary of the research conducted
   o mapping the research objectives to the relevant research chapters;
   o providing a summary of the contributions made by the study and the research significance of the study
   o discussing the trustworthiness of the study
   o presenting the limitations of the study, and
   o making recommendations for future research.

CHAPTER 2

2. THEORETICAL FRAMEWORK

Ch. 1	The previous chapter contained a brief background to the study.
Ch. 2	This chapter presents the theoretical orientation of the study.
Ch. 3	The next chapter will focus on the research methodology utilized during the execution of this research study.
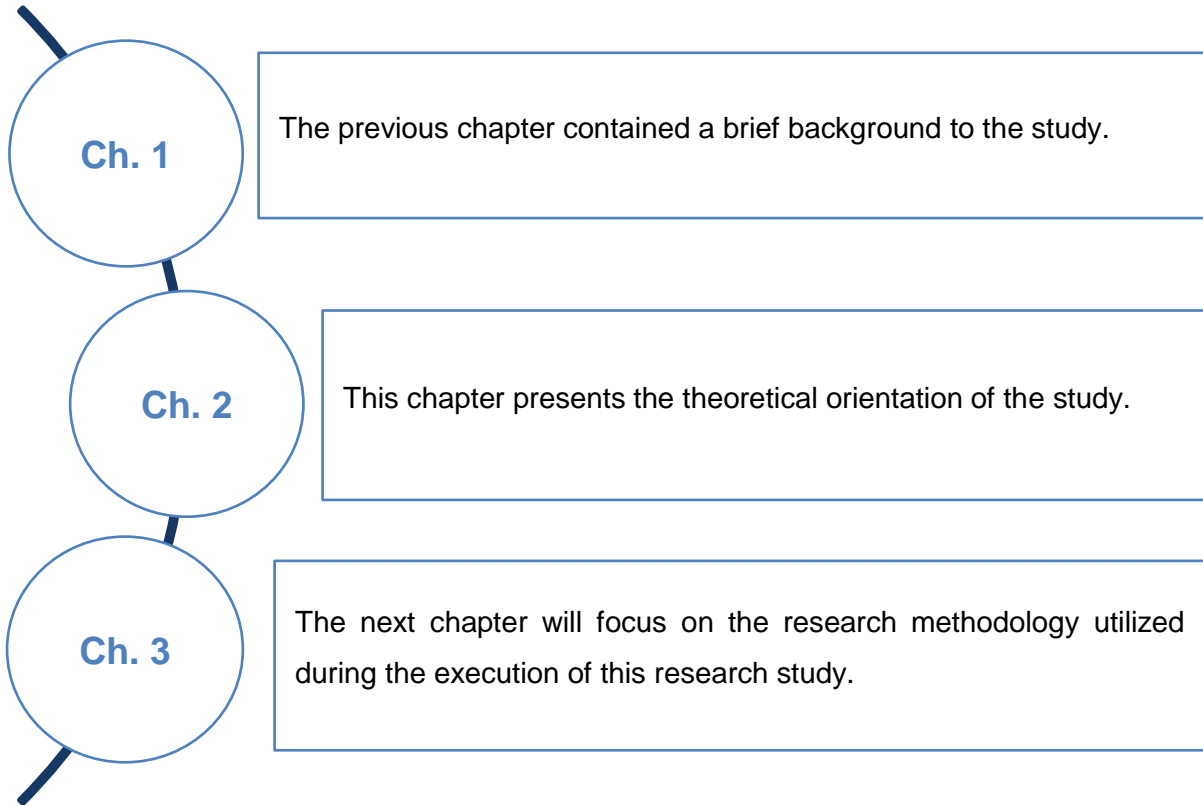
2.1. Introduction

The next section discusses the concept of a theoretical framework as one of the aims of the study was to construct a theoretical framework to promote a better understanding of the acceptance of EMRs by nurses.

2.2. Theoretical framework

In literature, the term "theoretical framework" is used interchangeably with other terms such as "conceptual framework" and "conceptual model" (Casanave & Li, 2015). For the sake of consistency, the term theoretical framework will be used in this study. Merriam (2009) refers to the term "theoretical framework" and states that it "is the underlying structure, the scaffolding or frame of your study" (p. 66). Merriam (2009) and Merriam and Tisdell (2015) further indicate, that when identifying a theoretical framework for a study, the following should be taken into account:

- Disciplinary orientation
- Existing body of literature.

According to Newman, Sime, and Corcoran (1991), a discipline may be identified by specifying an area of study. Thorne (2016) argues that the disciplinary orientation of a study is evident in the body of literature that has been reviewed during the study. Furthermore, Thorne (2016) asserts that the disciplinary orientation of a study assists in pointing out the motivation for the study as well the potential audience.

Merriam (2009) further claims that the body of literature reviewed assists the researcher to construct the problem statement of the research by

- identifying what is known about the topic of interest
- delineating the focus of the study and identifying the existing knowledge gap, and
- specifying the purpose of the study.

As illustrated in Figure 2-1 below, Merriam (2009) further argues that the disciplinary orientation, together with the body of literature (in the outermost frame), give rise to the problem statement (in the second frame) which gives rise to the purpose of the study (in the innermost frame).
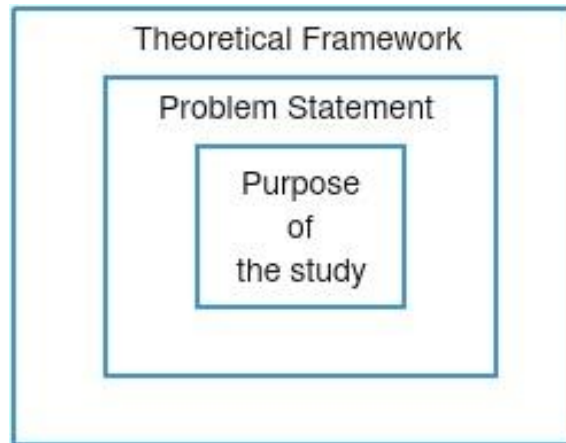
Figure 2-1: Theoretical framework (Merriam, 2009)

2.2.1. Disciplinary orientation of this study

The researcher has qualifications in Information Technology (IT) and is, thus, conversant with an IT discipline. Moke (1999) emphasises that the informatics discipline differs from other related disciplines in that it encompasses the core aspects of various fields. According to the American Medical Informatics Association (n.d.), this variety of fields includes computer science, decision science, information science, management science, cognitive science and organisational theory. At the time of the study, the researcher had specifically been working within Health Informatics (HI) as an area of study. Graham (1994) defines HI as "an evolving scientific discipline that deals with the collection, storage, retrieval, communication and optimal use of health related data, information and knowledge" (p. 6). Hovenger (2010) argues that, in order to understand HI, one should not limit themselves to the technology alone. Staggers and Nelson (2016) support this statement by asserting that it is essential that HI draws from the work and activities of health care professionals. Hence, research conducted within the HI context on healthcare professionals requires that healthcare professionals be used as the research participants in order to construct knowledge or to make meaning out of the phenomenon under study.

2.2.2. Body of literature

According to Kumar and Aldrich (2010), during a research study a review of the existing body of literature plays an important role in providing clarity and focus to a research problem and assisting in the choice of research methodology to be used.

Furthermore, Kumar and Aldrich (2010) assert that a literature review helps to broaden the knowledge base of the researcher as well as contextualise the research findings.

In line with these assertions, through reviewing the existing body of literature, the researcher was able to support the focus of the study as well as identify the existing knowledge gap. As noted in Chapter 1, section 1.2, the literature review highlighted the prevailing inadequate understanding of the reasons for the acceptance or lack of acceptance of EMRs by nurses. Hence, the main purpose of this research study was to create a framework that would contribute to a better understanding of the factors influencing the acceptance of EMRs by nurses.

Accordingly, the researcher had to contextualise the study by reviewing literature on the role of nurses in recordkeeping in a hospital setting. In achieving this objective, RO 1, the researcher had to rely on existing research. Subsequent to contextualizing the study, literature relevant to the articulation of factors influencing the acceptance of EMRs by nurses was reviewed. The articles reviewed focused on studying the reactions/satisfaction of physicians and nurses in respect of EMRs; the benefits of EMRs as well as the perceptions of nurses regarding EMRs. The relevant factors were, thus, articulated based on the aspects addressed in these articles – in relation to nurses only, not physicians. The intention behind this process was to realise RO 2, namely, to articulate the factors influencing the acceptance of EMRs by nurses. In addition, it was deemed necessary to conduct a literature review in order to realise RO 3, namely, to analyse these factors to clarify their influence on EMR acceptance by nurses. This involved reviewing existing literature on appropriate models, frameworks and/or theories in order to identify an appropriate theoretical framework to provide structure to the analysis of the factors which had been articulated.

The following section discusses the way in which the theoretical framework framed the understanding of the factors that influence the acceptance of EMRs by nurses in hospitals, as informed by the disciplinary orientation of the study and existing body of literature.

2.3. Understanding factors that influence the acceptance of EMRs by nurses in hospitals

Merriam (2009) maintains that a theoretical framework informs the techniques used to analyse the data collected and to interpret the research findings. Merriam (2009) further states that such a theoretical framework is based on the concepts, terms, definitions, models, and theories found in a particular literature base and disciplinary orientation. As noted in Chapter 1, section 1.5, the main objective of this study was to devise a framework that would contribute to a better understanding of the factors that influence the acceptance of EMRs by nurses. Thus, in short, the focus of this research study was the acceptance of EMRs. The theoretical framework used in the study played an important role in guiding the development of the framework to understand the acceptance of EMRs by nurses.

This research study – situated within the HI discipline, as indicated in section 2.2.1 – inter alia, formulated factors that affect the acceptance of EMRs by nurses. This was done by collecting data from hospital-based nurses about the use of EMRs within a hospital. Both the participants in the study and the setting to which the participants belonged were informed by the "health" aspect of HI. In addition, the subject of the study (EMRs) was informed by the "informatics" aspect of HI. Thus, the discipline orientation contributed to the framing of the study.

Furthermore, the literature reviewed also contributed to the framing of the study. According to research, it is acceptable – or even expected – to use existing knowledge when discussing the findings of a study as this highlights the contribution of the current study to the existing knowledge base (Merriam, 2009). The following sections, section 2.3.1 and section 2.3.2, discuss the existing knowledge utilised in the discussion on findings of the study.

2.3.1. Acceptance stages

Aljeeran (2016) highlights that it is common practice for researchers who are studying the acceptance of technology to investigate factors that influence the adoption of the technology in question. Moreover, Huijts, Molin, and Steg (2012) declare that technology implementation may influence technology acceptance. To assist in a better understanding of the factors that influence the acceptance of EMRs by nurses, it was

deemed necessary to acknowledge the fact that various researchers in the HI discipline have tended not to differentiate between the "adoption" and "implementation" of technology in a consistent way although Rocker (2010) does differentiates between technology adoption and implementation, hinting that adoption takes place prior to the implementation of technology.

As illustrated in Table 2-1, below, technology adoption involves acquiring knowledge about the technology; persuasion and learning in question and, ultimately, taking the decision to adopt such technology. The adoption is then followed by the actual implementation of the technology.

Table 2-1: Technology diffusion

Adoption			Implementation
Knowledge acquisition	Persuasion & learning	Decision	
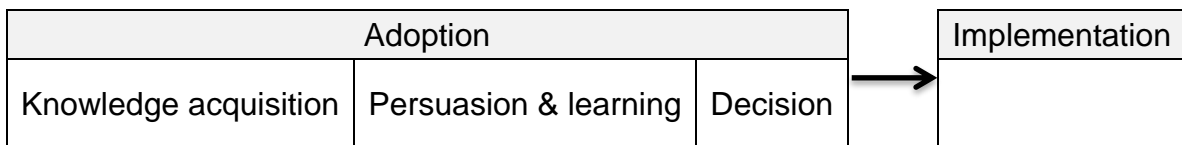
Source: Rocker (2010)

Nevertheless, Peek et al. (2014) highlight the importance of probing further than just the implementation of technology to include the use of the technology. Hence, the researcher deemed it relevant to analyse the various stages in which the factors identified in this research study may play a role in influencing EMR acceptance by nurses. Thus, when analysing the factors that affect the acceptance of EMRs by nurses in hospitals the researcher incorporated the acceptance stages (adoption, implementation and use) as cited in existing literature and highlighted in Figure 2-2 below.
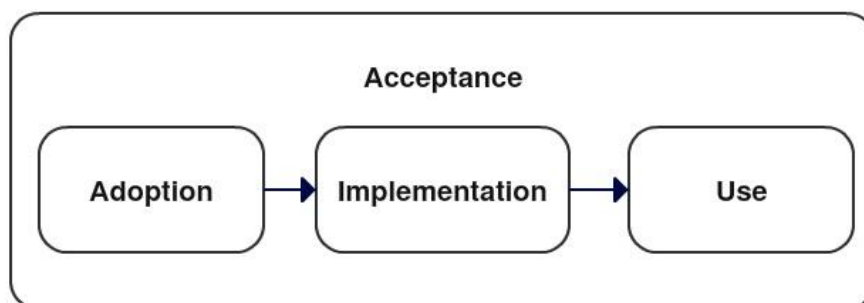
Figure 2-2: Acceptance stages

The analysis indicated at which acceptance stage each factor has an influence on acceptance in order to promote better understanding of the factors involved.

Furthermore, the researcher sought an appropriate theory in terms of which to further analyse and present the factors with the intention of contributing to a better understating of such factors. This theory is discussed in the following section.

2.3.2. Socio-Technical Systems (STS) Theory

It was essential that the theory used in this research study was a suitable fit to the approach that the research intended to use in order to realise the research objective. Research revealed that the quantitative approach to conducting research is "basically appropriate for the testing of theories" (Vogelsang, Steinhüser, & Hoppe, 2013; p. 1). However, in view of the fact that the purpose of this study was to contribute to a better understanding of a specific phenomenon, instead of testing a theory, the qualitative approach was deemed better suited to the purposes of the study. Al-Busaidi (2008) declares that one of the major strengths of qualitative research is "its emphasis upon understanding the phenomenon of interest holistically and in its context" while Holloway and Wheeler (2013) maintain that the basis of qualitative research is that "individuals are best placed to describe situations and feelings in their own words" (p. 6). Furthermore, Al-Busaidi (2008) specifically asserts that qualitative research has the ability to establish greater insights into the views of healthcare providers than may otherwise be the case. Based on this premise, a qualitative approach was utilized in this study.

The review of existing literature on the acceptance of technology highlights the dominance of both the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). This is further highlighted by Venkatesh and Bala (2008), as well as Venkatesh, Thong and Xu (2016). However, researchers have criticised the reliance of such acceptance of technology research on TAM and UTAUT, citing that important determinants of acceptance may be overlooked (Peek et al., 2014). Furthermore, close inspection of these theories has revealed their quantitative nature (Spil & Schuring, 2005; Vogelsang et al., 2013). This limits their suitability in respect of qualitative studies and, hence, their exclusion from this research study as it was qualitative in nature.

In addition to focusing on theories and models of a qualitative nature, it was important that the researcher identify a theory that was in line with the assertion by Knudtzon (2002) that the technology-use paradigm was making a shift "from a technology–

centric to a human-centric approach" (para. 3). Furthermore, as noted in section 2.2.1, in order to understand HI, which was the disciplinary orientation of this study, it was important that the researcher not limit herself to technology alone (Hovenger, 2010). Socio-technical Systems (STS) theory, which Georgiou and Whetton (2010) have traced back to the social sciences, is declared by Ghaffarian, (2011) to incorporate a comprehensive view, including the human-centric approach. Georgiou and Whetton (2010) are of the opinion that STS theory has gained popularity in the HI discipline while Kushniruk et al. (2014) argue that the socio-technical perspective may be instrumental in attaining positive outcomes in view of the implementation of information technology within the healthcare context.

Griffith and Dougherty (2001) maintain that, according to the STS theory, every organisation is "made up of people (the social dimension) using tools, techniques and knowledge (the technical dimension) to produce goods and services valued by customers who are part of the organisation's external environment (environmental dimension)" (p. 205). Currie and Finnegan (2009) highlight that this theory has been used in studies researching the impact of Information and Communications Technology (ICT) on organisations. Eason (2008) further states that, though there are researchers who have formulated their own theoretical frameworks around this area, the STS theory must not be disregarded as it makes a valuable contribution to understanding the phenomena of ICT implementation in organisations. The dimensions of this theory, as it applied to this study, are presented in Figure 2-3 below.
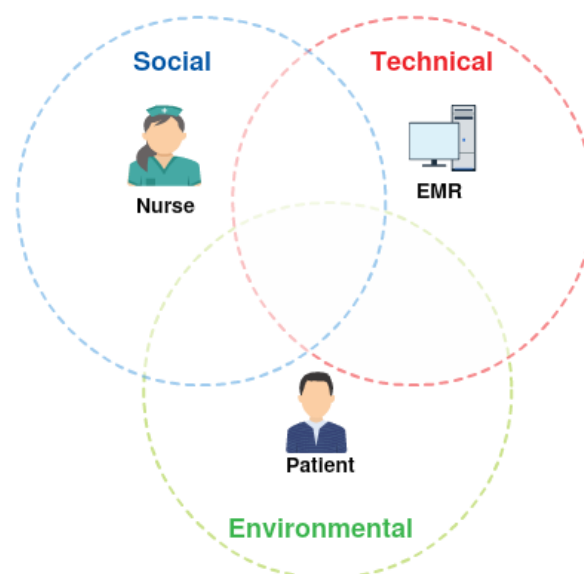
Figure 2-3: Socio-Technical Systems theory

Some of the literature that focuses on the STS theory includes only the social and technical dimensions. However, Shozi and Modise (2015) concluded that the "environmental" dimension is also a crucial component of the STS theory. This is due primarily to the fact that it is impossible to understand a system without including the environment in which it exists (Opazo, 2010). In addition, in the context of this research study, the patients whom the nurses "serve" belong within a specific environment with this environment having an impact on the social and technical dimensions (Georgiou & Whetton, 2010). Georgiou and Whetton (2010) further state that, in the healthcare context, the environment includes the health organisation to which a hospital belongs; funding bodies; government regulators; the community and the global environment.

In two studies conducted by Chang (2010) in public hospitals in Taiwan and by Thune et al. (2013) in the United States of America (USA), the researchers were of the view that stakeholders include any internal or external individuals or groups that have an influence on the organisation in question. The table below, Table 2-2, presents the stakeholders, both internal and external which were identified. The internal stakeholders were situated within the social dimension and the external stakeholders within the environmental dimension.

Table 2-2: Stakeholders

Stakeholders		Chang (2010)	Thune, et al., (2013)
Internal	Healthcare provider	√	√
External	Customers (patients)	√	√
	Experts (research institutions, schools, hospitals, and government agencies in medical informatics)	√	
	Vendors	√	√
	Government agencies	√	√

The STS dimensions, as well as the stakeholders, are depicted in Figure 2-4 below:
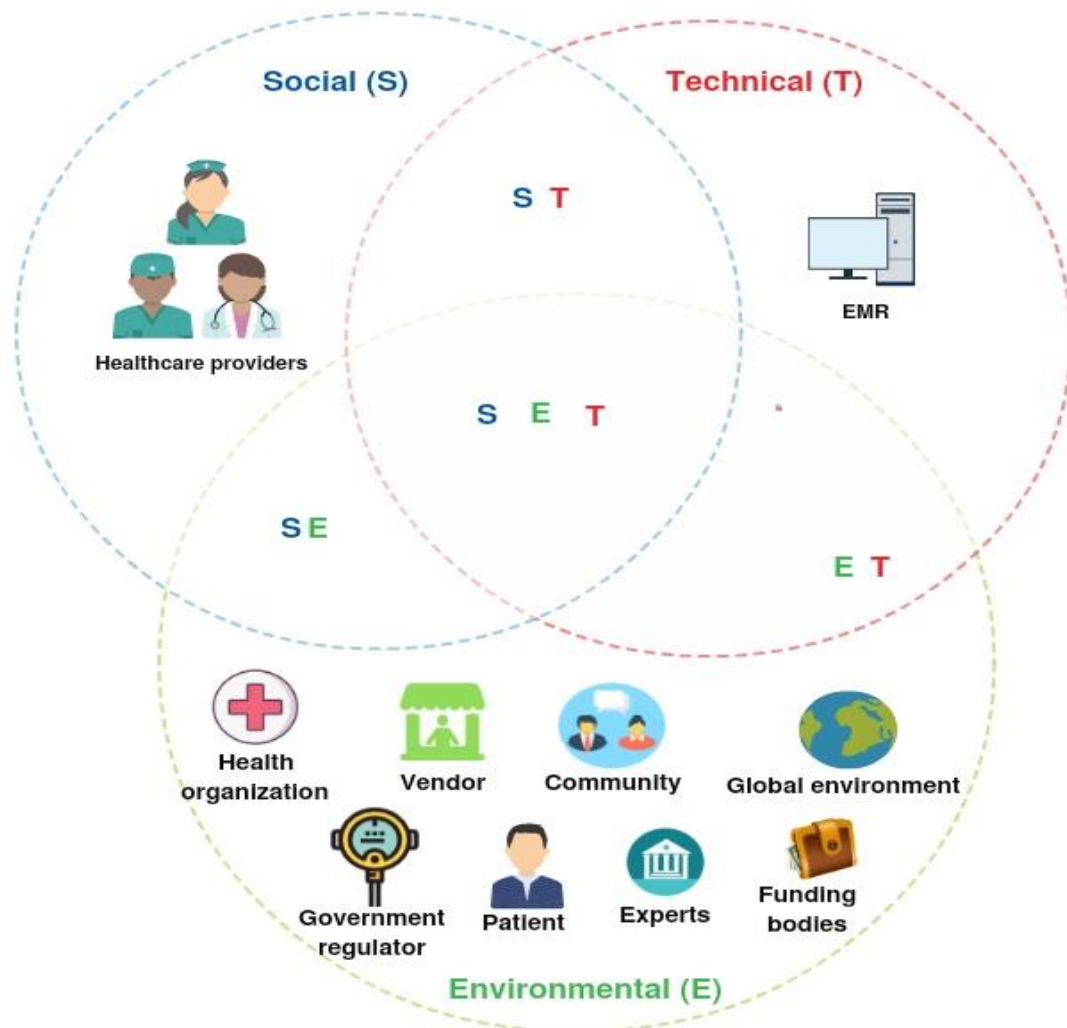
Figure 2-4: STS dimensions (with stakeholders)

The socio-technical perspective in HI emerged partly as a result of the failure of information technology implementations within the healthcare context (Kushniruk et al., 2014). In the main the implementation of Health Information Systems (HIS) results in various changes within an organisation, including changes in the following (Kushniruk et al., 2014; Delaney & D'Agostino, 2015):

- Organisational structures (e.g. management structures, organisational power structures);
- Organisational environments;
- Job descriptions; and
- Relations between patients, healthcare providers and healthcare provider teams.

According to Borycki et al. (2009) such changes have an impact on the work of healthcare providers. Kushniruk et al. (2014) argue that the socio-technical

perspective may be instrumental in the achievement of positive outcomes as a result of the implementation of information technology within the healthcare context. Accordingly, in this research study, the STS theory was used as a theoretical lens through which the identified factors that influence the acceptance of EMRs by nurses are viewed. Hence, the study indicates the STS dimension(s) from which each factor originates as well as the STS dimension(s) influenced by the factor.

2.4. Conclusion

The purpose of this chapter was to discuss the theoretical orientation that was used when conducting this research study. This involved explaining the influence of the disciplinary orientation of the study as well as the existing literature reviewed in the study. The next chapter contains a detailed discussion of the research methodology that was used in the study.

CHAPTER 3

3. RESEARCH METHODOLOGY

Ch. 2

The previous chapter discussed the theoretical orientation of the study to provide a foundation for the discussion on the methodology used.

Ch. 3

The purpose of this chapter was to outline the way in which the study was conducted. This outline encompassed a discussion of the research design, including the research paradigm, research approach and research process. The chapter then focused on the methodology used to answer the RQs as specified in Chapter 1. The chapter then culminated in a discussion on the ethical considerations involved in research.

Ch. 4

The next chapter will focused on analysing the role which nurses play in recordkeeping in the hospital settings.

3.1. Introduction

This chapter describes the research methodology used in this research study. Strauss and Corbin (1998) define research methodology as "a way of thinking about and studying social reality" (p. 4). Hence, this chapter presents the viewpoint that was adopted in this study, as well as the way in which the research study was designed. This encompassed the research paradigm used, including the research approach and process. Furthermore, the research methods that were used, as well as the research ethics upheld during the study, are discussed.

3.2. Research design

A research design may be described as the act of producing a project out of research questions (Robson, 2002). As discussed in this section, the research design used in this study aimed to transform the RQs into a feasible "project".

Saunders et al. (2009) assert that the research philosophy that a researcher holds may be regarded as the point of departure from which the researcher derives his or her understanding of the research question as well as the research design linked to it. It is, thus, important to specify the point of departure from which the researcher in this study derived her understanding of the research question and the research design used. This is discussed in the next section – section 3.2.1.

3.2.1. Research paradigm

When conducting research, a researcher adopts the stance of a particular paradigm ("worldview"). Creswell (2013a), an established researcher in the field of research design, accepts Guba's (1990) definition of a "paradigm" according to which a paradigm is "a basic set of beliefs that guide action" (p. 17).

Merriam (2009) highlights the importance of basing a research study on a specific philosophical foundation. Prior to referring to the four (4) philosophical foundations (Table 3-1), Merriam highlights the fact that various writers differ in respect of the way in which they discuss paradigms and that these range from "theoretical underpinnings", "theoretical traditions and orientations", "theoretical paradigms", "worldviews" to "epistemology and theoretical perspectives". Given the variance in

these terms, it was deemed to mention that, in this research study, the term "paradigm" was used for the purposes of consistency.

Table 3-1: Philosophical foundations

	Positivist/ Postpositivist	**Interpretive/ Constructivist**	**Critical**	**Postmodern/ Poststructural**
Purpose	Predict, control, generalise	Describe, understand, interpret	Change, emancipate, empower	Deconstruct, problematise, question, interrupt
Types	Experimental, survey, quasi-experimental	Phenomenology, ethnography, hermeneutic, grounded theory, naturalistic/qualitative	Neo-Marxist, feminist, participatory action research (PAR), critical race theory, critical ethnography	Postcolonial, postconstructural, postmodern, queer theory
Reality	Objective, external, out there	Multiple realities, context-bound	Multiple realities, situated in political, social, cultural contexts (one reality is privileged)	Questions assumption that there is a place where reality resides; "Is there a there there?"

Source: Merriam (2009)

As indicated in Table 3-1, Merriam (2009) refers to four paradigms, namely, the positivist/postpositivist, interpretive/constructivist, critical and postmodern/poststructural paradigms. Merriam (2009) elaborates on these by pointing out the purpose, type and reality that applies to each paradigm. Based on these differences, it may be said that this research study was situated within the interpretive/constructivist paradigm. Von Glasersfeld (2013) affirms that a constructivist paradigm is based on the view that knowledge resides in people and that people are able to construct knowledge based on their experiences. Thus, constructivism is about understanding a phenomenon by learning through experiences (Duffy & Jonassen, 2013). As noted in Chapter 1, section 1.5, the main objective of this study was to contribute to better understanding of the factors that influence the acceptance of EMRs by nurses. The understanding of these factors from the perspective of nurses required accessing their experiences.

As illustrated in Table 3-2, this constructivist paradigm is based on the following principles (Wilson & Clissett, 2011).

Table 3-2: Table 3 2: Constructivist paradigm principles

Area of concern	Constructivist principle
The nature of reality	Multiple social realities exist. Reality is represented by the most sophisticated and informed construction that can be agreed upon at a particular time.
The relationship of the knower to the known	The interaction of the researcher and participant creates knowledge and understanding of the phenomenon under consideration.
The possibility of generalization	The concept of generalization is replaced with the notion of tentative application of findings to other, similar settings.
The possibility of causal linkages	Due to mutual simultaneous shaping, it is not possible to separate cause from effect
The role of values	Values permeate constructivist research.

Source: Wilson & Clissett (2011)

As is clear from the abovementioned principles, one of the core principles of constructivism is the interaction between researcher and participant which creates knowledge and understanding about the phenomenon under study (Baxter & Jack, 2008). As noted in Chapter 1, section 1.2, the main problem addressed in this research study was the inadequate understanding of the factors that influence the acceptance of EMRs by nurses in hospital settings. Thus, a constructivist paradigm was deemed a suitable fit as the researcher was required to interact with the study participants in order to acquire both knowledge and understanding of the factors that affect the acceptance of EMRs by nurses. Furthermore, the constructivist paradigm has also been declared suitable for studies that focus on healthcare professionals as study participants (Wilson & Clissett, 2011). This research study focused on nurse professionals as the study participants. The research approach used in the study is discussed in the next section.

3.2.2. Research approach

The study adopted a qualitative approach to conducting the necessary research. According to Albert Einstein, "Not everything that can be counted counts and not everything that counts can be counted" (Brikci & Green, 2007, p. 2). This view is in alignment with the qualitative research approach applied in this study. Strauss and Corbin (1998) define a qualitative research approach as an approach that produces findings without relying on statistical procedures or any form of quantification. Creswell (2013a) adds to this definition by asserting that qualitative research is intended for "exploring and understanding the meaning individuals or groups ascribe to a social or human problem" (p. 4). Creswell (2013a) characterised a qualitative study design as follows:

- Conducted in a natural setting.
- Researcher is the key instrument in the data collection process.
- Uses multiple methods.
- Involves complex reasoning (inductive and deductive).
- Focuses on the perspectives, meanings, and multiple subjective views of the participants.
- Situated within the setting of the participants or sites (social/political/historical).
- Involves an emerging and evolving design rather than a tightly prefigured design.

- Is reflective and interpretative (i.e. sensitive to the biographical/social identities of the researcher).

- Presents a holistic, complex picture.

Silverman (2016) found Stake and Jegatheesan (2008) to be correct regarding the purpose of qualitative research as Silverman (2016) cites them as asserting that "[t]o comprehend some meanings of life, one must get close to that life" (p. 31). This is further supported by Holloway and Wheeler (2013) who declare that the basis of qualitative research is that "individuals are best placed to describe situations and feelings in their own words" (p. 6). In addition, Taylor, Bogdan, and DeVault (2015) describe qualitative research as an inductive approach because understanding is developed from the data collected rather than by using the data to confirm preconceived concepts. Holloway and Wheeler (2013) go further by declaring that this type of approach is appropriate for gaining understanding, knowledge and insight, specifically in respect of the experiences of healthcare professionals. Brikci and Green (2007) also support this view. This research study focused on nursing professionals as the research participants and, thus, it was felt that a qualitative approach would assist in gaining understanding, knowledge and insight, specifically on the experiences of nurses. This was of the utmost importance because the main aim of the study was contribute to a better understanding of the factors that influence the acceptance of EMRs by nurses and this meant relying on the experiences of nurses in order to gather these factors.

The following section describes the research process followed in the study.

3.2.3. Research process

Figure 3-1 below depicts the high-level research process that was followed in order to answer the main RQ. From the conception of the research to completion, it was incumbent on the researcher to remain abreast of the current literature. The literature review assisted the researcher to identify and motivate the importance of the problem addressed in the study as well as to defining the ROs. The RQs addressed in the study are presented on in Figure 3.1. As may be noted:

- RQ 1 was addressed in Chapter 4 by means of a literature review.

- RQ 2 was addressed in Chapters 5, 6, as well as 7, by means of a literature review, case study, argumentation and member checking.

- RQ 3 was addressed in Chapter 8 through argumentation, as well as applying Socio-Technical Systems (STS) theory as a theoretical lens.

		MAIN RQ:		
		WHAT ARE THE CONSTITUENTS OF A FRAMEWORK TO BETTER UNDERSTAND THE FACTORS THAT INFLUENCE EMR ACCEPTANCE BY NURSES?		

Chapter 1: Introduction

Chapter 2: Theoretical framework

Chapter 3: Research methodology

Chapter 4: Nursing profession in hospitals

RQ 1:	What is the role of nurses in recordkeeping in a hospital setting?	**Method:**	Literature review

Chapter 5: Factors that influence the acceptance of EMRs by nurses (Literature review)

RQ 2:	Which factors influence the acceptance of EMRs by nurses?	**Method:**	Literature review Content analysis Argumentation

Chapter 6: Case study context

RQ 2:	Which factors influence the acceptance of EMRs by nurses?	**Method:**	Case study Content analysis

Chapter 7: Factors that influence the acceptance of EMRs by nurses (Case study results)

RQ 2:	Which factors influence the acceptance of EMRs by nurses?	**Method:**	Case study Content analysis Argumentation Member checking

Chapter 8: Understanding EMR acceptance by nurses: A framework

RQ 3:	How can these factors be analysed such that their influence on EMR acceptance by nurses becomes clear?	**Method:** **Theory:**	Argumentation STS theory

Chapter 9: Conclusion

Figure 3-1: High-level research process

The methods used during the execution of the research are discussed in the following section.

3.3. Research methods

Rigorous methods were applied throughout this research study to ensure that the study would make a suitable contribution to the existing gap in literature. Strauss and Corbin (1998) define research methods as "a set of procedures and techniques for gathering and analysing data" (p. 3). Brikci and Green (2007) assert that, unlike quantitative methods, qualitative methods are not concerned with understanding "how many" or "'how much", but, instead, they focus on understanding the "what", "how" or "why" when unravelling a phenomenon. The research methods that were used to realise the objectives of this research study are discussed in this section.

Methodological triangulation is known to enhance the understanding of the phenomenon under study (Bekhet & Zauszniewski, 2012; Olsen, 2004; Yeasmin & Rahman, 2012). This study made use of what Bekhet and Zauszniewski (2012) term a "within-method" methodological triangulation. They explain that, unlike an "across method" methodological triangulation, which makes use of both quantitative and qualitative methods to collect the requisite data, the within-method makes use of either qualitative or quantitative methods.

As alluded to in the discussion on the research process in the previous section, more than one research method, a literature review and a case study were used to identify the factors that influence the acceptance of EMRs by nurses. Olsen (2004) refers to a literature review as a qualitative research method, while Starman (2013) maintains that a case study may be qualitative in nature. In this study both the literature review and the case study were used as research methods to realise the objectives of the study and are discussed in sections 3.3.1 and 3.3.2.

3.3.1. Literature review

Conducting a literature review, specifically in a thesis, is of value to the research in the following ways (Bruce, 2001):

- The researcher is able to synthesise knowledge about subject matter under study.

- The review demonstrates the dedication of the researcher to the research in question.
- It becomes a rationale for future research.
- It introduces the researcher to existing scholarly traditions and etiquette.

Taking these benefits into account, a literature review was conducted immediately after the conception of the research and was used to answer the following RQs:

1. What is the role of nurses in the provision of healthcare in hospital settings?
2. Which factors influence the acceptance of EMRs by nurses?

3.3.2. Case study

The sole purpose of a case study is to allow the researcher to explore and understand a specific phenomenon related to a particular subject matter within a real-life context (Bromley, 1990; Yin, 1994; Zainal, 2007). As noted in Chapter 1, section 1.5, the goal of this research was to contribute to the better understanding of the acceptance of EMRs by nurses in hospital settings. In addition, the study focused on nurses as the study participants.

It is recommended that a researcher should base a research study on a "single, overarching central question" (Creswell & Poth, 2016, p. 138). Furthermore, Creswell and Poth, 2016 assert that a research study is also based on a number of sub-RQs. Hence, as noted in Chapter 1, section 1.4, the "single, overarching central question" in this study was the following: What are the constituents of a framework to promote a better understanding of the factors that influence EMR acceptance by nurses? Furthermore, as alluded to in section 3.2.3, the following sub-RQ would be answered by means of a case study: Which factors influence the acceptance of EMRs by nurses?

The following case study research process, as depicted in Figure 3-2, was followed in an attempt to answer this sub-RQ:
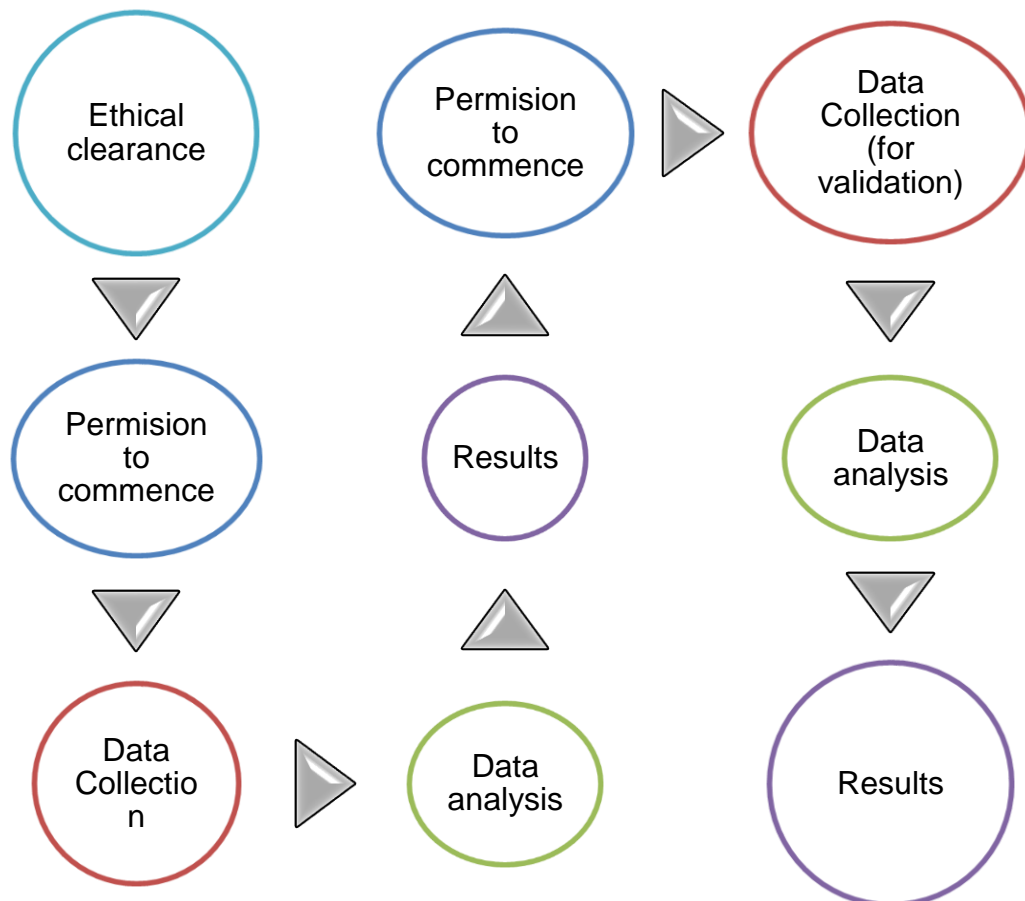
Figure 3-2: Case study research process

As illustrated in Figure 3-2, ethical clearance was sought prior to the commencement of the case study. This was followed by the researcher obtaining permission from the unit manager to visit the hospital selected as the study site with the purpose of commencing with the data collection. Once permission had been received and a suitable date agreed upon, the researcher visited the hospital and the data collection commenced. Subsequent to the data collection the researcher transcribed the data and conducted a content analysis in order to analyse the results. The content analysis led to the identification and formulation of the factors that influence the acceptance of EMRs by nurses. The researcher sought to validate the study results by means of feedback from the nurse participants (member checking). See Chapter 6 for a detailed discussion on the context of the case study.

3.3.2.1. The study population

As noted in Chapter 1, section 1.2, research has established that nurses constitute the largest user group of EMRs in hospital settings (Furukawa et al., 2010; Nelson & Staggers, 2014; Strudwick et al., 2015). However, there is inadequate literature that

focuses on the factors which contribute to EMR acceptance with nurses as the target user group. Hence, the focus of this research study was primarily on nurses. However, in addition to nurses, the study sample also included matrons and an IT manager. The purpose of using these participants was to collect descriptive data about the units/wards as well as the information technology used in the hospital.

3.3.2.2. Sampling

In its simplest form, sampling may be defined as "the selection of specific data sources from which data are collected to address the research objectives" (Gentles, Charles, Ploeg, & McKibbon, 2015, p. 1775). There are various sampling methods. However, this research study used a purposive sampling strategy in selecting the participants. Purposive sampling is a strategy that involves the premeditated selection of study participants based on specific criteria that they meet (Tongco, 2007). This type of sampling is extensively used in qualitative studies (Palinkas et al., 2015; Yu & Teddlie, 2007). It is suitable for cases in which the researcher is knowledgeable about the population and the sample is in alignment with the research objective (Babbie & Rubin, 2009). This method allows for the selection of "information-rich cases" (Patton, 2015, p. 169). The selection of information-rich cases is imperative with Elo et al. (2014) asserting that the research participants used in a study should be knowledgeable about the subject matter. Thus, for the purposes of this study the potential participants had to work at a hospital that had adopted an EMR.

Purposive sampling was used to identify a hospital that had adopted an EMR as this would allow for the identification of factors from the information provided by study participants who had had experience of an EMR within their workspace. Initially, to identify hospitals that met the study criteria, hospitals in the Eastern Cape province of South Africa were contacted as they were easily accessible by the researcher. However, the researcher was unsuccessful in identifying hospitals willing to participate in the study and that met the criteria. Thus, the search had to be extended and contacts within healthcare informatics were contacted. This pointed the researcher to the Inkosi Albert Luthuli Central Hospital (IALCH) situated in Durban, KwaZulu-Natal (KZN), South Africa (SA). Contact with IALCH confirmed that the hospital met the research criteria and was, thus, a suitable potential setting for the study.

The participants within the hospital had to be either a/an:

- IT manager – knowledgeable about the EMRs in the hospital
- Matron - knowledgeable about the units/wards in which the nurses worked
- Nurse – knowledgeable about the factors contributing to EMR acceptance among the nurses.

As noted in Chapter 1, section 1.2, there is little information in the literature on factors contributing to the acceptance of EMRs by nurses. Therefore, within the participating hospital, it was crucial to use nurses as participants in the study to enable the researcher to gather information on the factors that influence the acceptance of EMRs by the nurses. In addition, an IT manager and matrons were identified as suitable research participants who would be able to provide data for descriptive purposes about the technology used in the hospital, as well as the settings in which the nurses worked.

This sampling strategy resulted in the following sample size (see Table 3-3).

Table 3-3: Case study sample size

Participant	Sample size
IT Manager	1
Matron	12
Nurse	370
	383

Note: Eleven of the 12 matrons completed matron questionnaires while the 12th matron participated in the interviews.

Guetterman (2015) reports on an ongoing debate in the literature on the relevance of determining appropriate benchmark sample sizes in qualitative research. Guetterman (2015) reports that researchers are divided between having a standardised sample size and allowing sample sizes to vary, based on the requirements of the study in question. In this research study the researcher allowed all willing nurses in the participating hospital to participate in the study as there were no logical compelling reasons to limit the sample size or exclude certain nurses. The researcher agrees with Gentles et al. (2015) on the notion that the main priority of qualitative research is to

understand the phenomenon under investigation rather than population representation.

3.3.2.3. Data gathering techniques

This study used the following data collection methods during the case study:

- Questionnaires:

Questionnaires were used as a data collection instrument to pose questions to the relevant research participants in the hospital. Meadows (2003), Mills et al. (2005), and Hyman, Lamb, and Bulmer (2006) all assert that it is acceptable for a researcher to formulate data collection questions based on their own "intuition" together with adapting questions in existing data collection instruments formulated by other researchers in existing research studies. Accordingly, the questions used in the questionnaires were a combination of questions that the researcher had formulated, as well as questions identified in existing research by Arvary (2002), Kangethe (2013), Likourezos et al. (2004), Loomis, Ries, Saywell, and Thakker (2002), and Ludwick and Doucette (2008).

The questionnaires included both open-ended questions and closed-ended questions. Where closed-ended questions were used, the participants were given an opportunity to elaborate on their responses immediately below the question, by means of an open-ended question. In addition, at the end of the questionnaire the participants were given an opportunity to mention anything else that they wanted to add but which was not covered in the questionnaire. Iversen, Bjertnæs and Skudal (2014) assert that including an open-ended question at the end of structured questions potentially increases response rates and, furthermore, provides room for elaboration as well as allowing the participant to identify new issues.

As may be seen in Table 3-4, the questionnaires were directed at three (3) types of participants, namely, Information Technology Managers (IT Managers); matrons; and nurses. Although nurses were the main focus of this research study, the researcher also deemed it important to describe the environment in which the nurses worked (i.e. unit/wards, information technology, etc.) so as to be able to view the data they provided through an informed lens. Hence, an IT manager and matrons were also used as

participants in the study. It is, thus, essential to understand the necessity of including each type of participant.

From the:

- o IT Managers:

The researcher sought to gather general data about the use of EMRs in the hospital.

- o Matrons:

The researcher sought to gather general data about the units/wards in which the nurses worked.

- o Nurses:

The researcher sought to identify and gather data on factors that affected the acceptance of EMRs by nurses.

Two types of matrons worked in the hospital. These matrons were either:

- o Office-based: Members of management and did not have offices situated near units or wards; or
- o Ward-based: Offices located in specific units/wards in the hospital.

Throughout the research study the data gathered from these two types of matrons was reported on disjointedly.

- Interviews:

Interviews were conducted with ward-based matrons (matrons working in specific units/wards) as to further probe the data gathered via the questionnaires. These were one-on-one telephonic interviews between the researcher and each matron. Telephonic interviews were found to be the suitable interview mode due to the demanding nature of the daily schedule of matrons. A summary of the data collection instruments and the subjects which each probed is presented in Table 3-4 below.

Table 3-4: Summary of data collection instruments used in case study

Data Collection Instrument(s)	Participant(s)	Subjects of Probe
IT Manager Questionnaire	IT Manager	• Work related biographical information • Software used in the hospital • EMR used in the hospital • Comments additional to what was covered in the questionnaire.
Matron Questionnaire	Matrons (both ward and office-based)	• Work related biographical information • Ward descriptive information • Ward routine • Computer use • Storage mediums for patient data • EMR used in the hospital • Comments additional to what is covered in the questionnaire.
Nurse Questionnaire	Nurses	• Nurse biographical information • Work related biographical information • Paper-based system use • Computer literacy • Technology personality • EMR use • Comments additional to what is covered in the questionnaire.
IT Manager Interview	IT Manager	• Hospital commission date • Paper-based system used in the hospital • EMR use, access control and training • EMR changes and updates • EMR downtime.

Data Collection Instrument(s)	Participant(s)	Subjects of Probe
Matron Interview	Matrons (unit/ward-based)	• Use of the hospital EMR across job levels • EMR training • EMR access control • EMR use • EMR changes and updates • EMR downtime • Ward/unit layout • Comments additional to what is covered in the interview.

As may be noted from the table, no interviews were conducted with the nurses. This was due to the fact that the researcher did not have immediate access to the nurses. Even the distribution of the nurse questionnaires was handled by the matrons. The questionnaires and the interview transcripts are contained in Appendices 2-5 (See CD).

Prior to the data collection the data collection instruments were tested in a pilot study. Existing research advocates that conducting a pilot study is a valuable exercise in research as it may enhance the success of a research study (van Teijlingen & Hundley, 2002). Accordingly, the researcher conducted a pilot study to test the data collection instruments prior to collecting data from the actual participants. Twelve (12) nurses, outside of the participating hospital, participated in the pilot study. The necessary changes were made to the data collection instruments based on the feedback received. See Appendix 6 (on CD) for suggestions quoted from the feedback received.

3.3.2.4. Ethical considerations

As noted in section 3.2.2, qualitative research involves obtaining an understanding about a particular phenomenon from the individuals who are part of the reality in question. However, there are certain ethical issues that need to be addressed before a researcher interacts with those who will shed light on a particular topic as ethical

issues may arise (Fouka & Mantzorou, 2011; Shamoo & Resnik, 2009). Hence the need for ethical considerations.

A noted in Chapter 1, section 1.7, ethical clearance was sought from and approved by NMMU before the research proceeded. In addition, prior to conducting the study at the participating public hospital permission to conduct the study had to be sought from both the Department of Health (DoH) and the hospital itself. Permission was granted by both the hospital as well as the Provincial Health Research Committee (PHRC) of the DoH of KZN.

Furthermore, a consent form was included in each questionnaire as the first page with which the potential participants interacted. This consent form contained a description of the project. In addition, it also alerted the study participants to the following important aspects:

- Voluntary participation
- Implied consent
- Freedom to withdraw from the study
- Confidentiality and anonymity of participants in publications
- Contact information of the research team.

It is essential that participants take part willingly in research (Connelley, 2014; Department of Health, 2015). Furthermore, Connelley (2014) asserts that consent may be regarded as implied if a participant completes a questionnaire. Hence, the participants were alerted to this fact in the questionnaire. Even after providing their consent, participants should be allowed to withdraw their participation at any point during the research (Connelley, 2014; Department of Health, 2015). It is also crucial to ensure that participants are not identifiable in publications (Department of Health, 2015). Including the contact details of the researcher/research team in the consent form provides the participants with an alternative should they desire to ask further questions or relay complaints (Department of Health, 2015). The participants should understand the requirements of their participation (Connelley, 2014). In addition to including all these aspects in the consent form, the researcher addressed these aspects orally when speaking to the participants in meetings.

3.3.2.5. Seeking permission to conduct research

Owing to the fact that the hospital selected was a public hospital, in addition to seeking permission from the gate keeper of the hospital, permission had to be sought from the Department of Health (DoH) prior to the commencement of the research. Permission to conduct the research was granted by both the hospital gate keeper, as well as the Provincial Health Research Committee (PHRC) of the DoH of KZN (see Appendix 7 and Appendix 8 (on CD), respectively).

Note: in this study the term "gatekeeper" is based on the following definition given by Jup (2006):

> [T]he person who controls research access … or the person within a group or community who makes the final decision as to whether to allow the researcher access to undertake the research (p. 126).

3.3.2.6. Data collection

The data collection process using the questionnaires took place rom the 8th to 11th September 2015. In preparation for the data collection, the researcher printed copies of the questionnaires that were to be distributed to the willing participants. The willing nurse participants were from the following nine units within the hospital:

- ICU/Critical Care
- Medical
- Obstetrics and Gynaecology (O & G)
- Out Patient Department (OPD)
- Paediatrics (Paeds)
- Stomatherapy
- Surgical
- Theatre
- Trauma and Burns

Prior to the distribution of questionnaires, the researcher had brief meetings with the participants. The meeting attendees and the purpose of the meetings are presented in Table 3-5 below.

Table 3-5: Meeting attendees and the purpose of the meetings

Attendees	Purpose of meeting
Nursing Manager (NM) and two (2) matrons	To obtain permission from the NM to commence with the data collection.
Matrons	To explain the study; matron questionnaires, including the consent form; and to plan the distribution of the matron and nurse questionnaires. This was crucial as the researcher did not have immediate access to the nurses for the distribution of the nurse questionnaires.
Operational Managers (OM)	To explain the study and the nurse questionnaire, including the consent form. This was in case the nurses had questions and they preferred to ask the OMs.
Nurses	To explain the study and the nurse questionnaire, including the consent form.

See section 6.2.1 for an explanation as to where the meeting attendees fell within the staff hierarchy of the hospital.

Although the consent form that accompanied all the questionnaires made it clear that participation in the study was voluntary, the researcher also highlighted this point orally when addressing the participants in the meetings. The nurses collected their questionnaires from either the OM of their ward or the matron of their unit. As indicated in Table 3-6, 580 nurse questionnaires were distributed to nurses across all job levels. The number of IT managers and matrons was not known to the researcher beforehand. However, upon arrival at the hospital, the researcher found one (1) IT manager and seventeen (17) matrons. Accordingly, one (1) IT Manager questionnaire was distributed to the IT Manager via email, as per the request of the IT Manager, and 17 matron questionnaires were distributed.

Table 3-6: Summary of distributed questionnaires

Questionnaire	Distributed Questionnaires	Completed Questionnaires	Response Rate
IT Manager Questionnaire	1	1	100%
Matron Questionnaire	17	11	64.7%
Nurse Questionnaire	580	370	63.8%
	598	382	63.9%

As indicated in Table 3-6, of the 580 questionnaires distributed to the nurses, 370 were completed and returned to the researcher, thus equating to a response rate of 63.8%. The 370 completed nurse questionnaires and matron questionnaires were distributed as follows (see Table 3-7).

Table 3-7: Breakdown of received nurse questionnaires

Units	Nurse Questionnaires	Matron Questionnaires
ICU	65	√
Medical	48	√
O & G	40	√
OPD	37	√
Paeds	45	√
Stomatherapy	3	√
Surgical	43	√
Theatre	42	
Trauma and burns	47	√

Note: An additional three matron questionnaires were received, making a total of 11 matron questionnaires. However, these three matrons were office-based matrons and not linked to specific units.

3.3.2.6.1. *Interviews*

Eight interviews were conducted for the case study. The IT manager and all the ward-based matrons who were willing to participate in the interviews received the interview questions beforehand to enable them to prepare for the interviews. One IT manager participated in the interview and seven ward-based matrons participated in telephonic interviews, individually. However, one of the seven matrons also completed the interview questions by hand and returned it via email to the researcher. The researcher captured the research data in Excel spreadsheets. Only ward-based matrons were interviewed. When analysing the data collected from the matron questionnaires the researcher noted topics that called for further probing. The interviews were scheduled from 2 to 10 November 2015.

The following section discusses the data analysis method applied during the study.

3.3.3. Content analysis

The study used content analysis to analyse the data that had been collected. Content analysis is a type of analysis that probes text for "meaning, contexts and intentions" (Prasad, 2008, p. 1). When using traditional content analysis researchers may apply either an inductive or a deductive approach (Elo & Kyngas, 2008; Elo et al., 2014; Hsieh & Shannon, 2005). These approaches are depicted in Figure 3-3 below (Elo & Kyngas, 2008).
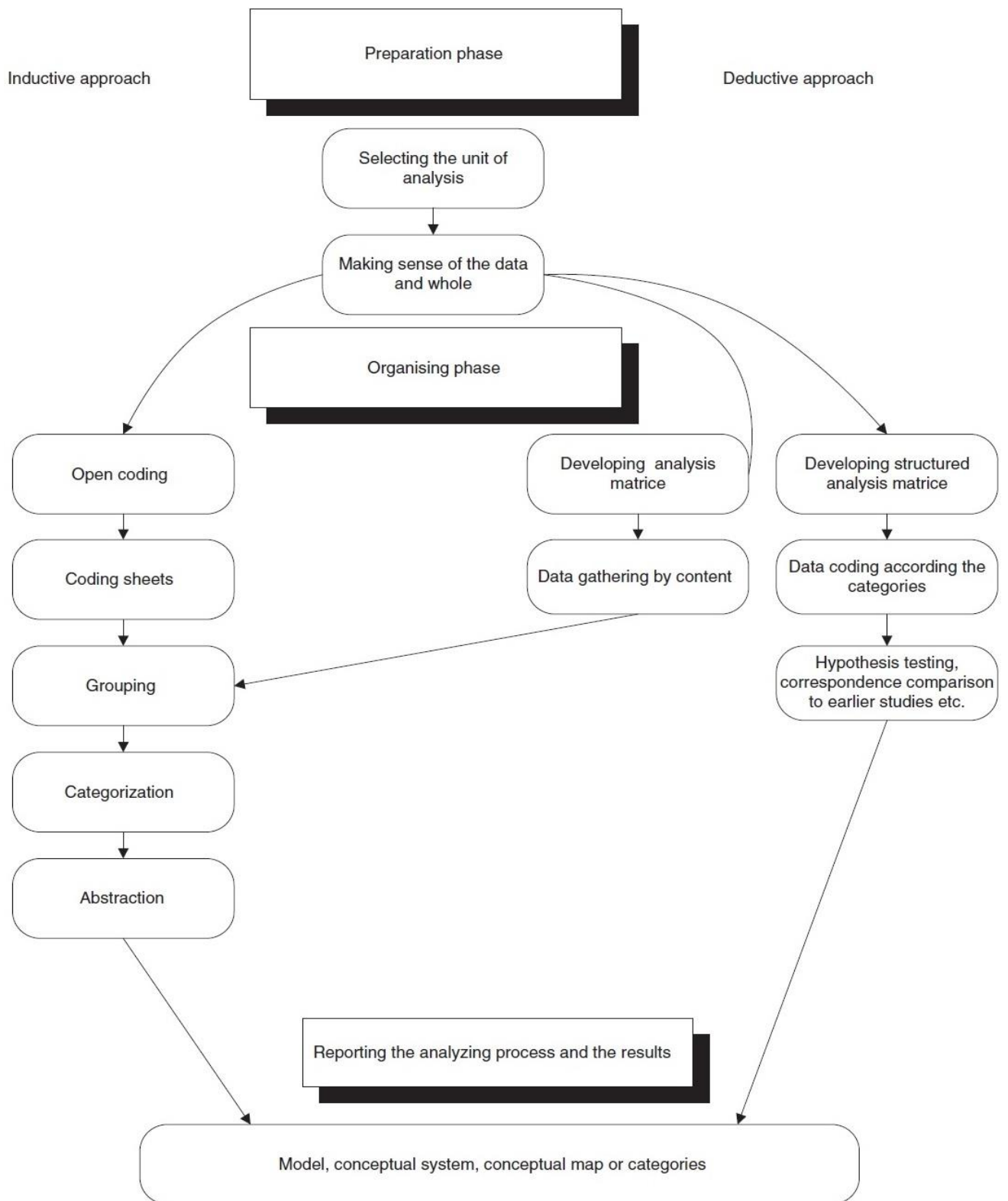
Figure 3-3: Content analysis (Elo & Kyngas, 2008)

According to Lauri and Kyngas (2005), the inductive content analysis approach is used when there is limited literature available on the phenomenon under scrutiny. As stated in Chapter 1, section 1.2, there was limited literature on the phenomenon under

investigation in this study. Furthermore, Hsieh and Shannon (2005) attest to the extensive use of this type of analysis in health studies. Accordingly, the researcher deemed it appropriate to apply an inductive content analysis approach.

As may be seen in Figure 3-3, there are three phases of content analysis (Elo & Kyngas, 2008):

- Preparation

This phase entails selecting the unit of analysis and making sense of the selected data (Elo & Kyngas, 2008).

- Organising

This phase entails making notes throughout the data analysis as the researcher goes through the data for the purpose of coding. Strauss and Corbin (1998) define coding as "the analytic processes through which data are fractured, conceptualised, and integrated to form theory" (p. 3). A coding sheet is used to capture the coding; categories are conceived; and meaning is, thus, abstracted from the analysis (Elo & Kyngas, 2008).

- Reporting

This phase involves reporting on the results of the analysis, as well as the analysis itself (Elo & Kyngas, 2008).

Reporting on the analysis and results is contained in Chapters 5 and 7. The following section discusses the argumentation method.

3.3.4. Argumentation

Argumentation refers to the mechanism of justifying or disagreeing with a statement by the use of language in order to persuade the reader of the claim (Smaling, 2002; Van Eemeren, Jackson, & Jacobs, 2015). Figure 3-4 depicts the constituents of an argument (Search & Write, 2013):
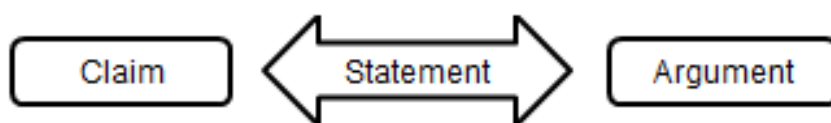
Figure 3-4: Argumentation

Search and Write (2013) report that, in a thesis, the constituents of argumentation include a claim that is being asserted; a statement that links the claim to an argument; and the argument itself (empirical evidence or a reference). In this research study argumentation was used when formulating the relevant factors as well as the framework.

The following section discusses the validation method used to prove the accuracy of the factors.

3.3.5. Member checking

According to Cohen and Crabtree (2006) and Harper and Cole (2012), in qualitative research one of the methods that may be used to validate the quality, credibility, and trustworthiness of results is member checking. They assert that member checking improves the validity of a study by verifying the accuracy and completeness of the findings with members of those groups from whom the data was originally collected. Furthermore, both Murphy and Dingwall (2003) and Creswell (2007), assert that this method allows participants the opportunity to provide feedback based on their review of the findings. Recent research also supports this view, with Koelsch (2013), Parahoo (2014), and Årlin, Börjeson, and Östberg (2015) echoing the same sentiments and further arguing that it is also equally important to verify whether or not the participants find the results "fair" although this does not imply that the participants have to agree with every detail of the results.

Ryan (2006) maintains that qualitative research "values participants' perspectives on their worlds" and "often relies on people's words as its primary data" (p. 21). This is further supported by Creswell (2013b) who states that one of the characteristics of a qualitative study is its focus "on participants' perspectives, their meanings, their multiple subjective views" (p. 46). Based on these views, the researcher decided to use the "member checking" method as it provided the participants with the opportunity to "confirm" their perspectives and views. Furthermore, this study was of a constructivist nature. Pickard and Dixon (2004) believe that member checking is the appropriate validation method to use with participants in studies located within the constructivist paradigm. During member checking interviews and questionnaires may be utilised as methods to verify "any conclusions" drawn by the researcher (Gledhill, Mulligan, Saffery, Sutton, & Taylor, 2007).

Thus, subsequent to the data collection, data transcription and data analysis, the researcher identified and formulated case study-based factors affecting the acceptance of EMRs by nurses. Arrangements were made with the nursing manager to return to the hospital for the purposes of validating the data which had been collected. To ensure the validity and reliability of the results member checking was carried out. The factors which had been identified and formulated were validated by the nurses. During the validation process the nurses completed a questionnaire which had been developed based on the factors formulated (see Appendix 9 on CD). The validation process took place from 5 to 9 September 2016.

Prior to the validation of the results a pilot study of the data collection instrument was conducted to ensure that the structure of the validation questionnaire would be understandable to nurses. One nurse, from outside the participating hospital, participated in the pilot study. No changes were suggested as the nurse was able to understand the questionnaire.

The researcher printed copies of the questionnaires that were to be distributed to the participants. The participants were from the following units within the hospital (all had participated in the initial data collection):

- ICU
- Medical
- O & G
- OPD
- Paeds
- Stomatherapy and Surgical (These units had merged since the initial data collection stage at the hospital.)
- Theatre
- Trauma and Burns

The researcher pointed out that only nurses who had participated in the initial stage of data collection could participate in the validation stage. Three hundred and seventy (370) nurses had participated in the initial data collection stage and, thus, 370 validation questionnaires were distributed to the nurses. Of the 370 nurses, 279 nurses

completed the questionnaire, thus equating to a response rate of 75.4%. The breakdown in terms of hospital units is presented in Table 3-8.

Table 3-8: Breakdown of validation nurse questionnaires

Units	Validation questionnaires
ICU	52 out of 65
Medical	47 out of 48
O & G	27 out of 40
OPD	32 out of 37
Paed	35 out of 45
Stomatherapy and Surgical	35 out of 46
Theatre	8 out of 42
Trauma and burns	43 out of 47

The validation results are discussed together with the factors that emerged in Chapter 7.

3.4. Conclusion

The purpose of this chapter was to describe the research methodology used in the study in order to clarify the way in which the study was conducted, as well as the research paradigm that influenced the study. This description encompassed the research design, including the research paradigm, approaches and processes used. In addition, the research methods and theoretical orientation of the study, as well as the issue of research ethics, were discussed. The chapters following this chapter address the three RQs that were revisited in this chapter.

CHAPTER 4

4. NURSING PROFESSION IN HOSPITALS

Ch. 3

The previous chapter explained the way in which the study was conducted. This included a discussion on the research design, research methods, theoretical orientation and ethical considerations.

Ch. 4

This chapter focuses on nurses as the primary study participants. It addresses the first research objective of the study, namely, to analyse the role of nurses in recordkeeping in hospital settings. The discussion includes an explanation of the various categories of nurses and the role of nurses during the provision of healthcare in a hospital setting. In addition, the discussion focuses on the role of nurses in recordkeeping in hospitals.

Ch. 5

The next chapter focuses on formulating the factors that influence the acceptance of EMRs by nurses.

4.1. Introduction

As stated in Chapter 1, section 1.1, this research study used nurses as the primary study participants. It was, therefore, important to have a general understanding of nurses in terms of the categories of nurses and their scope of practice. Thus, the purpose of this chapter is to analyse the role of nurses in recordkeeping, specifically in hospitals.

4.2. Nurses

This section discusses the various categories of nurses and the role nurses play as healthcare providers within a hospital setting, including the role of the nurse in record keeping. However, prior to this discussion, it was deemed important to provide a definition of the term nurse. According to the International Council of Nurses (ICN) (1987), a nurse may be defined "as a person who has completed a programme of basic, generalised nursing education and is authorised by the appropriate regulatory authority to practise nursing in his/her country" (para. 4). Furthermore, the ICN (1987) states that a nurse is a person who is equipped to

- engage in the general scope of nursing practice, including the promotion of health, prevention of illness, and care of the physically ill, mentally ill, and disabled people of all ages and in all health care and other community settings
- carry out health care teaching
- participate fully as a member of the health care team
- supervise and train nursing and health care auxiliaries, and
- be involved in relevant research.

4.2.1. Nurse categories

In various publications, the term nurse "categories" is referred to as "titles". The sole purpose of assigning titles to nurses is to differentiate between professions; to ensure that "consumers" are aware of these differences and to make it easy to recognise the nursing profession, regardless of the geographical area of practice (Cahill, Alexander, & Gross, 2014). However, according to Uys and Klopper (2013), "not all countries have a range of nurse categories" (p. 1). Table 4-1 below presents the various categories assigned to nurses in different countries. The table has been adapted from the Institute

of Medicine (2010) by including the South African categories as sourced from Rispel (2015):

Table 4-1: Titles of nurses from various countries

Country	First Level	Second Level	Others
Brazil	• Nurse Diploma or BSN	• Technical or Auxiliary	
Canada	• State Registered Nurse	• Enrolled Nurse	• Registered Midwife
Columbia	• General Nurse		
Ethiopia	• Junior or Senior Clinical Nurse • Chief Staff Nurse	• Health Assistant	• Assistant Clinical Nurse • Assistant Public Health Nurse • Public Health Nurse Midwife
Israel	• Licensed, Registered, Graduate, or Qualified Nurse	• Practical Nurse	• Midwife
Lebanon	• Registered Nurse or Technical Superior	• Technical Nurse	• Psychiatric Nurse Midwife
Nepal	• Registered Nurse		• Auxiliary Nurse • Midwife • Auxiliary Nurse and Midwife
Peru	• Registered General Nurse	• Auxiliary/Midwife	
Poland	• Nurse	• Assistant Nurse	• Midwife
SA	• Professional Nurse/ Registered Nurse	• Enrolled Nurse / Staff Nurse	• Auxiliary Nurse/ Nursing Assistant
Ukraine	• Medical Sister • Medical Sister in the Specialty of Pediatrics		• Midwife • Feldchers

Source: Adapted from the Institute of Medicine (2010)

As may be noted in Table 4-1, based on experience, the categories advance from the first level and include "other" categories. However, regardless of the category, Hsiao, Wu, and Chen (2013), Mayosi and Benatar (2014), Mash et al. (2012) and Breier, Wildschut, and Mgqolozana (2009) affirm that nurses are central to the provision of

healthcare. Hence, it is important to understand the role of nurses in the provision of healthcare. This includes an understanding of their role in a hospital setting.

4.2.2. Role of nurses in a hospital setting

As the largest group of healthcare providers, the important role that nurses play in the provision of healthcare is irrefutable (National Department of Health, 2013; Jones & Sherwood, 2014). This is especially true as nurses are known to be the key providers of health care services to patients (Duplaga, 2016; Lee, 2004).

The fact that Breier et al. (2009) assert that nurses are the source of the majority of healthcare provision in the health sector is evidence that nurses have a vital role to play in the provision of care to patients in the health sector. This is also the reality in hospitals with Matsebula and Willie (2007) asserting that the success of operations at hospitals is "highly dependent" on nurses.

The World Health Organisation (n.d.) defines hospitals as "health care institutions that have an organised medical and other professional staff, and inpatient facilities, and deliver medical, nursing and related services 24 hours per day, 7 days per week" (para. 1).

Within a hospital the structure of nursing units are contingent upon the organisation of the nursing programme and the number of beds in a nursing unit and in a patient room (Carr, 2011). In addition, the nursing units are sited in a way that attempts to shorten the distance that nurses have to cover between their station and the beds of the patients. Ngin (1994) asserts that, within a hospital, at the start of a shift a nurse is responsible for performing a needs analysis. This involves determining the following:

- Who their patients are
- The condition of those patients during the past 12 to 24 hours
- What was done for them
- What further care should be given
- How and when should that care be given.

Figure 4-1, below depicts the typical movements of a nurse between patient rooms and other areas in the nursing unit during a shift. Note: The blocks denote the destination points (such as a patient; nursing station; medication room; lounge; pantry

and elevators) of the nurse while the multiple lines outline the pathways between the destination points.
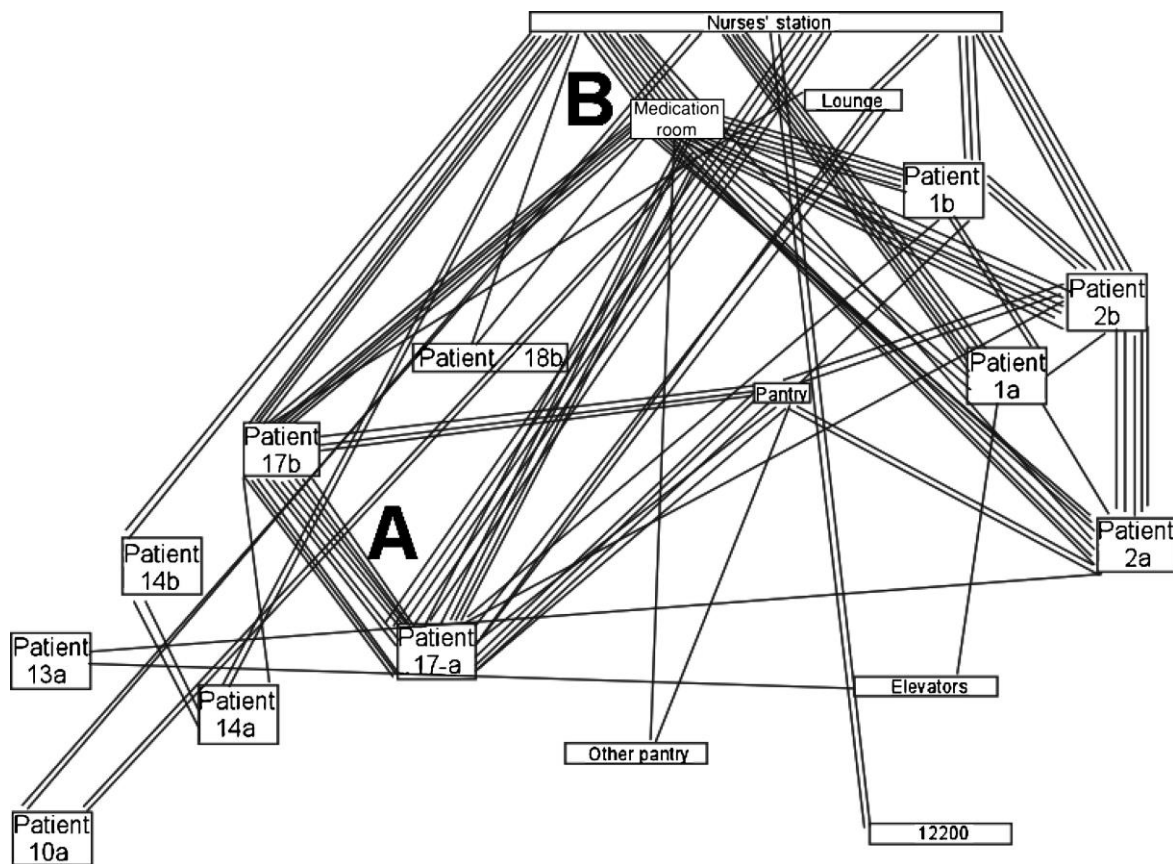
Figure 4-1: Nursing activity (Potter, et al., 2005)

Based on the multpile lines that point to the patients as the destination points- in the example in the figure, it is clear that patient care is the main activity performed during a shift. However, during the provision of care to patients, there are various roles that nurses must play. A model known as the Nursing Role Effectiveness Model (NREM), formulated by Donabedian (1980), maps out a breakdown of the various roles that nurses have to fulfil within the healthcare context. This model also relates the roles identified to patient and health outcomes. As may be seen in Figure 4-2, using their experience, knowledge and skills nurses play an independent, dependent and interdependent role during the provision of care to patients. It is important to note that, although this model goes further to relate these roles to patient and health outcomes, for the purpose of this research study, the researcher interrogated the roles rather than the outcomes. Hence, the discussion of the model is limited to the roles which nurses fulfil.
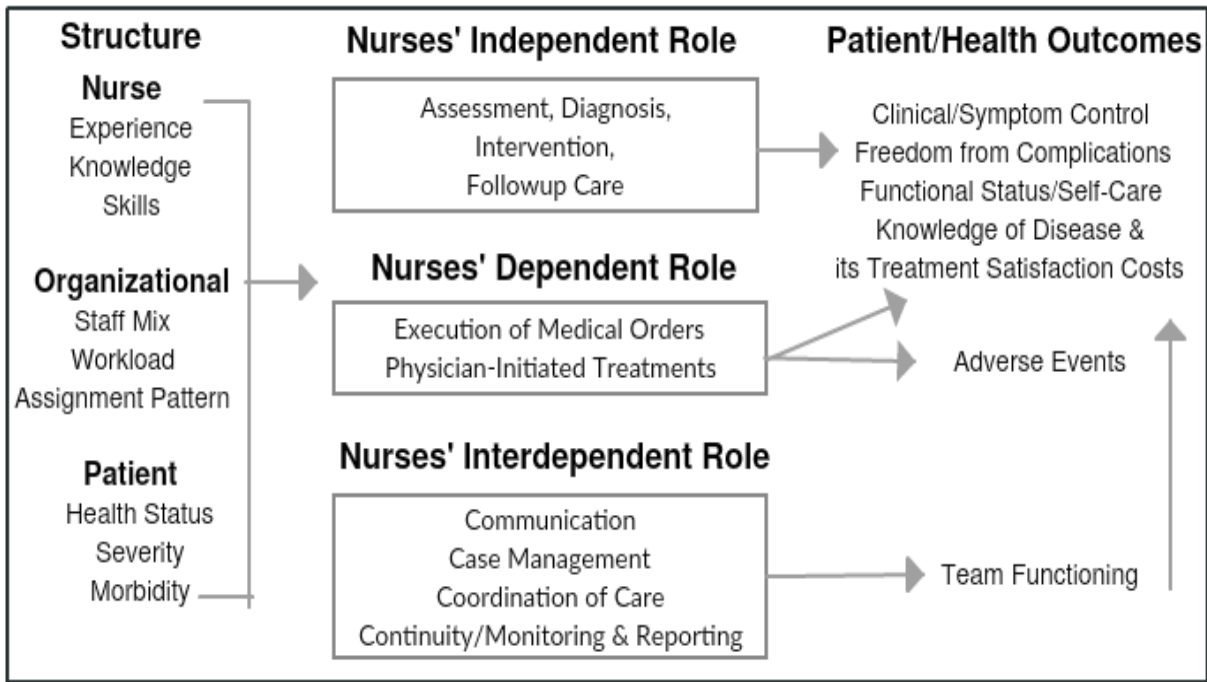
Figure 4-2: The Nursing role effectiveness model (Donabedian, 1980)

The NREM articulates that the independent role involves a nurse carrying out assessments, diagnoses, interventions and follow up care. The ability of a nurse to carry out assessments is a fundamental skill of all nurses (West, 2006), particularly in view of the fact that the nursing process is initiated through assessments (Feely, 1994). In line with what is illustrated in Figure 4-3, Alfaro-LeFevre (2015) and Potter et al. (2005) assert that, although there are overlaps, the nursing process is initiated by an assessment, followed by the diagnosis, planning, implementation and evaluation. (Note: In the NREM, "planning, implementation and evaluation" are grouped together as "intervention and follow-up care".)
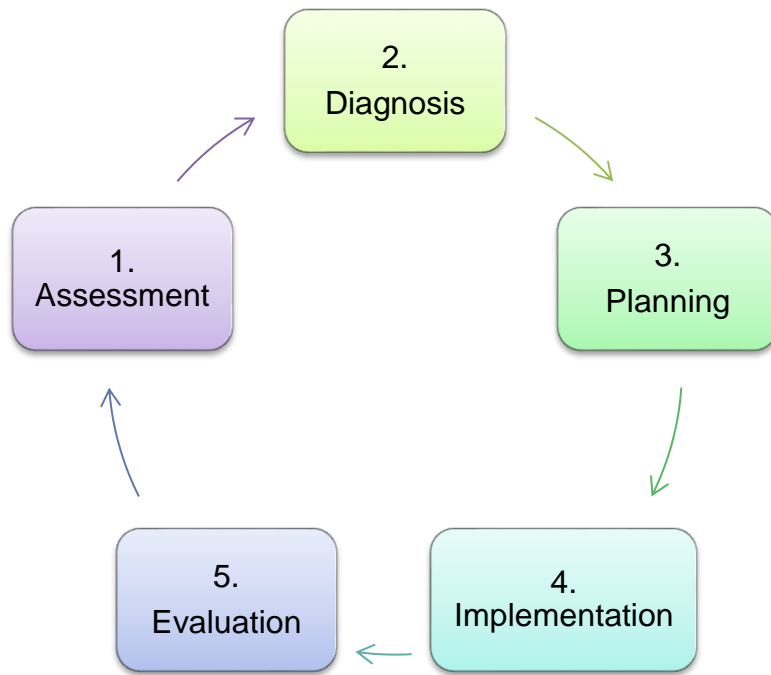
Figure 4-3: Nursing process (Adapted from Alfaro-LeFevre, 2006)

One may argue that even these steps highlight the importance of recordkeeping by nurses. The dependent role is centred on the execution of medical orders and physician-initiated treatments. Ngin (1994) asserts that the focus of the nurse is the treatment and care activities that encompass the physical, social and psychological well-being of the patients. However, the activities included in the dependent role make it clear that this focus goes beyond self-initiated treatments to physician-initiated treatments. Bulechek, Butcher, Dochterman, and Wagner (2013) define a physician-initiated treatment as "an intervention initiated by a physician in response to a medical diagnosis but carried out by a nurse in response to 'doctor's orders'" (p. 42). Ngin (1994) echoes the same sentiments but goes further by stating that, in addition to their other tasks nurses are also tasked with the responsibility of carrying out the orders given by physicians.

Bulechek et al. (2013) attest that this nursing responsibility extends further than carrying out the treatments initiated by physicians to the treatments initiated by pharmacists, respiratory therapists and physician assistants. Adebesin, Foster, Kotz, and Van Greunen (2013) highlight the importance of information sharing between healthcare providers during treatment and care activities. The recording of such treatment and care activities contributes to the sharing of information between healthcare providers (Stevens & Pickering, 2010). Finally, the interdependent role

require nurses to communicate and be involved in case management, coordination of care, continuity of care as well as monitoring and reporting.

The next section focuses on the role of nurses in recordkeeping, specifically in hospitals.

4.2.3. Role of nurses in recordkeeping

Globally there are similarities in terms of the duties assigned to nurses (Heartfield, 1996). According to Heartfield (1996), these similarities includes duties such as the documentation of patient care, assessments, findings and the outcome of the care provided. The role that nurses play in the provision of healthcare, with specific reference to recordkeeping, has long been of importance. This is further substantiated by the fact that, as asserted by Gugerty et al. (2007), recordkeeping consumes up to 50% of the time that nurses spend during each shift. Moreover, Rampfumedzi (2006) as well as Fawcett and Rhynas (2012) state that recordkeeping is at the core of all aspects involved in the nursing process. According to Stevens and Pickering (2010), the diagnosis also requires nurses to carry out some form of recordkeeping. In addition, a nursing care plan also involves documentation which Maharaj (2015) refers to as a "written guide" which is centred around the needs of a patient.

Adebesin et al. (2013) highlight the importance of information sharing between healthcare providers during treatment and care activities. This recording of treatment and care activities contributes to the sharing of information between healthcare providers (Stevens & Pickering, 2010). Research conducted in 1994 by Ngin, focusing on nursing communication and documentation activities, highlighted the "usual view" of nurses as healthcare providers who perform the bedside nursing that includes interacting with a patient. However, Ngin (1994) argues that what may hidden from the onlookers is the structuring and organisation of holistic care in the form of the information retrieval, documentation and communication activities that nurses carry out.

One may argue that even the interdependent role that nurses play relies heavily on recordkeeping. According to Parker and Coeira (2000), communication is central to the information flow in healthcare. Furthermore, Payne, Hardey, and Coleman (2000) point out that the communication that occurs between nurses and other healthcare

providers involves communicating via oral reports as well as written records with the latter means of communication proving to be extremely useful in combating communication breakdown. Payne et al. (2000) assert that communication breakdown may occur due to the "physical isolation" that may exist between healthcare providers. Furthermore, not only does recordkeeping have an impact on communication but also on continuity of care (Bowie, Sweeney, Beattie, & Burns, 2004), with Owen (2005) declaring that continuity of care is maintained through accurate documentation.

Ngin (1994) lists the following types of recordkeeping practices by nurses:

- Retrieval of patient and clinical information
- Decision-making and execution based on the intepretation and analysis of information
- Documentation or communication of decisions and actions (those to be taken and those already taken).

The fact that information documentated regarding a patient is used during decision making and the execution of tasks, as alluded to by Ngin (1994), implies that the information should be of quality. Furthermore, not only does the documented information serve as evidence of care that may be useful during investigations, but it also contributes to the continuity of care (Beach & Oates, 2014). According to Stevens and Pickering (2010), the provision of care to patients involves "good recordkeeping". They further state that the standard of care provided to patients is reflected in the quality of recordkeeping with poor recordkeeping impacting negatively on both patients and nurses (Moloney & Maggs, 1999; Prideaux, 2011). Jefferies, Johnson, and Griffiths (2010) assert that, to ensure quality nursing documentation, it must meet the following criteria:

- Detail the actual work of nursing
- Fulfil legal requirements
- Be patient-centred
- Presented in a logical sequence
- Record variances in care
- Reflect the clinical judgement of nurses
- Be written in real time.

Despite the fact that they are aware of the requirements of quality documentation, nurses sometimes struggle to put this knowledge into practice due to both their workload and time constraints (Beach & Oates, 2014). However, poor quality documentation may lead to miscommunication and poor information flow. This may have detrimental implications, as room for errors is created. A significant number of the errors that occur in healthcare may be associated with failures in communication and the flow of information (Nagpal et al., 2012; O'Daniel & Rosenstein, 2008).

According to Hsiao et al. (2013), nurses comprise the "major group" that plays an important role in the provision of patient care to inpatients. An inpatient is regarded as a patient who is admitted in a hospital for a period of time that is dependent on the treatment required (Motoi, 1998). According to Ngin (1994), the following, as presented in Table 4-2 below, are typical recordkeeping activities in an inpatient unit.

Table 4-2: Typical recordkeeping activities

	Administrative	**Clinical**
Purpose	Legal documentation for bureaucratic purposes; maintains hospital systems.	Facilitate, coordinate continuity of patient care.
Medium	Standardised forms.	Standardised forms; index cards; paper; and memory.
Uses of Information	Hospital administrators; third-party payers; external regulators; occasionally other health-care providers.	Self; other co-workers (i.e., nurses, physicians, etc.) involved in giving care to patients.
Examples	Medical records; nurse assessments; care plans; discharge plans; patient classifications.	Physician orders; nurse and medication Kardexes; and worksheets.

Source: Ngin (1994)

As noted in Chapter 1, section 1.1, the documentation of the medical record of a patient promotes continuity of care (HPCSA, 2008). Also also noted in Chapter 1, section 1.1, there are three dimensions that enable the continuity of patient care:

interpersonal, informational and longitudinal. Informational continuity is a pre-requisite for longitudinal continuity because it is impossible to maintain an extensive medical record of a patient over a period of time without information. On the other hand, longitudinal continuity is a pre-requisite for interpersonal continuity because, the longer the duration of the healthcare provision, the more knowledge a healthcare provider acquires about a patient. This knowledge then informs the healthcare provision offered to the patient. Thus, it is important to achieve informational continuity (Donaldson, 2000; Freeman et al., 2003; Mainous III & Gill, 1998; Olsen et al., 2014). However, if this is to be achieved, it is essential that accurate patient medical records are kept.

In line with both the claim by Boone (2010) that the adoption of an EMR places nurses in a key end-user role and the declaration by Duplaga (2016) that the effectiveness of ehealth solutions is realised through the understanding and acceptance of ehealth solutions by nurses, it made sense to conduct a study focused on understanding the factors that influence the acceptance of EMRs by nurses.

4.3. Conclusion

This chapter addressed the RQ 1 of this study, namely, to analyse the role of nurses in recordkeeping in hospital settings. The discussion included an explanation of the various categories of nurses and also the role of nurses during the provision of healthcare in hospital settings. This laid a foundation for the investigation into the factors that influence the acceptance of EMRs by nurses and which is discussed in the next chapter and with the aim of addressing RQ 2.

CHAPTER 5

5. FACTORS THAT INFLUENCE THE ACCEPTANCE OF EMRs BY NURSES (LITERATURE REVIEW)

Ch. 4

The previous chapter analysed nurses and their role in recordkeeping in hospital settings.

Ch. 5

This chapter presents the factors that influence the acceptance of EMRs by nurses as found in the literature review. Thus, the chapter addresses RO 2, namely, to identify the factors that influence the acceptance of EMRs by nurses. The chapter begins with an explanation of how the factors were formulated and then the actual factors are presented.

Ch. 6

The next chapter contextualises the case study that was conducted in order to gather data and formulate further factors.

5.1. Introduction

As noted in Chapter 1, section 1.1, despite the benefits of EMRs, publications on the failures of EMRs implementations in hospitals cite a lack of user acceptance as an important contributory factor to such failures (Khalifa, 2013; Kumar & Aldrich, 2010; Sumner, 2015; Zaheer & Sayed, 2013). Khan and Woosley (2011) motivate the importance of research that focuses on the adoption and implementation of technology by highlighting the expense involved in and the low success rate of such initiatives. Furthermore, Michel-Verkerke, Stegwee, and Spil (2015) assert that acceptance is an important factor in the adoption of technology. Thus, it would be an error to focus only on promoting the adoption of EMRs and not on ensuring acceptance after the adoption of EMRs. As highlighted in Chapter 2, section 2.2.1, research conducted within the HI context requires that healthcare professionals are used as the research participants from whom knowledge may be constructed or meaning made of the phenomenon under study. Hence, the purpose of this chapter is to identify the factors that influence the acceptance of EMRs by nurses. The factors discussed in this chapter emerged from the literature review.

5.2. Formulation of factors

The factors presented in this chapter were formulated in the research study. In order to do this the researcher conducted a review of relevant literature. The literature review required the relevant research studies be identified. In order to identify these studies, the researcher had to interact with multiple databases and search engines. A librarian was consulted in order to enlist her expertise in searching for content. The search for relevant articles was conducted in the following search engines and databases:

- Emerald
- Gale group
- Google
- Google Scholar
- IEEE Xplore Digital Library
- Sage
- Scopus
- SpringerLink

- Taylor & Francis Online.

These online sources provided access to various journals, conference proceedings, standards and books on engineering, health sciences, social sciences, science, technology and management research.

When searching through these sources the search criteria for articles included the following:

- Post 1990
- Focusing on EMRs

  It was evident during the literature review that certain articles use the terms "EMR" and "EHR", interchangeably although the two meanings are not interchangeable. Thus, the researcher read abstracts in order to filter the articles considered.

- Focusing on nurses as study participants

  It was important to ensure that the factors were derived from nurse and not from the views of other healthcare providers. In cases where the article focused on nurses and doctors, the researcher included only findings that had been specifically collected from nurses. If the source were not specified, the researcher disregarded the article.

- Focusing on hospitals

  The setting for the case study of this research was a hospital and, hence, it was important to derive literature-based factors from the same healthcare provider group.

The studies that met the search criteria used to formulate the factors are presented in Table 5-1 below .

Table 5-1: Studies used in the formulation of literature-based factors that influence the acceptance of EMRs by nurses

Study title	Reference
Physicians' and nurses' reactions to electronic medical records: Managerial and occupational implications.	Darr, Harrison, Shakked, and Shalom (2003)
Physician and nurse satisfaction with an electronic medical record system.	Likourezos et al. (2004)
The endless nursing benefits of electronic medical records.	Orlovsky (2011)
Information systems and healthcare XXXII: Understanding the multidimensionality of information systems use: A study of nurses' use of a mandated electronic medical record system.	Hennington, Janz, Amis, and Nichols (2009)
Validation of a professionals' satisfaction questionnaire with electronic medical records (PSQ-EMR) in psychiatry.	Boyer et al. (2010)
Embracing EMR.	Brooks (2011)
Understanding nurse perceptions of a newly implemented electronic medical record system.	Holtz and Krein (2011)
Electronic medical records (EMR) and nurses in Turkish hospitals.	Top et al. (2012)
Perception of electronic medical records (EMRs) by nursing staff in a teaching hospital in India.	Pera, Kaur, and Rao (2014)

As noted in Chapter 3, section 3.3.3, in view of the limited literature available on the phenomenon under scrutiny, an inductive content analysis approach was used to analyse the text that the researcher had found to be relevant during the literature review. This approach required the use of codes to categorise and extract meaning from the text. Saldana (2015) describes a code as "most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (p. 3). Saldana (2015) goes further to say it is possible for codes that are assigned to text to differ from researcher to researcher as the act of coding is not a precise science but, rather, an interpretive act. The codes assigned in this research study correlated with the descriptive names associated with the factors presented in the next section. For the sake of consistency all the factors were assigned descriptive names from a positive influence viewpoint,

for example, one of the factors discusses the influence of a *lack* of braveness in the acceptance of EMRs by nurses but this factor is termed "braveness".

Using an Excel spreadsheet, the researcher captured the code representing the text as well as the reference as the source of the text.

The next section discusses the factors that were identified and formulated. Prior to the presentation of these literature-based factors, it is important to declare that these factors were not gathered from literature focusing on a specific category of nurses. Certain studies specified that their sample of nurses consisted of "registered nurses" and/or "licensed practical" nurses although not all studies mentioned this specification. Nevertheless, it was clear that the samples used in these studies comprised nurses working in a hospital setting.

5.3.   Factors that influence the acceptance of EMRs by nurses - Literature

The following are the literature-based factors that influence the acceptance of EMRs by nurses in a hospital setting.

5.3.1. Braveness

According to Brooks (2011), a registered nurse, a change in technology in the form of an EMR may make nurses feel uneasy and result in a lack of braveness due to their fear of a loss of control as well as fear of the unknown. Hence, the existence of fear among nurses may negatively influence their reception of EMRs.

5.3.2. Change acceptance

According to Brooks (2011), a registered nurse, the introduction of an EMR introduces change into the workplace and nurses may not welcome such a change, thus resulting in EMR resistance. Thus, a resistance to change may negatively influence the acceptance of EMRs by nurses.

5.3.3. Communication

A study conducted by Brooks (2011), found that nurses were of the view that the use of an EMR allowed them to spend less time communicating with other healthcare providers than may otherwise have been the case. In addition, nurses in a study conducted by Top et al. (2012) expressed the view that the use of EMRs enabled them

to carry out their work in a way that increased patient safety by improving the communication between healthcare providers. Thus, the usefulness of an EMR for communication purposes may positively influence the acceptance of EMRs by nurses.

5.3.4. Computer literacy

According to nurses, a lack of computer experience often constitutes a barrier to the use of EMRs. Likourezos et al. (2004) found that "Some staff are not that computer literate and it takes a while for them just to enter information into the system" (p. 422). Boyer et al. (2010) endorsed this further by referring to a study conducted by Alquraini, Alhashem, Shah and Chowdhury (2007) which found that younger nurses usually had more computer experience as compared to their older counterparts and they tended to be more positive in their views and attitudes towards an EMR. This was further supported by the following quotes from a study conducted by Holtz and Krein (2011): "You know, I work with more 'seasoned' nurses, I'll help them find things [on the computer]." Another stated, "I have grown up with computers and I think it is a lot harder for the people, generations behind to get accustomed to it because they didn't grow up with computers." Another nurse echoed the same sentiments, "We have a lot of older nurses who aren't that strong in computers and stuff, and those seem to be the ones that have the most questions." An older nurse agreed with this, "You know, the younger people have grown up with computers – I don't even have a computer at home." Thus, computer literacy, or the lack thereof, may influence the acceptance of EMRs by nurses.

5.3.5. Ease of use

The nurses in a study conducted by Likourezos et al. (2004) indicated that, when using an EMR, they found it easy to "enter", "access" and "read" data. This was echoed in a study conducted by Top et al. (2012), although there were also suggestions in relation to "'user-friendliness', ability to write text, and placement of the work station in a private area" (p. 422). Such positive views may positively influence the acceptance of EMRs by nurses. However, any lack in addressing or following up on the suggestions made may have negative consequences for the acceptance of EMRs by nurses.

5.3.6. Information accessibility

Nurses in a study conducted by Top et al. (2012), as well as the nurses in a study conducted by Darr et al. (2003), were of the view that EMRs improved access to patient information. It may, thus, be concluded that the accessibility of information stored in the EMR may have a positive impact on how nurses accept EMRs.

5.3.7. Information protection

Nurses in a study conducted by Likourezos et al. (2004) were of the opinion that patient information is more confidential with an EMR as compared with paper records. However, one of the nurses was quoted as saying, "I'm still doubtful regarding confidential information that can be accessed by hackers or non-medical workers" (p. 422). Thus, the ability, or lack thereof, of the EMR to promote and maintain the protection of patient information may influence how nurses accept the EMR.

5.3.8. Job facilitation

Nurses in a study conducted by Top et al. (2012) were of the view that using an EMR facilitated their job due to the help with it provided them in their hospital work. This view could have a positive impact on their acceptance of EMRs.

5.3.9. Nurse involvement

The involvement of nurses in the adoption of EMRs may impact positively on their acceptance of the EMR. The nurse participants in a study conducted by Darr et al. (2003) revealed that nurses tend to demonstrate a positive attitude towards EMRs if they were allowed input into how the EMR is implemented.

5.3.10.　　Nurse perceptions

Nurses in a study conducted by Likourezos et al. (2004) expressed a number of perceptions in relation to the EMR. These included the following (Likourezos et al., 2004):

- Crowding will not decrease in the [hospital].
- The number of [hospital] visits will not decrease.
- The number of laboratory tests will not decrease.
- Patient waiting time will not decrease.

- Patient care expenses will not be reduced.
- Less down time will occur in the future.
- Patient care will not improve.

In addition to the perceptions listed above, the following perceptions were also identified:

- Communication between healthcare providers will improve (Hennington et al., 2009).
- Paper-work will be eliminated (Top et al., 2012)
- Risk of errors will be reduced (Hennington et al., 2009).

The perceptions related to patient care not improving were in contradiction with a study conducted by Top et al. (2012) and another study conducted by Hennington et al. (2009) as these researchers found that nurses were of the view that EMRs would not improve the quality of the medical care received by the patients. However, though contradictory, the nurses stated that widespread use of the EMR would improve healthcare in their country – the USA. Furthermore, Top et al. (2012) found that nurses were of the perception that the EMR would assist them in monitoring patient progress and reduce their workload. Moreover, nurses in a study conducted Hennington et al. (2009) stated that the use of an EMR could improve decision making; and provide timely access to patient information. These perceptions may influence the acceptance of EMRs by nurses either positively or negatively.

5.3.11. Optimistic championing nurses

A study conducted by Holtz and Krein (2011) revealed that the presence of nurses who are optimistic about EMRs, referred to as champion nurses, could positively influence other nurses in relation to their willingness to use EMRs.

5.3.12. Paper-based system experiences

The previous experiences of nurses regarding the use of a paper-based system could encourage their acceptance of EMRs. For example, nurses in a study conducted by Likourezos et al. (2004) expressed the opinion that patient information was more confidential with EMR than with paper records. In addition, they also reported that they were able to speed up their work with EMRs in comparison with the amount of time

spent when using a paper-based system. Thus, negative experiences with a paper-based system versus positive experiences with an EMR may positively influence the acceptance of EMRs.

5.3.13.   Patient care

The impact of an EMR on patient care may influence the acceptance, or lack thereof, of EMRs by nurses. Nurses in a study conducted by Likourezos et al. (2004) stated that they were "better able to monitor patient progress" when using the EMR (p. 422). In addition, nurses in a study conducted by Top et al. (2012) voiced the opinion that the use of EMRs enabled them to carry out their work in a way that increased patient safety by improving the communication between healthcare providers. Nurses in a study by Darr et al. (2003) echoed the positive sentiments regarding the improvement of patient care. One of the nurses was quoted as saying "[t]he quality of care has improved, there is much more extensive and accurate information on each patient" (p. 355) According to a registered nurse, quoted by Orlovsky (2011), nurses were of the opinion that the use of EMRs assisted in improving the level and consistency of patient care, thus making them open to "embracing" EMRs. One of the suggestions from the nurse participants, which related to patient care, was to "Place the computers in a secure area so that staff are not interrupted when patients and family are asking questions." However, nurses in a study conducted by Hennington et al. (2009) were of the view that the use of the system detracted from their ability to provide timely patient care. This further supported the findings of a study conducted by Holtz and Krein (2011) with one of the nurses being quoted as saying that "takes away from patient care." Another nurse stated that "I don't want to take the computer into the patient room. I want to talk to the patient, I felt like writing was faster, took less time and took less focus away from the patient." A nurse in a study conducted by Hennington et al. (2009) echoed the same sentiments and was quoted saying, "Our goal is to provide the care, have the computer at the bedside, and enter your documentation, you know, as you do your care. Unfortunately, we are not able to do that because most of our computers have to stay stationary, so we have to still go in and do our care, come back to the computer, and then enter our documentation from that standpoint. So, you have different practices. Some people will go do the care and then enter it directly after performing the care before going to the next patient. Then some people will do all their patient care and then come and sit down and document

everything in the computer" (p. 8). According to nurses in a study conducted by Pera et al. (2014), the use of an EMR enabled them to make better patient care decisions than may otherwise have been the case. Thus, the impact of an EMR on patient care may influence the acceptance of EMRs by nurses.

5.3.14. Social influences

Social influence has been said to have an impact on the use of EMRs by nurses. Social influence includes the influence that is brought to bear by champion nurses in a hospital; nurses working on the same shift; aiming to please superiors; as well as decisions made by managers regarding other users of the system (Holtz & Krein, 2011). One of the nurses in a study conducted by Holtz and Krein (2011) was quoted as saying:

> It [EMR deployment] really should have physician management first because most of the functions would follow in line with the physician order and electronic medical records. But, for whatever reason, they [physicians] opted out of this system and were allowed that option … The double standards are so blatantly obvious to the nursing staff that it is just causing a rift and it is also causing a lack of confidence in the administration for not having more control over the physician group.

Thus, social influence may influence the acceptance of EMRs by nurses.

5.3.15. System functionality

Nurses in a study conducted by Likourezos et al. (2004) indicated that they sometimes had problems following the "sequence of screens" with which they needed to interact. The comments made by the participants included the following suggestions: "Better information flow, better organisation of data entry and retrieval" (p. 422) and "Allow for writing patient information on the EMR and do not rely only on clicking pre-programmed icons" (p. 422). Thus, the functionality that is contained in, or omitted from the EMR, may have an impact on the acceptance of EMRs by nurses.

5.3.16. Time

Nurses in a study conducted by Likourezos et al. (2004, expressed concerns about the amount of time it took to perform certain tasks: "Some staff are not that computer

literate and it takes a while for them just to enter information into the system";
"Downtime, freezing, logging off between sessions, amount of time it takes to log on";
"EMR could be better streamlined to help minimise the amount of time spent at the
computer, especially when doing examination notes"; "It is very time consuming to
order a …"; and "Staff tends to spend more time in front of the computer than with the
patients" (p. 422). However, the nurses reported that they had been able to speed up
their work in comparison with the amount of time spent when using the paper-based
system. However, nurses in a study conducted by Hennington et al. (2009) were of
the view that the use of the system detracted from their ability to provide timely patient
care. Registered nurses were quoted as saying: "It takes me about an hour [to chart
the first round of patient assessments] because, along the way, I'm getting stopped."
"Umm, man, that is hard to say because, I mean, you are back and forth so much,
actual charting itself, like the assessments and what not doesn't really take that long,
umm, it's going back and looking at labs and orders and is this ordered, have they
done this and umm that varies." And "Off and on all day, I mean, that is a constant
thing. You know, I mean you never really just get away from the computer because,
by the time you have charted on this patient, you have to do another assessment" (p.
9). Thus, the amount of time involved when using an EMR may have a positive or
negative impact on the acceptance of EMRs by nurses.

5.3.17.   Training

Nurses in a study conducted by Hennington et al. (2009) were of the view that
periodical training is required for EMR users. The availability of training, thus, plays an
important role in the acceptance of EMRs by nurses.

5.3.18.   Workload reduction

Nurses in a study conducted by Hennington et al. (2009) expressed the view that the
use of an EMR for data entry resulted in a reduced workload. This view on an EMR
may positively influence the acceptance of EMRs by nurses.

5.4.   Summary of factors

Table 5-2 below presents a summary of the factors that emerged from the literature
review. The table also indicates whether the factors were found to have a negative
and/or positive influence on the acceptance of EMRs by nurses.

Table 5-2: Summary of factors based on type of influence

No.	Factor	Influence (+)	Influence (-)
1.	Braveness		-
2.	Change acceptance		-
3.	Communication	+	
4.	Computer literacy	+	-
5.	Ease of use	+	-
6.	Information accessibility	+	
7.	Information protection	+	-
8.	Job facilitation	+	
9.	Nurse involvement	+	
10.	Nurse perceptions	+	-
11.	Optimistic championing nurses	+	
12.	Paper-based system experiences	+	
13.	Patient care	+	-
14.	Social influences	+	-
15.	System functionality		-
16.	Time	+	-
17.	Training	+	
18.	Workload reduction	+	

5.5. Conclusion

The purpose of this chapter was to identify literature-based factors that influence the acceptance of EMRs by nurses. Eighteen (18) factors were identified. These factors all provide an indication of those aspects that hospitals considering EMR adoption should take into account and/or address in order to create a conducive environment for EMR acceptance by the nurses. Further factors which emerged from the case study are identified in Chapter 7. The following chapter, Chapter 6, contextualises the case study that was conducted.

CHAPTER 6

6. CASE STUDY CONTEXT

Ch. 5

The previous chapter presented the literature-based factors that influence the acceptance of EMRs by nurses.

Ch. 6

This chapter contributes to addressing RO 2, namely, to identify the factors that influence the acceptance of EMRs by nurses. The chapter presents the context of the case study that was conducted in order to formulate further factors. This was deemed necessary in order to provide clarity on the setting of the study as well as the demographics

Ch. 7

The next chapter presents case-study based factors that influence the acceptance of EMRs by nurses.

6.1. Introduction

As stated in Chapter 1 section 1.5, the primary objective of this research study was to contribute to the better understanding of the acceptance of EMRs by nurses in hospital settings. Chapter 3 section 3.2.3 identified a literature review and a case study as two (2) of the rigorous methods that were used to realise the research objectives of the study. Specifically, in this study, these methods are used as part of a within-method methodological triangulation in order to enhance the understanding of the factors that influence the acceptance of EMRs by nurses. Thus far, the factors that influence the acceptance of EMRs were identified through a literature review (see the preceding chapter, Chapter 5) but are yet to be identified through a case study.

As indicated in, Chapter 1, section1.8 on the chapter layout, the case study-based factors are presented in Chapter 7. However, prior to that it was deemed necessary to describe the context of the case study that was conducted. Therefore, the main aim of this chapter was to provide context to the case study.

The following sections present the data that was collected in the context of the case study. The purpose of this data is to illustrate the environment in which the nurses worked. Note: In the tables presented in this section a black block indicates that no response was received from the participant.

6.2. The hospital

This section presents data that sheds light on the hospital that was used in this study. It describes the hospital demographic; the Information Technology used in the hospital; and the unit/ward demographics. The data presented in this section was derived from the questionnaires completed by the IT manager and the matrons and the interviews which were conducted with the IT manager and matrons; as well as from information communicated to the researcher by the matrons via email and also verbally during the data collection process at the IALCH hospital.

6.2.1. Hospital demographic profile

This section presents the demographic profile of the participating hospital. It includes the following:

- Hospital bed capacity

- Staff hierarchy at the hospital
- The staff census.

According to the data collected, IALCH has a bed capacity of eight hundred and forty six (846) beds in total. This categorises the hospital as a "large" hospital in line with Kachienga's (2004) classification of those hospitals with more than six hundred hospital beds as large hospitals.

The staff organisational structure of the hospital is presented in Figure 6-1 below. (Note: This structure includes those participants who were involved in the study.)
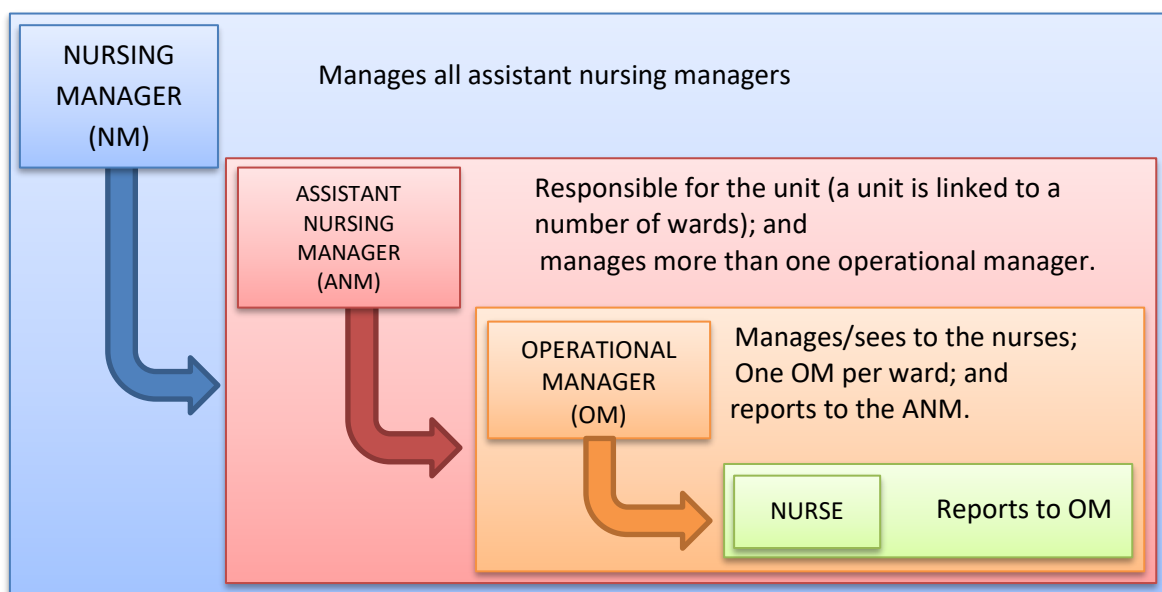
Figure 6-1: Staff organizational structure

In the hospital the Nursing Manager (NM) is directly responsible for the Assistant Nursing Managers (ANM) (also known as matrons) and indirectly responsible for the Operational Managers (OMs) and all other nurses. An ANM is directly responsible for the OMs and indirectly responsible for all other nurses. An OM is responsible for the nurses. Note: Throughout this research study the term "matron" is used to refer to an "assistant nursing manager", as the two titles have the same meaning.

At the time of the study the hospital had 1745) nursing staff members. The breakdown, according to the different job levels, is depicted in Table 6-1 below and comprised the following: 962 registered nurses; 462 staff nurses; and 321 nursing assistants.

Table 6-1: Number of nurses across job levels

Job Level	No. of Nurses
Registered Nurses	962
Staff Nurses	462
Nursing Assistants	321
Total	1745

The hospital had one IT manager and 17 matrons.

6.2.2. Unit/ward demographics

Table 6-2 below illustrates the unit/ward demographics, as sourced from the questionnaires completed by the matrons. The demographics include:

- Number of beds in ward
- Average bed occupancy level
- Number of nurses in ward
- Number of shifts per day
- Length of shifts (hours)
- Average number of patients for whom each nurse is responsible in a typical day
- Average amount of time nurse spends attending to a patient in a typical day.

Table 6-2: Unit/Ward demographical profiles

Unit/Ward	Number of Beds in Ward	Average Bed Occupancy Level	Number of Nurses in Ward	Number of Shifts per Day	Length of Shifts (Hours)	Average Number of Patients each Nurse may be responsible for in a Typical Day	Average Amount of Time Nurse spends attending to a Patient on a Typical Day
ICU	92	76–100%	400	2	10 hours and 12 hours	1:1 in ICU	
Trauma/Casualty (Burns and ICUs)	18	76–100%	19		1:2 in High Care	8–10 hours – day	
Paediatrics Ward	153	76–100%		2	10 hours – night		
Medical	179	76–100%	160	2	11 hours	1:1 in ICU	
Neurosurgery Ward	32	76–100%	32		1:2 in High Care	Depends on patient condition: 30 minutes	
Labour Ward H/C	10	76–100%	± 40	2	8 hours and 10 hours	1:4	7 hours
Outpatient	N/A	N/A	183	1	9 hours – day		

6.2.2.1. Typical ward routines

The analysis of the data collected from the matrons indicated that there were common activities across the different units/wards. The routine included the following activities (may vary depending on unit/ward):

- Take-over: This involves taking over from the previous shift.
- Administration: This involves administrative duties such as attending to emails; documentation (including recording and compiling shift reports; entering nursing care plan on the system; recording of observed fits; electronic capture of takeovers; and intake and output recording); analysing statistics; urine analysis; checking of roll-call; performing drug checks; controlling schedule drugs; attending to the emergency trolley and preparing for ward rounds.
- Education: This involves attending in-service training or debriefing sessions, as well as the provision of health education.
- Meeting: Involves attendance at meetings.
- Patient care: Providing patient care involves bathing, feeding and weighing patients; changing nappies; making up beds; sorting and prioritising patients; conducting urine analyses; monitoring vital signs; GM monitoring; writing patient notes; performing ward rounds (including preparing for such rounds); administering medication (including start doses prescribed by doctors) and injections; attending to hyper-active patients; preparing for and assisting doctors with procedures; wound dressing; mouth care; taking patients for X-rays; CT scans; as well as assessment and interpretation during consultations.
- Prayer: This involves praying as a ward/unit.
- Staff management: Proactive and reactive staff allocations.
- Hand-over: Handing over to the next shift.

6.2.2.2. Computer devices in units/wards

The study found that one of the three office-based matrons had one desktop computer each in her office. However, no responses were received from the other two office-based matrons.

Figure 6-2 depicts the number of desktop computers and laptops in the units/wards as well as the use of these computer devices. The study found that not one of the units had a tablet device at its disposal. In certain units/wards the computer devices

available appeared to be adequate although this was not the case throughout the hospital as certain units/wards do not have sufficient computer devices. As a result, the health care providers in these units/wards had to queue to use a computer device. In addition, the units/wards that had an inadequate number of devices did not seem to have a formal queuing system in place with the nurses merely communicating with each other. It emerged from the data collected that the workstations were situated either in the centre or at the entrance of the wards/units although, in certain wards/units, there was a computer next to each patient. The nurses in all the units were reported as having access to all the computers and medical devices in the wards, with the exception of the medical unit. The matron from the medical unit stated that, although the nurses had access to all the computer devices, they did not have access to all the medical devices in the wards.

User:
- Matron;
- Head of Department; and
- Secretary.

Purpose:
- Patient files; and
- Department files.

User:
- Matron;
- Head of Department; and
- Secretary.

Purpose:
- Patient files; and
- Department files.

ICU — x3, x3

User:
- Nurses; and
- Healthcare providers.

Purpose:
- Observation recording;
- Assessment; and
- Any other patient information.

User:
- Nurses; and
- Any healthcare providers

Trauma — x11, x3

User:
- Doctors; and
- Nurses.

Purpose:
- As patient Chart during ward rounds; and
- Capturing patients notes.

User:
- Matrons;
- Nurses; and
- Doctors.

Purpose:
- Capturing patient notes;
- Viewing and capturing patient treatment;
- Capturing care plans;
- Receiving, reading and sending emails;
- Using Word/PowerPoint;
- SAP;
- Speedminor; and
- Writing Matrons report.

Pediatrics — x4, x5

User:
- Nurse; and
- Clinical staff in the wards.

Purpose:
- Documentation of all tasks performed;
- Admission & discharges of patients (all patients wards); and
- Writing reports.

User:
- Nurse; and
- Clinical staff in the wards.

Purpose:
- Documentation of all tasks performed;
- Admission & discharges of patients (all patients wards); and
- Writing reports.

Medical — x48, x42

User:
- Doctors; and
- Nurses.

Purpose:
- Patient notes;
- Capturing patient program reports;
- Ordering of medication; and
- Conduction of investigations.

Neurosurgery — x2, x0

User:
- Nurses; and
- Doctors.

Purpose:
- Writing notes and orders;
- Viewing results;
- Ordering stock;
- Emails; and
- Documentation.

User:
- Nurses; and
- Doctors.

Purpose:
- Writing notes and orders;
- Viewing results;
- Ordering stock;
- Emails; and
- Documentation.

Labour — x12, x1

User:
- Doctors;
- Radiographers; and
- Nurses.

Purpose:
- Capturing doctors notes;
- Booking of patient appointments;
- Ordering of medication; and
- Administrative documents.

Outpatient — x53, x0

Laptop: Desktop computer:

Figure 6-2: Number of computer devices, users and purpose of use

6.2.2.3. Information storage mediums

The participants were asked to specify the type of information stored in a paper-based format and electronic format respectively. Their responses are presented in Figure 6-3 below. (Note: no data was provided for the ICU.)
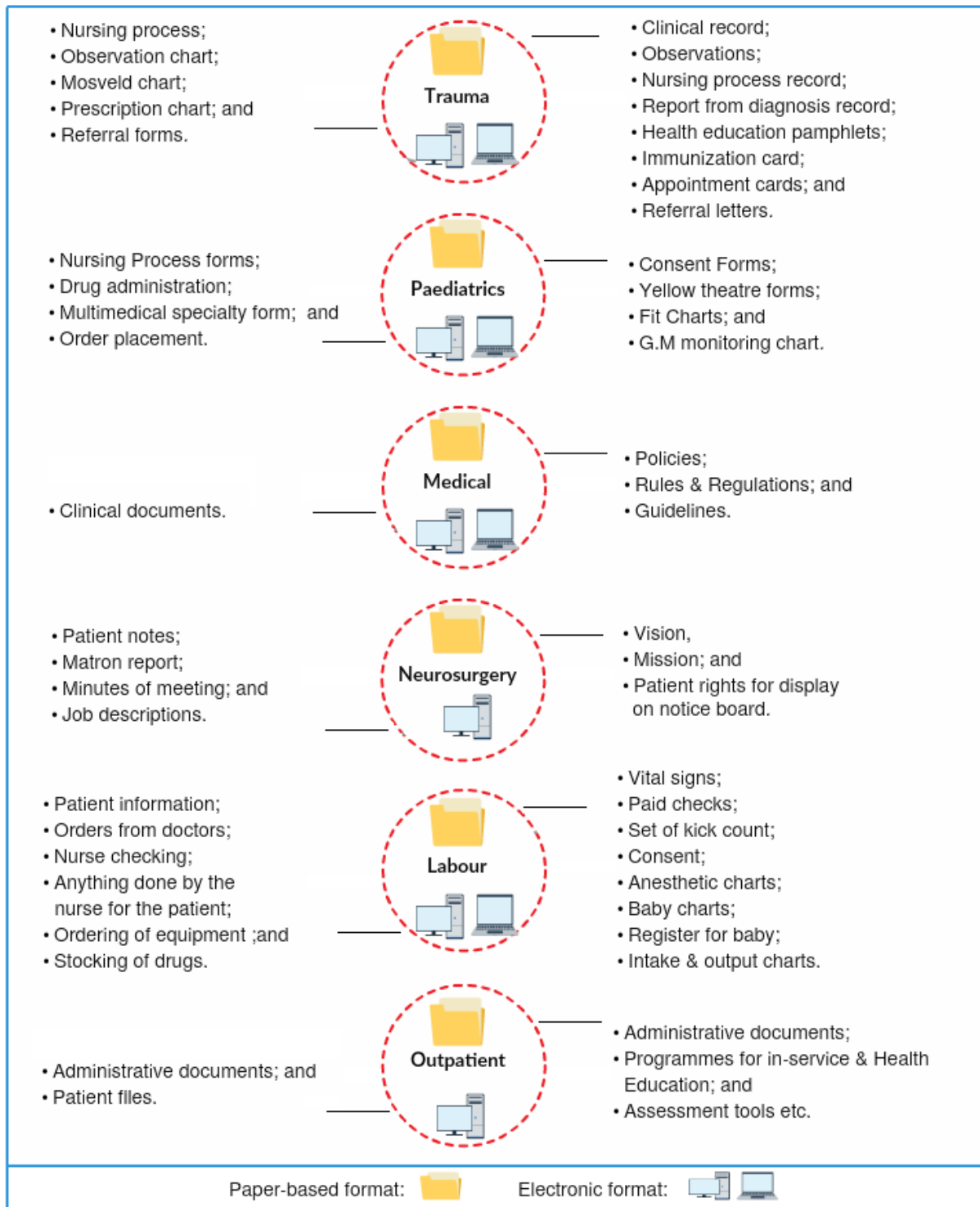
Figure 6-3: Information on storage mediums

6.2.3. Information technology

The hospital made use of an EMR to capture and store the patient medical information. The EMR used was Soarian and it was implemented in 2011. Soarian, however, was not the first EMR system to be implemented by the hospital. Prior to Soarian, the hospital had been using Medicom but Medicom had been discontinued by the developer. The intended users of the system were the admissions clerks; doctors and nurses. All these users had access to the information contained in the EMR. The study found that all the nurses were using the EMR at the time of the study.

The nurses had received training prior to the EMR implementation. The training was reported as being both practical and extensive as the nurses have to obtain 80% or above in order to pass. The training was provided by a private partner to IALCH– AME Africa. Training took place during the first month of employment, of a healthcare provider, over two weeks for eight hours a day as no nurse was allowed to commence ward duties prior to undergoing training. In addition, if a nurse has been away from work for a long period of time on maternity leave or sick leave, upon their return, the nurse was not allowed to commence duty prior to taking a refresher course. Nurses had to log in to use the EMR as a security measure to prevent nurses who had been on leave from accessing the EMR without having attended the refresher course, as well as for the protection of the information contained in the EMR. However, the study found that nurses did on occasion, share login credentials.

Every change or upgrade in an EMR necessitates training for the users affected by the change. In the main, the nurses were consulted prior to the implementation of changes to the operating EMR and, thus, they were afforded the opportunity to request the changes to the EMR that they felt were necessary In such a case, a team was appointed comprising users from all the various categories to discuss challenges or provide input. An elected leader communicates the outcome of the discussions to the service provider. At the time of the initial data collection, the hospital was expecting to change to a new EMR in 2016.

Figure 6-4 below lists all the software that was in use at the hospital at the time of the study, briefly explains the purpose of such software and specifies the users of the software.
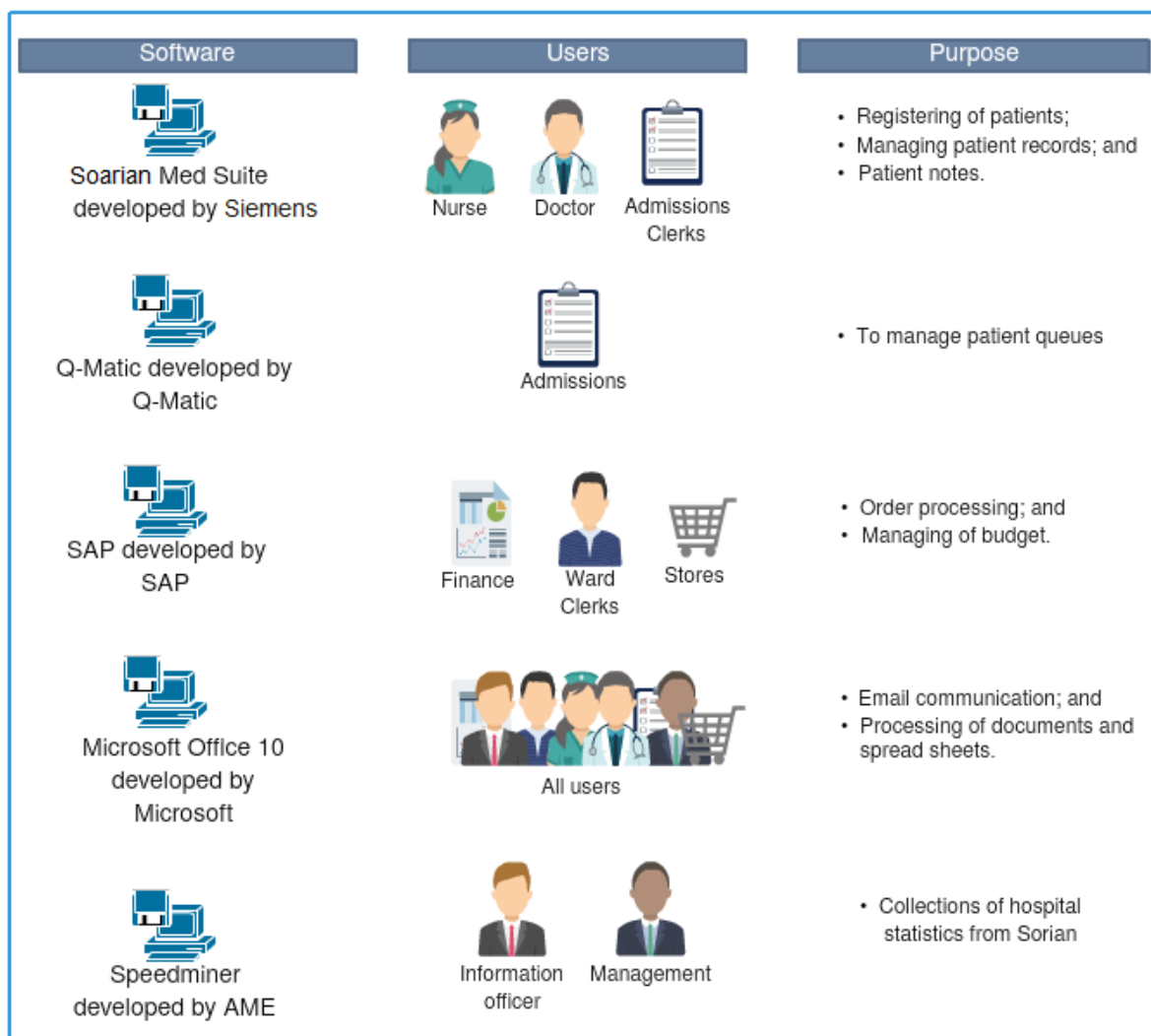
Figure 6-4: Software used in the hospital

The EMR in the hospital (Soarian) interacted with Speedminer to extract statistics, and with Trackcare, an NHLS system that sends blood results to the EMR for doctors to access.

6.3. Matron questionnaire

Of the 17 matrons in the hospital, 12 participated in the study but only 11 completed the matron questionnaires. The data collected from the questionnaires completed by the matrons and the interviews conducted with them is presented in this section. (Note: the responses in italics represent the verbatim comments made by the participants.)

6.3.1. Demographical profile

Of the 11 matrons who completed the questionnaires, three were office-based (part of management) and eight were unit/ward-based matrons although one of the unit

matrons indicated "Nursing Management" as her unit. The researcher confirmed at the hospital that the matron was responsible for the Stomatherapy unit. The demographic profile of these matrons is presented in Table 6-3 below.

Table 6-3: Matron demographic profile

	Years working in this Hospital	Years as a Matron	Unit	Were you working for the Hospital when the EMR was implemented?	If yes, what Position did you hold?
Office Matron 1	13 years	8 years		Yes	Operational Manager
Office Matron 2	13 years	8 years	Other: Management	Yes	Professional Nurse
Office Matron 3	13 years	11 years 9 months	Other: Management	Yes	Operational Manager
Unit Matron 4	11 years	2 years	Other: Nursing Management		
Unit Matron 5	13 years	10 years	ICU	Yes	Operational Manager
Unit Matron 6		10 years	Trauma/Casualty (Burns and ICUs)	Yes	RN and ANM
Unit Matron 7	13 years	2 years	ANM Office Paediatrics Ward	No	
Unit Matron 8	13 years	8 years	Medical Domain Office/Medical Domain with 7 wards	Yes	Professional Nurse
Unit Matron 9			Ward (Neurosurgery)	Yes	Professional Nurse
Unit Matron 10	5 years 1 month		Ward (Labour Ward H/C)	No	
Unit Matron 11	13 years	9 years	Outpatient	No	N/A

6.3.2. EMR resistance (Nursing staff)

Figure 6-5 below presents the data gathered from the matrons in respect of the staff resistance/lack of staff resistance to the adoption of EMRs. Of the 11 participants,

three were of the opinion that the nurses had resisted the adoption of EMRs whilst six recounted that there had been no resistance from the nurses. However, two of the 11 participants did not respond to the question.
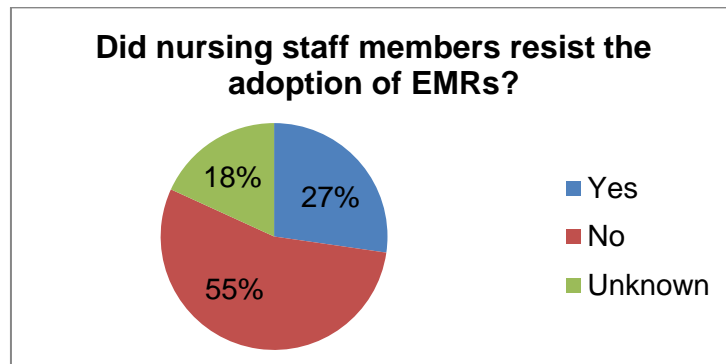
Figure 6-5: EMR resistance

6.3.3. Training (Nursing staff)

When asked whether the nurses had received adequate training to use the EMR nine of the 11 matrons agreed that the nurses had received adequate training. Two of the matrons did not respond to the question. See Figure 6.6.
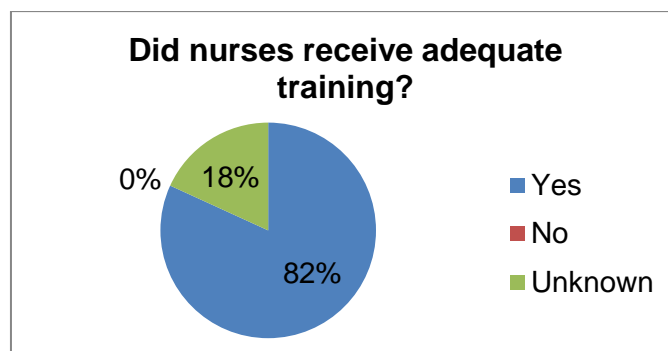
Figure 6-6: Training

6.3.4. Problems prior to, during and after the EMR implementation

The following sections discuss the problems that were experienced prior to, during and after the EMR implementation.

6.3.4.1. Prior to Implementation

As illustrated in Figure 6.7, when asked whether any problems had been experienced prior to the EMR implementation, four of the 11 matrons responded "No". One of the four indicated that this was due to the fact that all staff members had undergone training prior the commencement of their duties. Three of the matrons responded "Yes"

and cited "confidentiality", resistance on the part of the doctors, individualised [cannot make out word] problems and slow learners as the problems encountered. However, two matrons stated that the question was not applicable to them while two did not respond to the question.

6.3.4.2. During Implementation

When asked whether any problems had been encountered during the EMR implementation, four of the 11 matrons responded "Yes" and indicated patient confidentiality; poor recording during administration; issues with instant discharging of patients electronically; adapting pace of EMR for staff; inability to make care plans for patients; inability to reschedule the administration of medication and issues with the tallying of intake and output of patients. However, two of the matrons stated that the problems they had encountered had been resolved at a later date. The inability to capture data "after the stipulated time" was also cited as a problem that was later corrected. One matron responded "No", one was unsure and five did not respond to the question. These responses are presented in Figure 6.7.

6.3.4.3. After Implementation

As may be seen in Figure 6.7, when asked whether any problems had been encountered after the EMR implementation, three of the 11 matrons indicated that there had been problems. They cited the disappearance of scanned documents, mistakes during admission (wrong wards and wrong doctors); staff unaware of how to save; upgrade which required additional staff training and lack of patient privacy and confidentiality as problems. One responded "No" and seven did not respond to the question.

EMR problems

	Did any problems arise prior the EMR implementation?	Did any problems arise during the EMR implementation?	Did any problems arise after the EMR implementation?
■ Yes	3	4	3
■ No	4	1	1
■ N/A or Not sure	2	1	0
■ Unknown	2	5	7
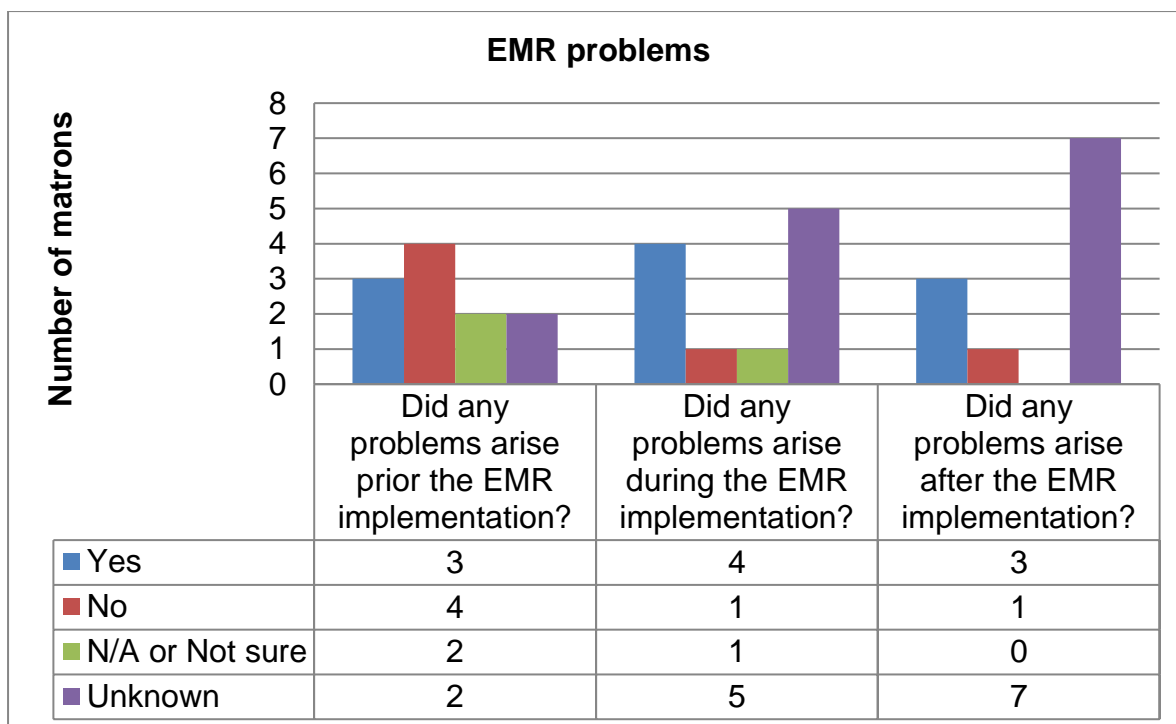
Figure 6-7: Problems prior to, during and after the EMR implementation

Thus, as cited by the matrons, the study found that the following problems had been encountered prior to, during and after EMR implementation. According to the data, prior to the EMR implementation they had experienced problems regarding the following:

- Confidentiality
- Resistance from doctors, as well as slow learners.

The matrons cited the following problems that had occurred during implementation:

- Lack of confidentiality
- The inability to backdate an entry
- The inability to create care plans for patients
- Issues regarding the rescheduling of medication on the system and on intake and output calculators
- Poor recording
- Late discharging of patients on the system
- The need for constant staff supervision and training.

They cited the following post-implementation problems:

- Lack of privacy and confidentiality
- Disappearance of scanned documents
- Errors regarding the admission of patients and assigning of doctors to patients
- The additional training required following a system upgrade.

It appeared that most of the problems cited had been encountered during the implementation of the EMR.

6.3.5. Advantages and disadvantages of EMR

When asked "What about the EMR has worked well", the responses included the following:

- Communication in relation to patient issues
- Work speed
- Availability of information
- Efficiency
- Easy retrieval of information
- Documentation
- Less time taken to do recordings as compared to writing using a pen and paper.

When asked "What about the EMR has not worked well", the matrons cited the following:

- Lack of patient confidentiality
- Issues with the recording of administered drugs
- Miscapturing of data
- Down time
- Reduction of hardcopy files.

When probed further during the interviews about the system downtime it emerged that the units/wards experienced system downtime once or twice a month although, in the main, it was a rare occurrence and usually happened after hours. They were, however, informed via email prior to the occurrence and, thus, were able to make provision by means of downtime forms that they used to capture patient information and then scan it into the EMR once it was operational again.

6.3.6. EMR acceptance

"Are nurses accepting of the EMR?" This question was posed to the matron participants. All responded "Yes", except for one who did not respond to the question. See Figure 6-8 below.

Are nurses accepting of the EMR?

- Yes
- No
- No response

0%
9%
91%
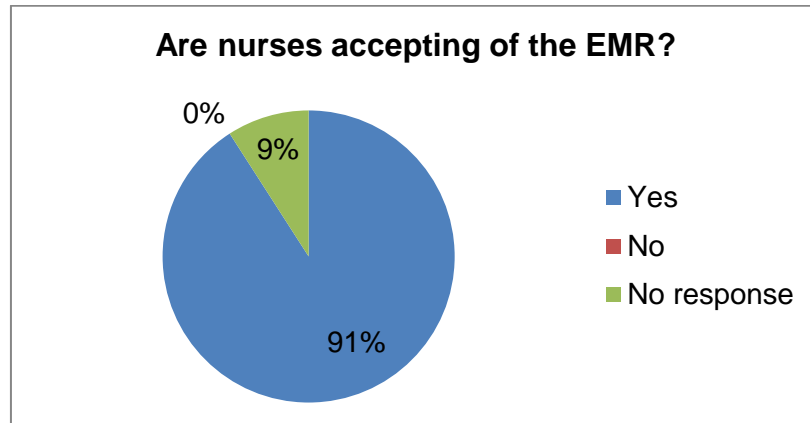
Figure 6-8: Acceptance by nurses

6.3.7. EMR data capturing

The researcher sought to ascertain how the data was captured in the EMR used by the hospital. According to the findings, data was captured by interacting with a key board as an input device. However, there was also an indication that data was fed in as input from external systems such as Innovian and Speedminer.

6.3.8. EMR interaction

When asked whether any other medical devices interacted with the EMR, nine of the 11 matrons participating in the study responded "Yes" and alluded to medical devices such as Imaging software and telemedicine, ECG machines; X-ray; MRI; charts; CT Scans; and Lantis. Two of the 11 matron participants did not respond to the question.

6.3.9. Additional comments

The questionnaire provided all the participants with an opportunity for any additional comments that they saw as relevant to the research. Two participants only provided additional comments. It emerged from these comments that the matrons foresaw problems with multiple people sharing a single computer because of the danger of infection being spread in this way. In addition, they cited the lack of templates.

"[It is] not easy to control infection as one computer is used by a number of people and [it is] not practical to clean after each use." – M005

"Some other companies [cannot] add more [templates] which at times feel it is needed, or what to add for improvement towards increasing windows [cannot make out word]". – M005

This section presented the data collected from the matrons who participated in the study. The next section discusses the data gathered from the IT manager.

6.4. IT manager questionnaire

There was one (1) IT manager within the hospital. This IT manager completed an IT manager questionnaire. The gathered data is presented in this section.

6.4.1. Demographic profile

The IT manager had been working in the hospital as an IT manager since 2011 and, thus, at the time of the study, the IT manager had been working for the hospital for four (4) years. However, the IT manager had not been working for the hospital when the EMR was implemented..

6.4.2. EMR

According to the IT manager, there had been a few problems prior to the EMR implementation. These problems had included user resistance; migration of information; and training. However, when asked whether there had been any problems during and after implementation, the response was "No". When probed about the advantages of the EMR the IT manager cited patient registration and the maintaining of patient records. In addition, when asked whether or not the nurses accepted EMRs the IT manager responded in the affirmative.

6.5. Nurse questionnaire

Five hundred and eighty nurse questionnaires were distributed to nurses across all job levels. Of the 580 nurses, 370 completed the questionnaires, thus equating to a response rate of 63.8%. The researcher captured the data from these questionnaires in Excel spreadsheets. The aid of a statistician was sought in order to analyse the resulting descriptive data.

The data collected is presented in this section. (Note: the responses in italics represent verbatim, written comments made by the participants.)

6.5.1. Demographic profile

The demographic profile of the nurses is described in the following sections.

6.5.1.1. Gender

As may be seen in Figure 6-9, 75.4% of the nurses who participated in the study were female and 5.4% male with 19.2% of the participants not specifying their gender.
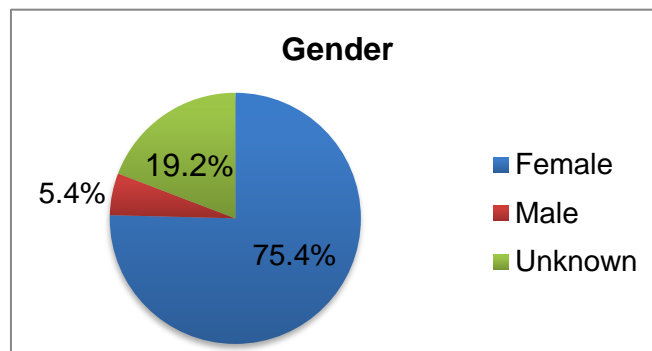
Figure 6-9: Gender distribution

6.5.1.2. Age

Figure 6-10 presents the age distribution of the nurses. As illustrated, 36.2% were between 30 and 39 years of age; 28.6% were between 40 and 49; 13.5% between 50 and 59 9.5% between 25 and 29; 1.9% 60 plus and 0.3% between 18 and 24 years of age while 10% of the participants did not indicate their age.
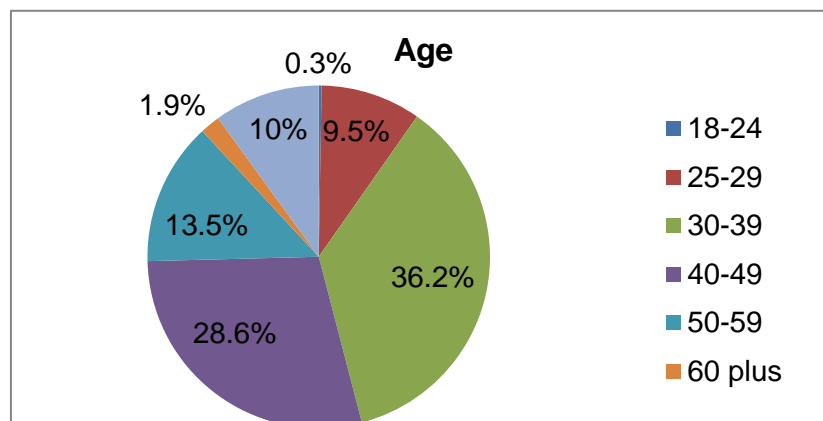
Figure 6-10: Age distribution

6.5.1.3. Home Language

As depicted in Figure 6-11, the home language of the participants was distributed as follows: 61.4% selected Zulu; 34.3% selected English; 5.4% selected Xhosa; 0.8% selected "Other" and 0.3% selected Afrikaans while 7% did not indicate their home language.
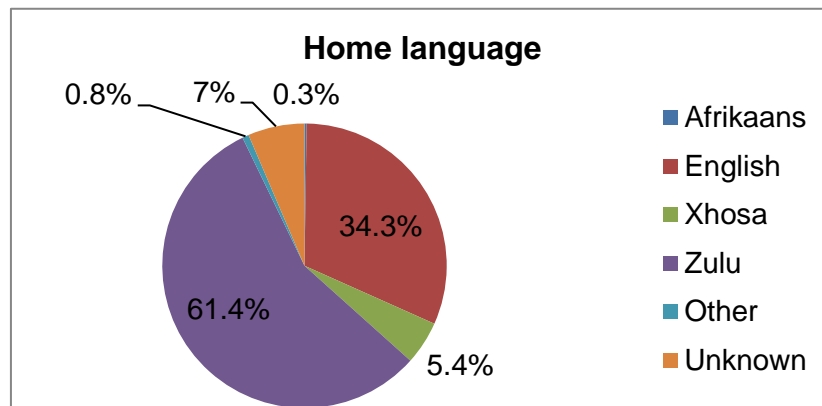
Figure 6-11: Home language distribution

6.5.1.4. Highest Education Level

Figure 6-12 presents the highest education level distribution among the nurses. As may be observed, 50.5% indicated a Diploma in Nursing as their highest education level; 14.3% a Higher Certificate in Nursing; 9.2% a Bachelor's Degree in Nursing; 3.5% a Postgraduate Degree and 3.5% indicating "Other". On the other hand, 18.9 of the participants did not indicate their highest education level obtained.
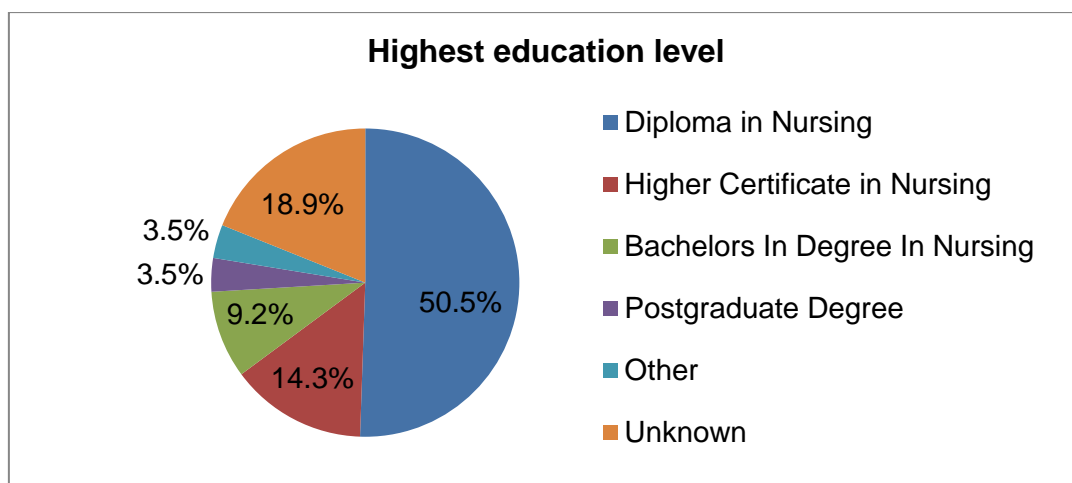
Figure 6-12: Highest education level distribution

6.5.1.5. Job Level

As may be observed in Figure 6-13, 60% of the participants were Professional/Registered Nurses, 17.8% were Enrolled Nurses/Staff Nurses; 7.3% were Auxiliary Nurses/Nursing Assistants and 0.8% indicated "Other" while 14.1% of the participants did not indicate their job level.
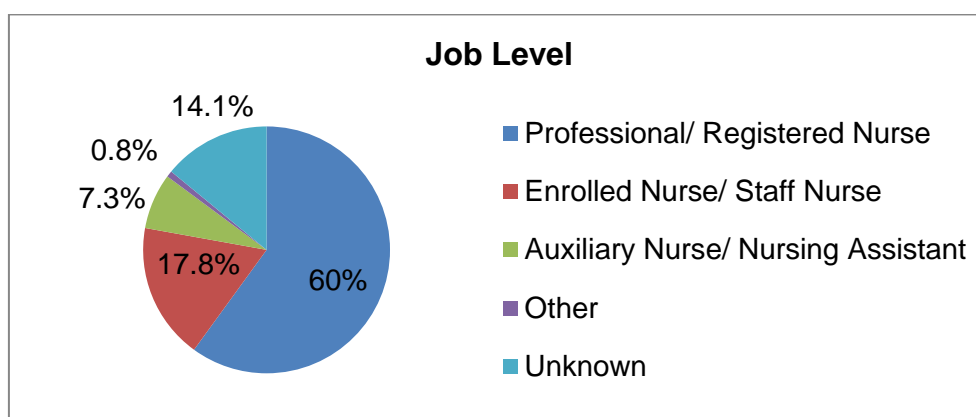
Figure 6-13: Job level distribution

A report, entitled "The nursing strategy for South Africa" (Department of Health, 2008) describes the following job levels as they pertain to nursing staff:

- Professional nurse/registered nurse (RN) as an individual who possesses the relevant competence and qualifications required to "independently practise comprehensive nursing in the manner and to the level prescribed and who is capable of assuming responsibility and accountability for such practice" (p. 5).
- Enrolled nurse (EN)/staff nurse as an individual who is "educated to practise basic nursing in the manner and to the level prescribed under section 31 (1) (c) of the Nursing Act" (p. 5).
- Auxiliary nurse (AN)/nursing assistant as an individual who is "educated to provide elementary nursing care in the manner and to the level prescribed under section 31 (1) (c) of the Nursing Act" (p. 5).

6.5.1.6. Nursing experience (in years)

As illustrated in Figure 6-14, 44.6% of the participants had been working in a hospital for more than ten years; 27% for six to ten years; 15.4% for one to five years and 1.9% for less than a year. However, 11.1% of the participants did not indicate the number of years they had worked as nurses in a hospital.
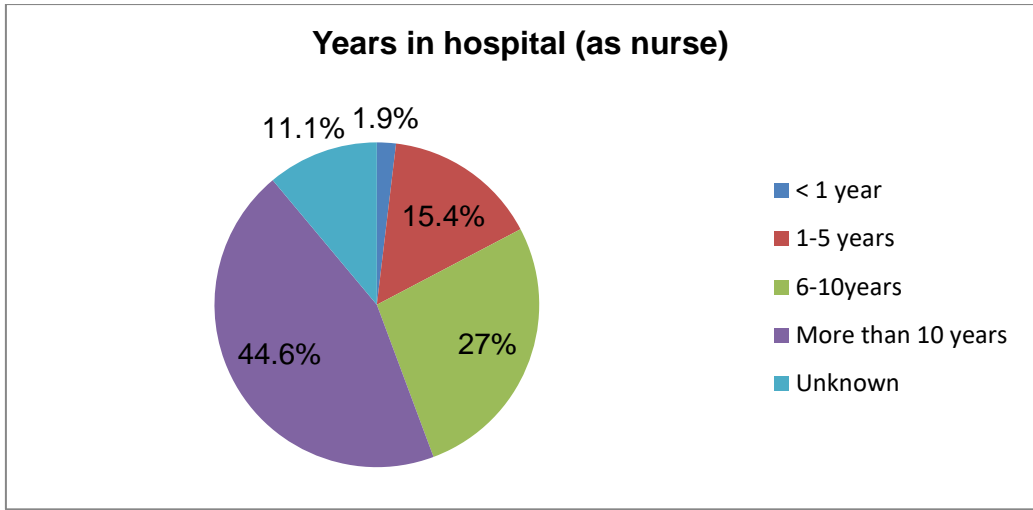
Figure 6-14: Years in hospital (as nurse)

6.5.1.7. *Experience in current hospital (in years)*

Figure 6-15 below presents the distribution of years worked in the current hospital by the nurses. As observed, 28.6% indicated that they had worked in the hospital for six to ten years; 26.5% for one to five years; 24.6% for more than ten years; and 5.7% for less than a year. On the other hand, 14.6% of the participants did not indicate the number of years they had worked in the current hospital.
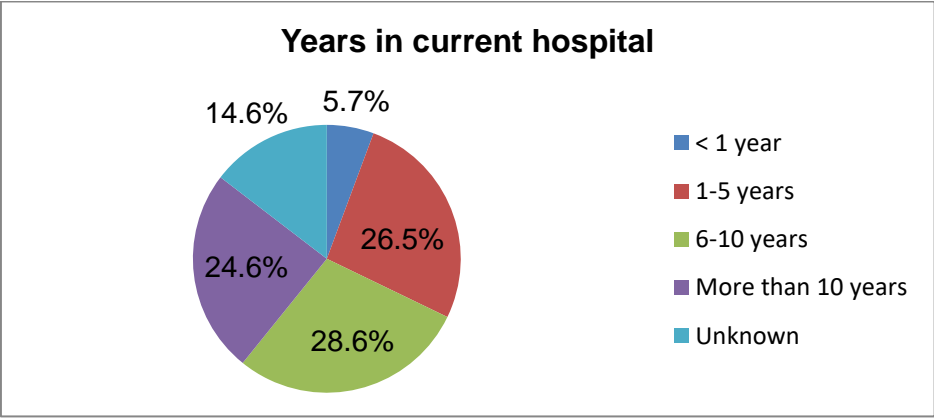
Figure 6-15: Years in current hospital

6.5.1.8. *Years using EMRs*

As illustrated in Figure 6-16 below, 20.5% of the participants had used EMRs for six to ten years; 16.8% for one to five years; 16.8% for more than ten years; and 3.8% for less than a year while 42.2% of the participants did not indicate the number of years for which they had been using EMRs.
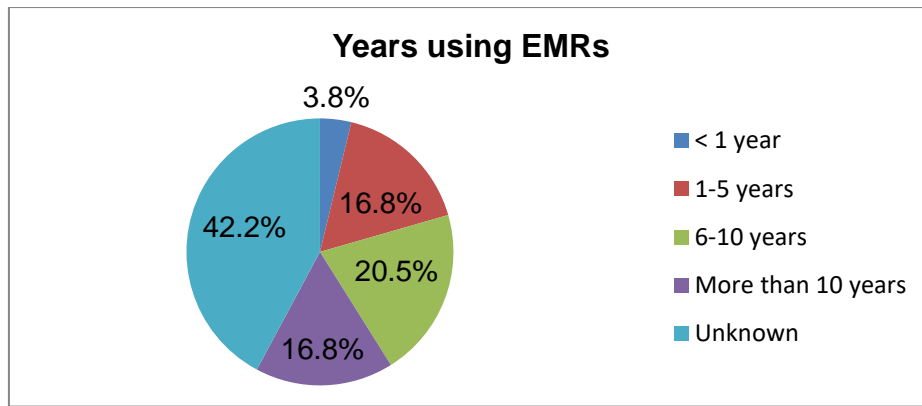
Figure 6-16: Years using EMRs

6.5.1.9. *Years using current EMRs*

As may be gathered from Figure 6-17 below, 24.6% of the participants had been using the current EMR (Soarian) for one to five years; 13.2% for six to ten years; 10% for more than ten years and 4.1% for less than a year. However, 48.1% of the participants did not indicate the number of years they had been using the current EMR. However, the fact that some of the participants had indicated that they had been using the current EMR for more than five years (when asked for "Years using current EMR") contradicted the information provided by the IT manager and matrons to the effect that the EMR had been implemented in 2011. In other words, at the time of the data collection the EMR had been in use for four years. It may be that the nurses had worked with the EMR in question at other hospitals where they had been employed. Since the questionnaires were completed anonymously the researcher was not able to follow up on this contradiction.
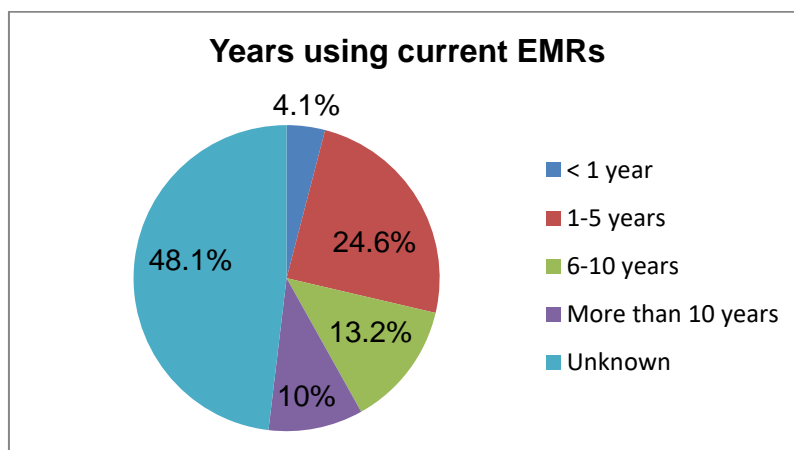
Figure 6-17: Years using current EMRs

6.5.1.10.   Unit/ward distribution

The participating nurses were distributed among a number of units/wards. Figure 6-18 presents this distribution. As may be noted, 17.6% of the participants were from the ICU unit; 13% from the Medical unit; 10.8% from the O & G unit; 10% from the OPD unit; 12.2% from the Paeds unit; 0.8% from the Stomatherapy unit; 11.6% from the Surgical unit; 11.4% from the Theatre unit and 12.7% from the Trauma and Burns unit. (Note the data presented in Figure 5.18 was based on the number of completed questionnaires collected from each unit.)
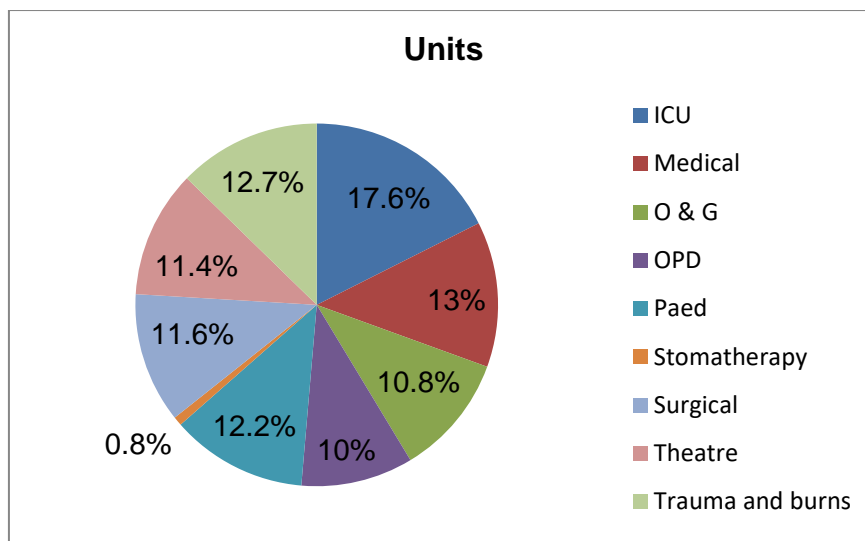
Figure 6-18: Unit

6.5.2. Paper-based system

The data collected from the nurses regarding the use of a paper-based system is discussed in the following sections.

6.5.2.1. Problems experienced

As illustrated in Figure 6-19, the nurses were probed about problems they had experienced while using the paper-based system in their wards. The responses varied between "No problems" and "Major problems". The largest number of responses, 42.4%, indicated "No problems"; 27.8% indicated "Minor problems"; and 11.6% indicated "Major problems". However, 18.1% of the participants did not respond to this question.
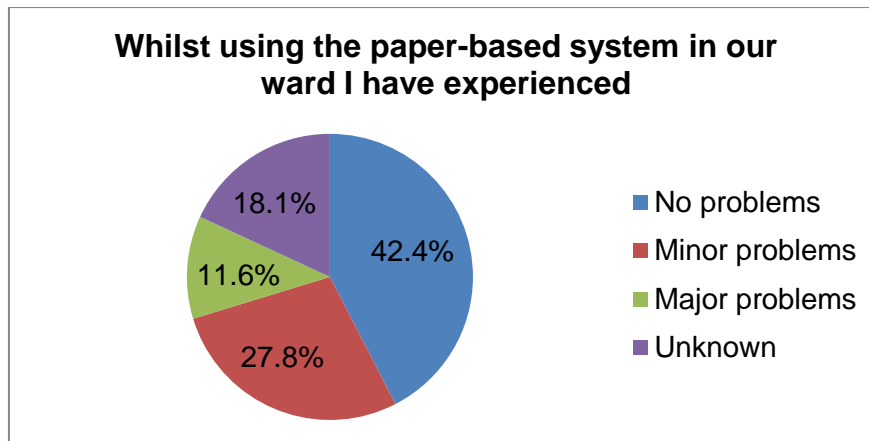
Figure 6-19: Paper-based system problems

Table 6-4 below presents the problems that the nurse participants had experienced (and a few positive experiences) in their use of a paper-based system. These experiences were categorised so as to extract a broader meaning from the data than may otherwise have been the case.

Table 6-4: Categorised experiences with the paper-based system

Categories	Problem		Positive Experience
	Minor	Major	
Ease of use	√	√	√
Error recovery	√	√	√
Infection control	√		
Information accessibility	√	√	√
Information protection	√	√	√
Legality	√	√	
Neatness	√	√	
Patient care	√	√	√
Processing speed	√		
Proper filing	√		
Record accessibility	√		
Record accuracy	√	√	
Record completeness	√	√	
Record conservation	√	√	
Storage space	√	√	
System availability	√	√	√
Time	√	√	√
Writing legibility	√	√	

6.5.3. Computer use

The data collected from the nurses regarding computer use is presented in the following sections. (Note: all values represented on graphs are percentage (%) values.)

6.5.3.1. *Computer Literacy*

As may be seen in Figure 6-20, more than 50% of the participants rated themselves as computer literate with 44.6% of the participants rating themselves as literate; 26.5% rating themselves as average; 20% rating themselves as extremely literate while 0.8% rated themselves as illiterate and a further 0.8% rated themselves as extremely illiterate. However, 7.3% of the participants either did not respond to the question or selected more than one option.
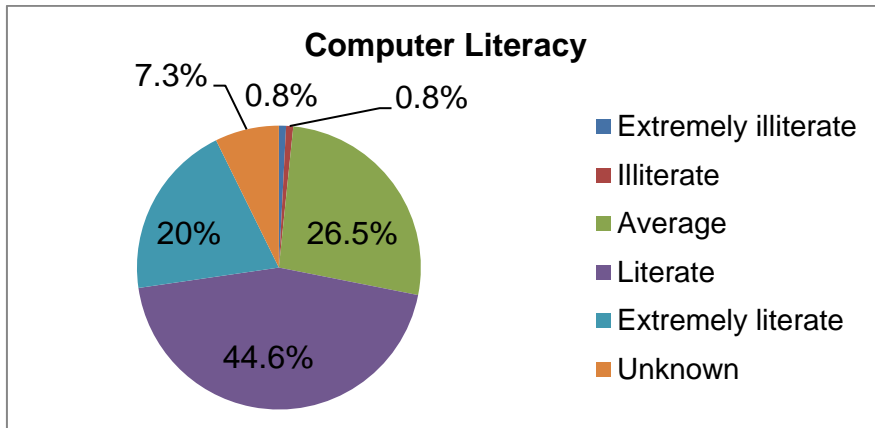
Figure 6-20: Computer literacy

In addition, as may be seen in Figure 6-21, the participants also provided the following self-ratings on their use of computer applications.

	Word processor application	Spread sheet application	Internet	Email	Social networking sites
■ Never	5.1	25.7	32.2	15.7	52.2
■ Seldom	14.3	21.4	13.8	8.1	4.1
■ Sometimes	24.1	22.4	17.3	17	8.9
■ Most times	16.2	8.4	14.1	23.5	5.7
■ Always	33.5	10.5	13.8	27	22.2
■ Unknown	6.8	11.6	8.9	8.6	7.0
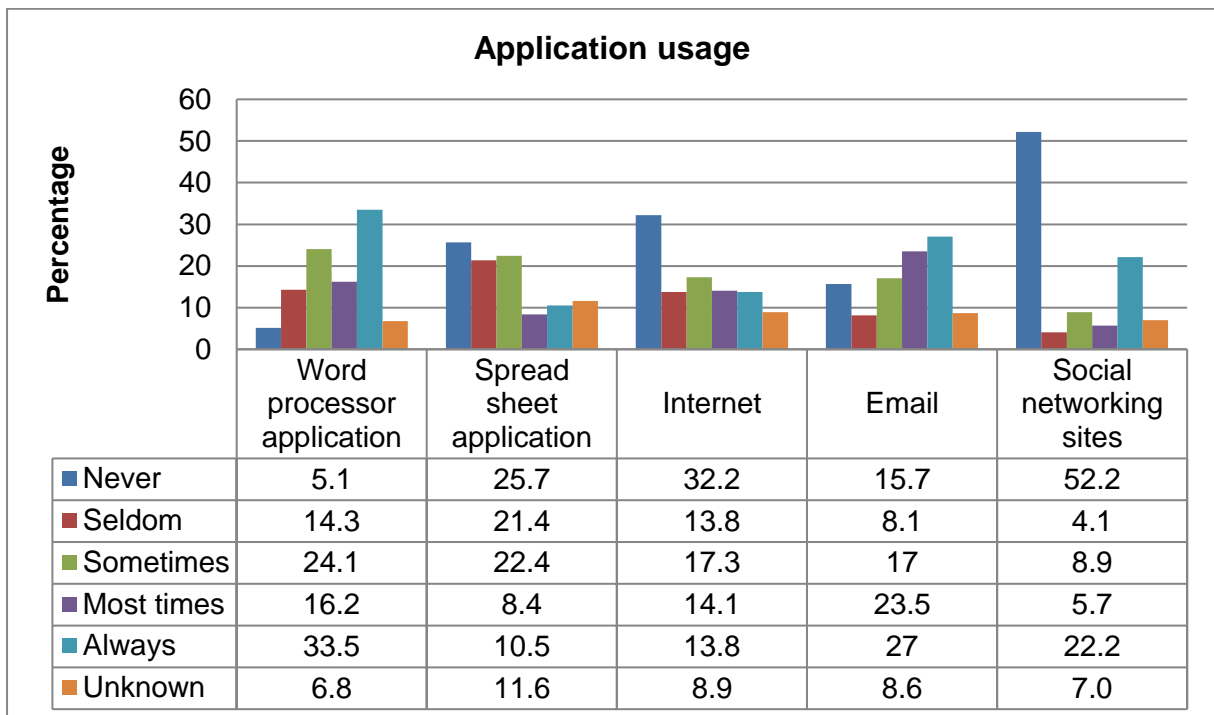
Figure 6-21: Application usage self-rating

6.5.4. Technology personality

In the questionnaire, the nurses were presented with the following technology personalities and their descriptions (Kuo, Liu, & Ma, 2013; Merriam-Webster, n.d.):

- Optimistic: An optimistic individual was described as someone who anticipates the best possible outcome.
- Innovative: An innovative individual was described as someone who has new ideas about how something may be done.
- Insecure: An insecure individual was described as someone who is not confident about him/herself or his or her ability to do things well – nervous and uncomfortable.
- Uncomfortable: An uncomfortable individual was described as someone who has a feeling of physical discomfort.

The participants were asked to provide a self-rating for each personality. The findings are discussed in sections 6.5.4.1 to 6.5.4.4, below. (Note: all values represented on graphs are percentage (%) values).

6.5.4.1. Optimistic
Figure 6-22 presents the self-rating of the participants regarding whether they possessed an optimistic technology personality. As may be observed, more than 50% of the participants agreed that they did possess an optimistic technology personality, 39.2% agreed and 26.2% strongly agreed while 3% strongly disagreed; and 2.7% disagreed. However, 8.9% of the participants either did not respond to the question or selected more than one option.

6.5.4.2. Innovative
As illustrated in Figure 6-22, more than 50% of the participants regarded themselves as innovative with 37% of the participants agreeing and 18.6% strongly agreeing while 1.9% disagreed and 2.7% strongly disagreed. However, 11.4% of the participants either did not respond to the question or selected more than one option.

6.5.4.3. Insecure
As may be seen in Figure 6-22, more than 50% of the participants indicated that they were not insecure about technology with 30.8% disagreeing and 33.5% strongly disagreeing that they possessed an insecure technology personality. On the other

hand, 7% agreed and 3.5% strongly agreed that they did possess an insecure technology personality while 10% of the participants either did not respond to the question or selected more than one option.

6.5.4.4. *Uncomfortable*

As depicted in Figure 6-22 below, more than 50% of the participants viewed themselves as comfortable with technology with 28.4% disagreeing that they were uncomfortable with technology and 39.2% strongly disagreeing. On the other hand, 5.4% agreed that they were uncomfortable with technology and 3% strongly agreed while 10.3% of the participants either did not respond to the question or selected more than one option.

Technology personality

	Optimistic	Innovative	Insecure	Uncomfortable
■ Strongly Disagree	3	2.7	33.5	39.2
■ Disagree	2.7	1.9	30.8	28.4
■ Neutral	20	28.4	15.1	13.8
■ Agree	39.2	37.0	7	5.4
■ Strongly Agree	26.2	18.6	3.5	3
■ Unknown	8.9	11.4	10	10.3
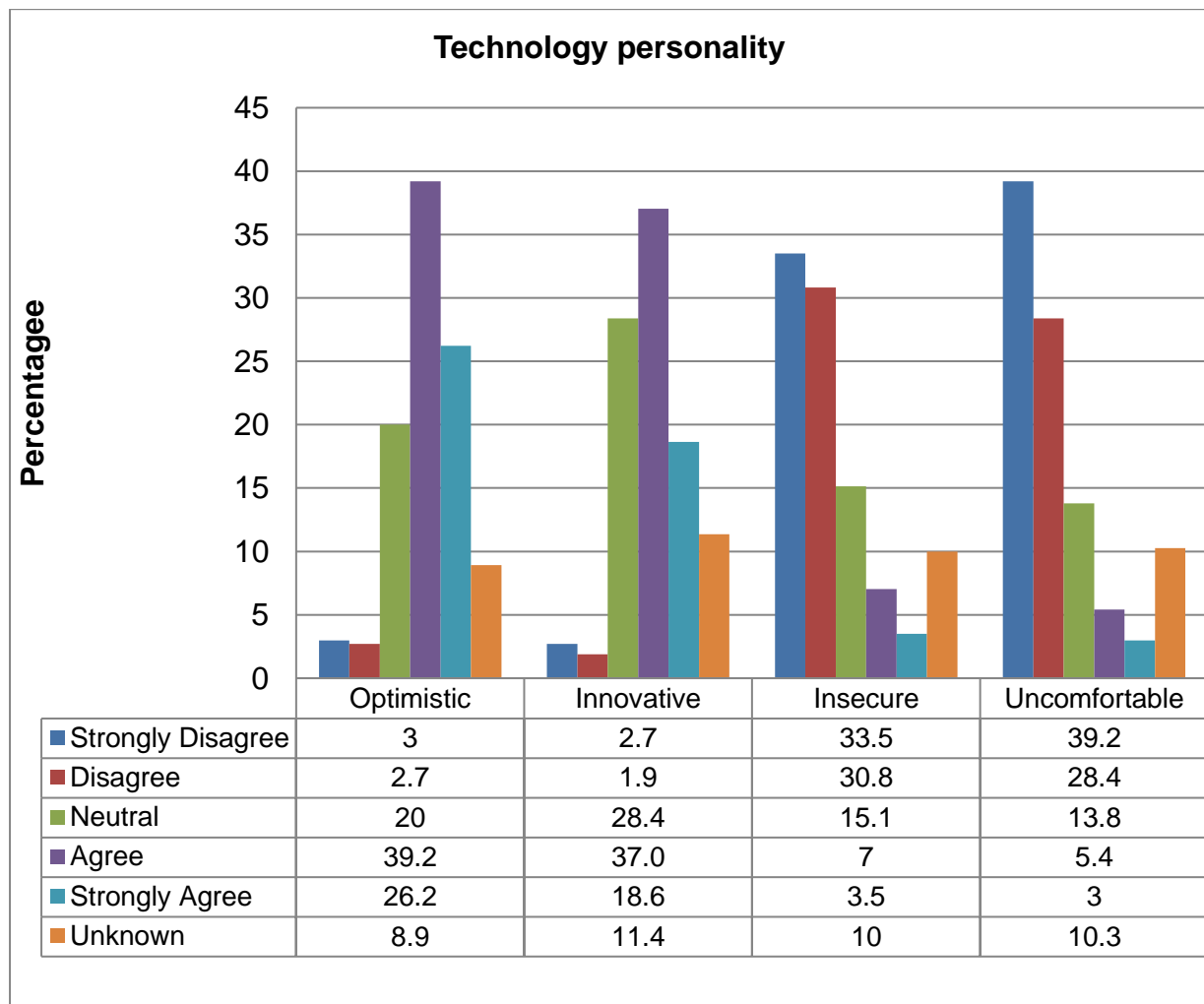
Figure 6-22: Technology personality (Optimistic, innovative, insecure and uncomfortable)

6.5.5. EMR

The data collected from the nurses regarding EMRs is discussed in the following sections.

6.5.5.1. EMR acceptance

As may be seen in Figure 6-23, a large percentage of the nurses (88.9%) agreed that they accepted the use of EMRs in the hospital whereas 3% only disagreed with the statement. However, 8.1% of the participants either did not respond to the question or selected more than one option.
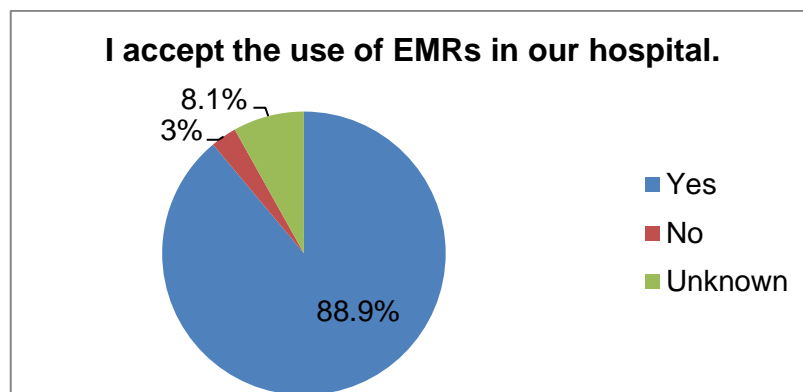
Figure 6-23: Acceptance of EMRs in hospital.

Further questions probing the reasons for this acceptance or lack thereof were then posed.

6.5.5.2. EMR adoption

According to the data collected 57.8% of the participants had been consulted prior to the adoption of EMRs, 35.9% said they had not been consulted; and 0.3% stated this question was not applicable to them. However, 5.9% either did not respond to the question or selected more than one option.
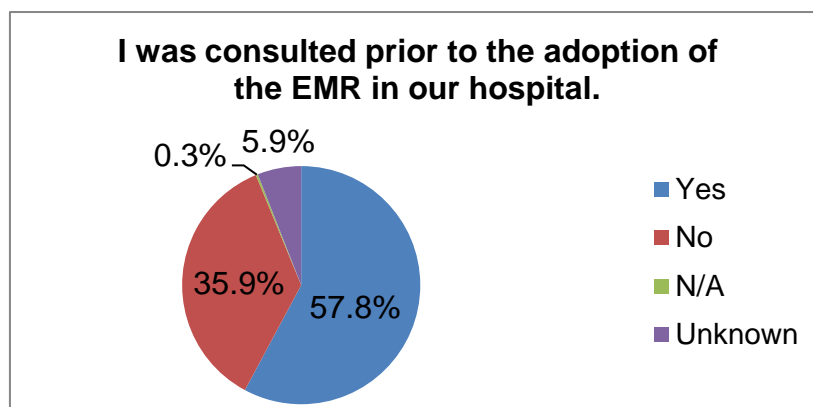
Figure 6-24: Consulted prior to the adoption of the EMR

As depicted in Figure 6-25 below, 71% of the participants indicated that they had received support from their head of department during the adoption of the EMR, 20.5% disagreed with the statement; and 0.3% said the question was not applicable to them while 8.1% of the participants either did not respond to the question or selected more than one option.
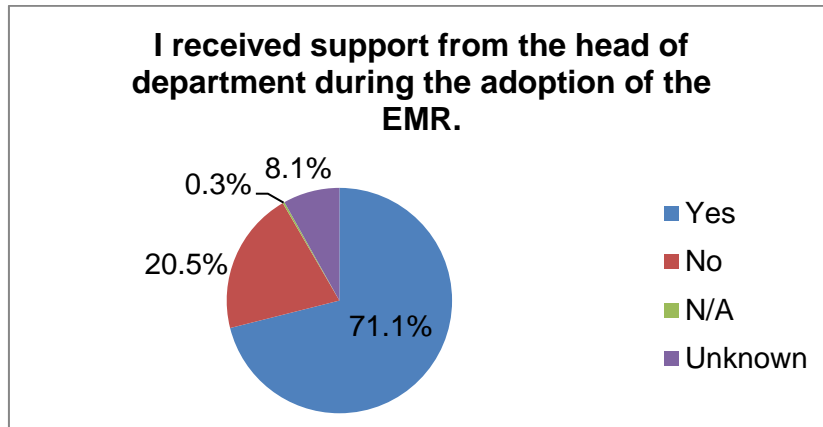
Figure 6-25: Support from the head of department

As illustrated below in Figure 6-26, 54.9% of the participants indicated that the hospital had had championing nurses who had promoted the acceptance of EMRs; 30.5% disagreed with the statement; and 0.3% indicated that the question did not apply to them. However, 14.3% of the participants either did not respond to the question or selected more than one option.
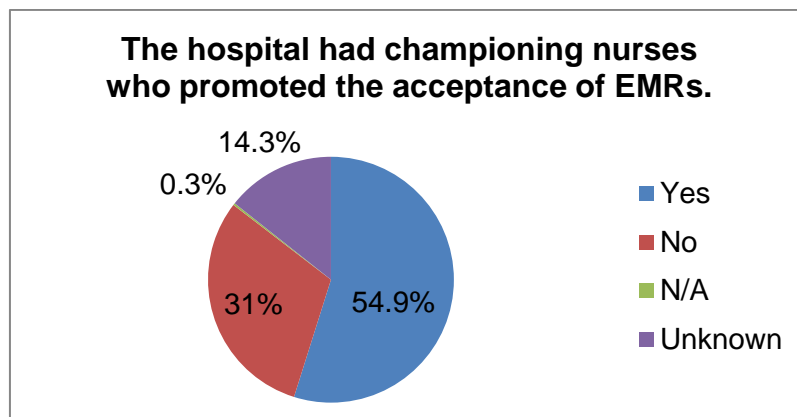
Figure 6-26: Championing nurses

As may be seen in Figure 6-27, when asked whether they had resisted the change that had been introduced by the use of EMRs in their hospital, more than 50% disagreed with the statement with 23.5% disagreeing and 32.2% strongly disagreeing.

On the other hand, 18.9% adopted a neutral stance; 10.3% agreed and 5.1% strongly agreed. However, 10% of the participants either did not respond to the question or selected more than one option.
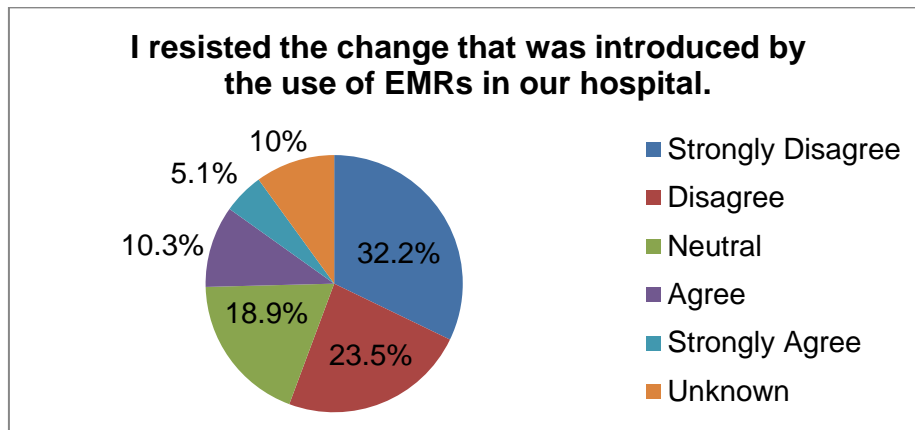
Figure 6-27: Change resistance

As illustrated in Figure 6-28, 34.1% (27.6% agreed and 6.5% strongly agreed) of the participants indicated that the adoption of an EMR in their hospital had required the use of technology with which they had been unfamiliar with 32.2% (18.4% disagreed and 13.8% strongly disagreed) disagreeing while 8.1% of the participants either did not respond to the question or selected more than one option.
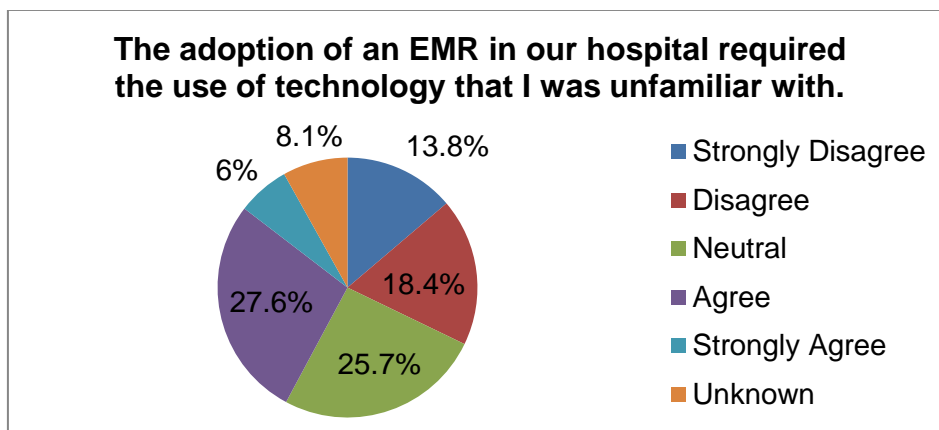
Figure 6-28: Unfamiliar technology.

As depicted in Figure 6-29, 22.4% only of the participants agreed that they had been fearful of this new technology with 16.5% agreeing and 5.9% strongly agreeing. On the other hand, 48.1% disagreed with the statement with 24.6% disagreeing and 23.5% strongly disagreeing. However, 6.5% of the participants either did not respond to the question or selected more than one option.
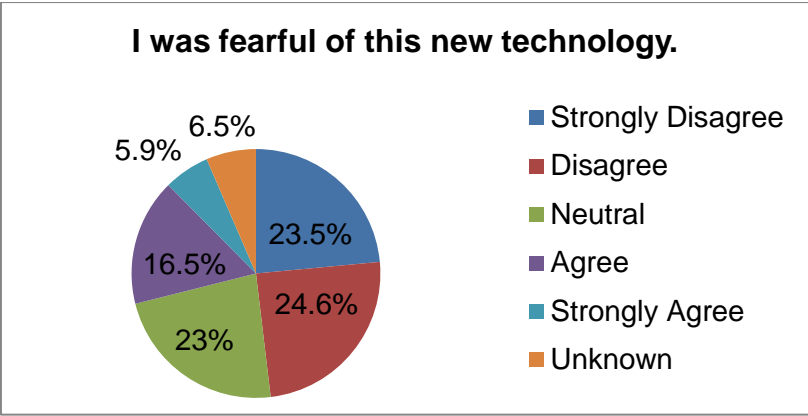
Figure 6-29: Fear of new technology

As may be observed in Figure 6-30, 25.1% of the participants agreed that the EMR in their hospital had made them fearful of losing control over their workflow with 20.5% agreeing and 4.3% strongly agreeing. On the other hand, 48.1% of the participants disagreed with the statement with 21.9% disagreeing and 26.2% strongly disagreeing. However, 7.8% of the participants either did not respond to the question or selected more than one option.
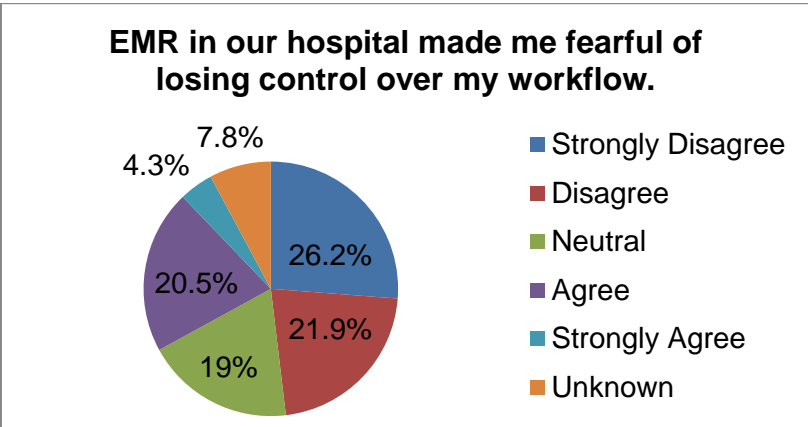
Figure 6-30: Fear of losing control

As illustrated noted in Figure 6-31, 62.4% of the participants agreed that the adoption of an EMR had had a positive impact on their workflow (40% agreed and 22.4% strongly agreed). Furthermore, 11% disagreed with the statement (7.8% disagreed and 3.2% strongly disagreed) while 8.1% of the participants either did not respond to the question or selected more than one option.
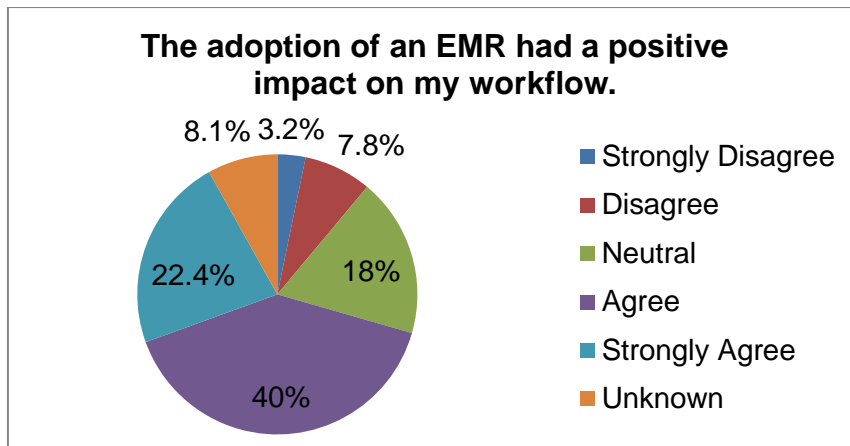
Figure 6-31: Positive impact on workflow

As depicted in Figure 6-32, 61.7% of the participants agreed that the adoption of an EMR had had a positive impact on their working speed with 37.6% agreeing and 24.1% strongly agreeing. On the other hand, 12.7% of the participants disagreed with the statement with 9.5% disagreeing and 3.2% strongly disagreeing. However, 8.1% of the participants either did not respond to the question or selected more than one option.
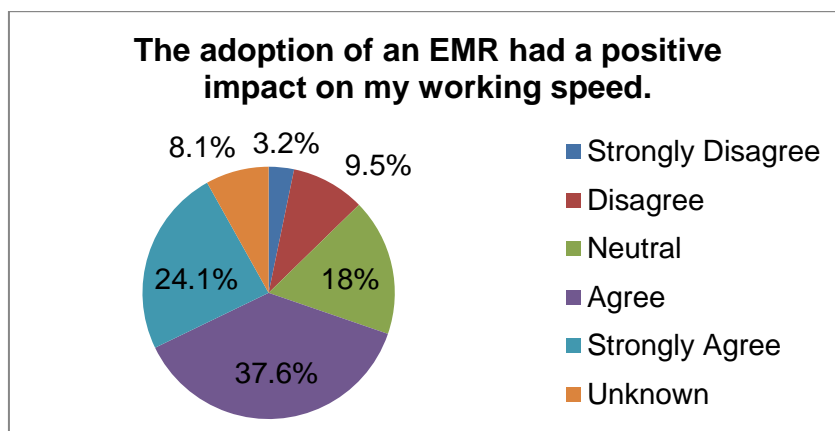
Figure 6-32: Positive impact on working speed

6.5.5.3. EMR use

The following section presents the participants' views on their computer experience, preferred computer devices, preferred mode of assistance, as well as the benefits that nurses associated with the use of EMRs. (Note: all values represented on graphs are percentage (%).

6.5.5.3.1. Views on computer experience

As may be observed in Figure 6-33, more than 50% of the participants indicated that their prior computer experience was an advantage in respect of their use of the hospital

EMR (35.4% agreed with the statement and 29.5% strongly agreed). On the other hand, 8.9% only disagreed with the statement (6.5% disagreed and 2.4% strongly disagreed) while 4.9% of the participants either did not respond to the question or selected more than one option.

My computer experience was an advantage for my use of our hospital EMR.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
- Unknown

4.9% 2.4% 6.5% 21% 35.4% 29.5%
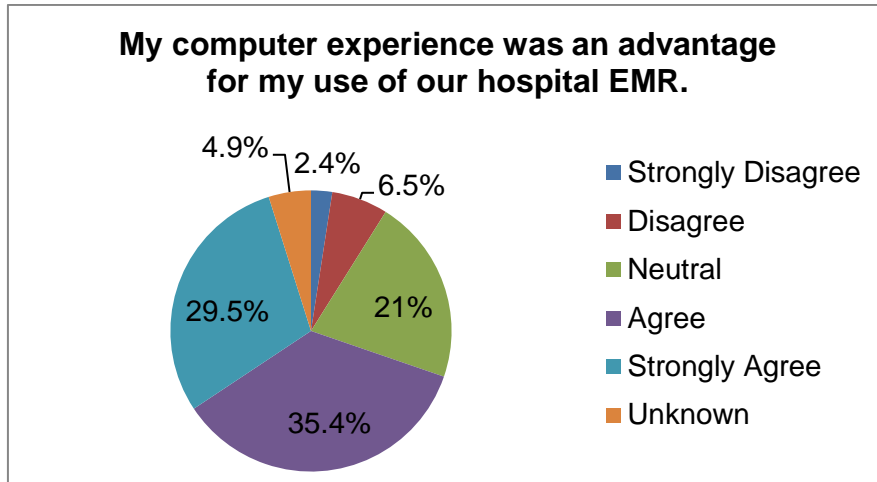
Figure 6-33: Computer experience

6.5.5.3.2. Preferred computer devices

As may be seen in Figure 6-34, for data capturing purposes the majority of the participants (71.4%) preferred working from a work station, 19.2% preferred tablet devices; 0.3% preferred laptops and 0.3% both preferred workstations and tablets. However, 8.9% of the participants did not respond to the question. For viewing purposes most of the participants (65.9%) preferred working from a work station although 24.6% preferred tablet devices; 0.3% preferred laptops and 0.3% preferred both workstations and tablets while 8.9% of the participants did not respond to the question.

This high percentage of nurses preferring to work from a work station tended to somehow contradict the complaints made by the nurses to the effect that bedside nursing has been challenged by the use of workstations. However, this is an area that requires further probing.

Preferred Devices

	When capturing data into the EMR I prefer to work from a	When viewing data or information in the EMR I prefer to work from a
■ Workstation	71.4	65.9
■ Tablet	19.2	24.6
■ Laptop	0.3	0.3
■ Workstation and Tablet	0.3	0.3
■ Unknown	8.9	8.9
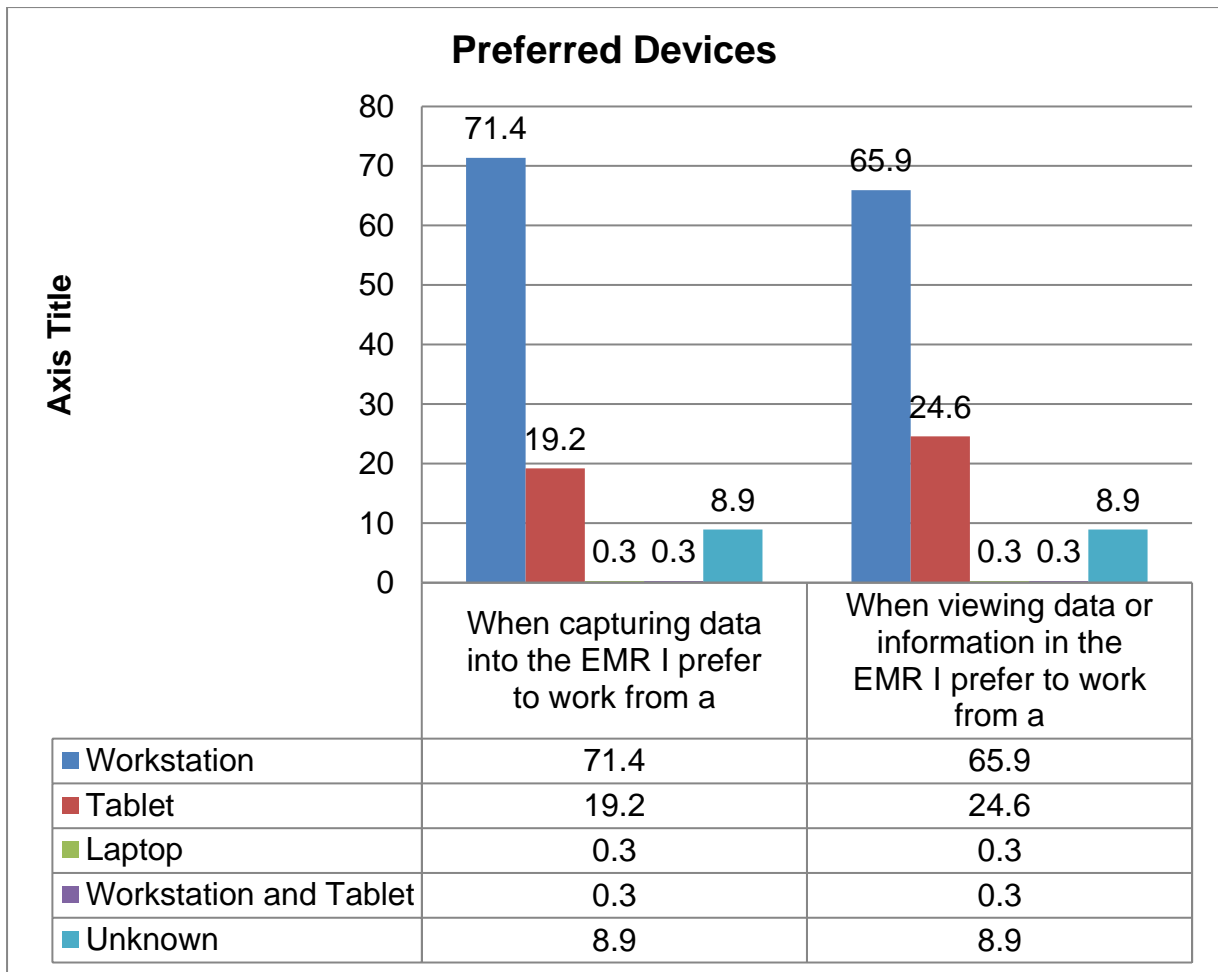
Figure 6-34: Preferred devices

6.5.5.3.3.   Preferred mode of assistance

As may be seen in Figure 6-35 below, regarding assistance with their use of the EMR, the participants indicated that they preferred receiving assistance from the IT helpdesk (91.6%) and also additional training (81.1%).
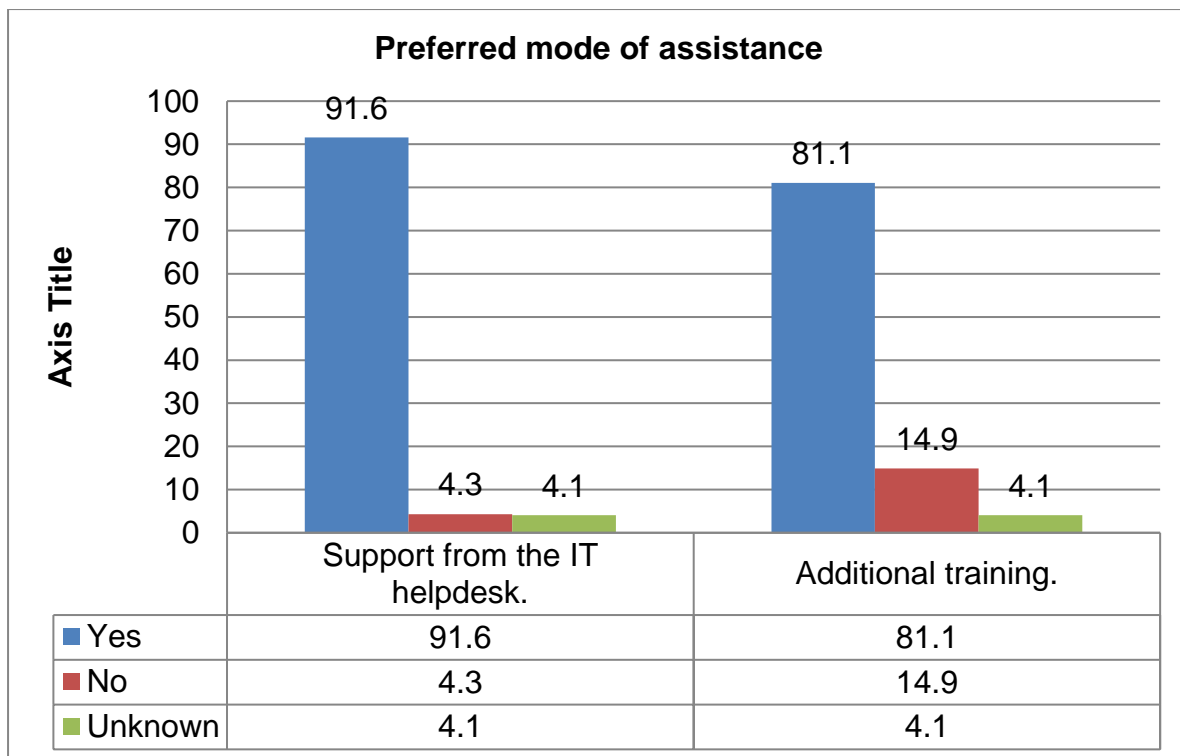
Figure 6-35: Preferred mode of assistance

6.5.5.3.4. Benefits of EMR use

Figure 6-36 illustrates the benefits the nurses perceived in respect of EMR use. As may be noted, there was a high level of agreement he nurses about the benefits of EMRs.
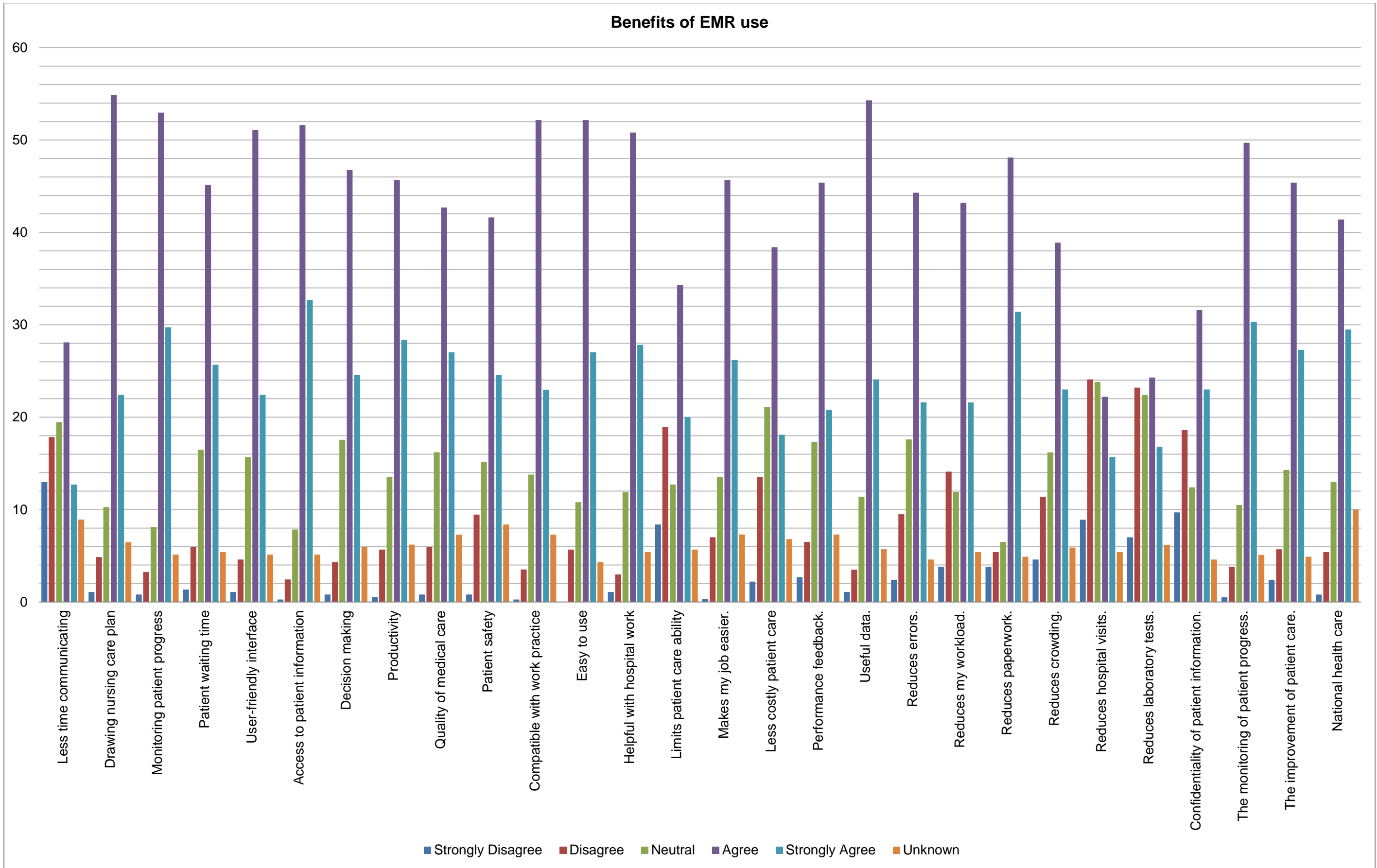
Figure 6-36: Benefits associated with EMR use according to the nurses

Furthermore, when asked whether there were any additional positive or negative patient care benefits that they associated with an EMR the feedback received from the nurses emphasised the availability and accessibility of medical test results and information of a patient; improvement in patient waiting times; accuracy of information contained in the records of a patient; and the added benefit of holistic patient care.

6.6. Conclusion

The purpose of this chapter was to present the context of the case study, prior to discussing the results in the next chapter – Chapter 7. This chapter aimed to provide an understanding of the environment in which the nurses worked. In terms of the ROs, this chapter was in alignment with RO 2, which is to identify the factors that influence the acceptance of EMRs by nurses. Although the factors that emerged from the case study are only presented in the next chapter, this chapter by describing the factors identified from the case study and, thus, it may be said to have contributed to the realisation of RO 2.

CHAPTER 7

7. FACTORS THAT INFLUENCE THE ACCEPTANCE OF EMRs BY NURSES (CASE STUDY)

Ch. 6	The previous chapter presented the context of the case study that was conducted during this research study.
Ch. 7	This chapter presents the factors that emerged from the case study that influence the acceptance of EMRs by nurses. This involved a discussion on how the factors were formulated and validated. The factors are then presented.
Ch. 8	The next chapter presents a framework aimed at contributing to a better understanding of the acceptance of EMRs by nurses.

7.1.   Introduction

As noted in Chapter 3, section 3.3, in order to identify the factors that influence the acceptance of EMRs by nurses both a literature review and a case study were conducted. The factors identified through the literature review were presented in Chapter 5. The purpose of this chapter is to present the factors for the acceptance of EMRs as derived from the case study.

Prior to the presentation of these factors the following sections will clarify how the factors were derived.

7.2.   Formulation of factors

This section elaborates on the way in which the factors presented in this chapter were identified and formulated. The process involves data transcription; data analysis and the validation of the factors.

7.2.1. Data collection

As noted in Chapter 2, section 2.3.2, data was collected from the nurses during a case study and using questionnaires in order to formulate the factors discussed in this chapter. Specifically, the answers to the following questions contained in the questionnaires administered to the nurses and discussed in Chapter 2 were utilised to identify these factors:

- "If you have experienced minor or major problems, please motivate."
- "Any other patient care benefits that can be positively affected by an EMR?"
- "Any other patient care benefits that can be negatively affected by an EMR?"
- "Anything else that you would like add which was not covered in this questionnaire?"

7.2.2. Data transcription

Immediately after data collection, the data transcription commenced. Bailey (2008) and Stuckey (2014) attest that transcription is the first step to data analysis as the transcripts are a reflection of the data interpretation undertaken by the researcher. The data was, thus, self-transcribed by the researcher as it was important that the researcher obtain a sense of the data and feel sure that the data was credible.

7.2.3. Data analysis

After the data transcription, the researcher conducted the data analysis. Similar to the data analysis performed in order to formulate factors derived from the literature review, this data analysis also required the use of codes to categorise and extract meaning from the data. As noted in Chapter3, section 3.3.3, this study used content analysis to analyse the data that had been collected. Qualitative research makes use of an inductive approach during the analysis of data that was collected in the settings of the participants (Creswell, 2013a).

7.2.3.1. Coding

Using an inductive approach to coding, which Gale et al. (2013) term open coding, during the coding the researcher would focus on a portion of the data obtained from a specific nurse participant and then decode and encode the data. Saldana (2015) describes decoding as reflecting on text so as to extract meaning from the text, and encoding as resolving on a code label that is suitable for the text. In some instances, the researcher had more than one code label linked to a single response of a participant as it became evident during the coding that the majority of the responses had touched on different aspects relating to factors that impact the acceptance of EMRs by nurses. See Appendix 10, on CD, for the actual Excel spreadsheet.

Table 7-1 below depicts the frequency of codes in descending order. As may be noted from the table, the most frequent code applied to paper-based system experiences/perceptions.

Note:

- The column with a "+" sign represented the number of instances where each code had a positive association with EMRs.
- The column with a "–" sign represented the number of instances where each code had a negative association with EMRs.
- Negative perceptions and experiences in respect of a paper-based system were classified as positive (+), as these may have positively influenced the acceptance of EMRs by nurses. On the other hand, positive perceptions and experiences in respect of a paper-based system were classified as negative (-) as these may have negatively influenced the acceptance of EMRs by nurses.

Table 7-1: Code frequency

	Code	EMR		
		+	**-**	**Total**
1	Paper-based system experiences/perceptions	211	9	220
2	Patient care	47	30	77
3	Information protection	10	41	51
4	Record conservation	37	12	49
5	Time	20	22	42
6	System availability	0	33	33
7	Ease of use	25	0	25
8	Information accessibility	20	0	20
9	System accessibility	0	12	12
10	System functionality	1	11	12
11	Record accessibility	9	1	10
12	Record accuracy	3	7	10
13	Processing speed	0	9	9
14	Information availability	8	0	8
15	Reliance on paper	0	5	5
16	Cost	1	3	4
17	System updates	0	4	4
18	Record completeness	1	2	3
19	Certification	0	2	2
20	Computer literacy	0	2	2
21	Error recovery	2	0	2
22	Legality	2	0	2
23	Nurse involvement	0	2	2
24	Support	1	1	2
25	Training	0	2	2
26	Attitude	1	0	1
27	Backup	1	0	1
28	IT support	0	1	1
29	Neatness	1	0	1
30	Record availability	1	0	1
31	Standard system	0	1	1
		402	212	614

7.3. Validation of factors

As noted in Chapter 3, section 3.3.53.3.3, Cohen and Crabtree (2006) and Harper and Cole (2012) assert that one of the methods that may be used in qualitative research to validate the "quality, credibility, and trustworthiness" of the results is member

checking. They assert that member checking improves the validity of a study by enabling the accuracy and completeness of the findings to be verified with the members of the groups from whom the data was originally collected. Thus, subsequently to the formulation of the factors, the researcher deemed it necessary to validate the resulting factors by providing the nurses with an opportunity to review the factors and provide feedback. As noted in Chapter 3, section 3.3.5 the feedback was solicited by means of a questionnaire.

As may be seen in Appendix 9 (on CD), the member checking questionnaire was structured as follows:

- Section A – Factors

This section contained the factors that had been formulated based on the data which had been collected. Each factor was accompanied by a Likert scale with five options (categories):

  o Strongly agree
  o Agree
  o Do not know.
  o Disagree
  o Strongly disagree

In order to simplify the reporting, a technique known as collapsing categories was applied to the categories. Collapsing a category implies meaningfully reducing the number of categories to a smaller number (Le Roy & Corbett, 2008; Vogt & Johnson, 2011). Le Roy and Corbett (2008) provided the following example as presented in Table 7-2:

Table 7-2: Collapsing of categories

Extremely liberal	Slightly liberal	Liberal	Moderate	Slightly conservative	Conservative	Extremely conservative
Liberal			Moderate	Conservative		

Source: Le Roy & Corbett (2008)

As may be observed, the seven categories in the first row were meaningfully reduced to three categories as seen in the second row. Thus, following this example, as depicted in Table 7-3 below, the original five categories were collapsed to three categories.

Table 7-3: Collapsing of validation categories

Strongly agree	Agree	Do not know.	Disagree	Strongly disagree
Agree		Do not know.		Disagree

According to De Vaus (2013), this technique may result in the highlighting of patterns in the data that may, otherwise, have been missed. Collapsing the validation categories simplified reporting in that it made it easier to highlight the fact that general consensus had been reached by the participants during the validation of each factor. The degree of agreement with the factors presented in this chapter ranged between 73.1% and 90% per factor, whereas the degree of disagreement ranged between 2.2% and 10.8% per factor.

- Section B – Overall feedback

This section contained a single question, adapted from a member checking questionnaire used in a study conducted by Whitley, Kite and Adams (2012). This question gave the participants an opportunity to provide their overall feedback in regarding the findings.

The following section presents the case study-based factors that influenced the acceptance of EMRs by nurses.

7.4. Factors that influence the acceptance of EMRs by nurses – Case study

As noted in Chapter 3, section 3.2.2, the basis of qualitative research is that "individuals are best placed to describe situations and feelings in their own words" (Holloway & Wheeler, 2013, p. 6). Accordingly, the researcher deemed it important to include quotations from the data which had been to support each factor.

Note the following:

- The factors were based only on the codes that had been identified from coding the data collected from nurses via questionnaires; and
- The text in italics represents the verbatim, written comments of the participants.

7.4.1. Attitude

A positive attitude of a nurse towards an EMR may positively influence how other nurses relate or use an EMR.

Supporting quote(s):

"Technology is 'awesome' if the attitude of individuals is responsible and they can use instead of abuse it." – N237

7.4.2. Back-up

The presence of a backup plan that allows the nurses to continue with work during load shedding may have a positive influence on the acceptance of EMRs by nurses.

Supporting quote(s):

"None because we have downtime programme that support EMR if not working on load shedding" – N077

"All records are backed." – N290

7.4.3. Certification

The absence of computer literacy certification or recognition may negatively influence how nurses accept EMRs. This is due to the fact that nurses would like to be recognised or awarded for the acquisition of computer skills. They are of the opinion that the recognition could contribute towards their resumes or curriculum vitaes for future endeavours.

Supporting quote(s):

"Certificate to be provided to nurses for computer literacy for future references and expirience." – N140

"Provide the health workers with a proper certificates of computer." – N177

7.4.4. Computer literacy

Low computer literacy levels amongst the nurses may negatively influence how they accept the EMR. Nurses that can be referred to as "computer illiterate" or "slow typers" are said to spend a lot of time on work stations. This may affect patient care, as it limits the amount of time available for a nurse to interact with a patient.

Supporting quote(s):

"Staff that are not familiar with computers will spend a lot of time on the computer. This will decrease the time that patient care can be rendered." – N088

"EMRs can have positive and negative impacts. 1) In my opinion I will say that nurses spend more time on the computers and less time with patient's. Not much interaction with the patient's. 2) Also not all nurses are computer literate and fast on typing. This takes up a lot of time and I feel in this way patient's are neglected because the nurse is busy entering data on the system. Overall I'd say it's a good system, a nurse needs to maneavre between patient and use of computer." – N340

7.4.5. Cost

The financial obligation the nurses associated with the acquisition and maintenance of an EMR may impact their acceptance of the EMR. The collected data indicated that nurses are of the opinion that the EMR is costly and this leads to the shortage of other resources within the hospital. However, there was an indication that the use of an EMR reduces "extra cost[s]" as it prevents the duplication of investigations on patients.

Supporting quote(s):

"Cost of EMR is expensive which can lead to shortage of other troopitoe resources to accommodate EMR program." – N262

"Increased cost [arrow] increased no. of computers needed. Delay in recording notes etc. while waiting for available computer." – N121

"Financial impact with regards to mantainance." – N011

"All prevent duplication of investogation on patient Reduce extra cost. …"– N289

7.4.6. Ease of use

The ease of use of an EMR may positively influence the acceptance of EMRs by nurses. The nurses were of the view that it is easy to capture, store, locate and retrieve patient information (including history, admission notes, diagnoses, treatment, side effects, lab and scan results, and charts) and patient records in an EMR. Additionally, the nurses reckoned that not only does an EMR make it easy to follow up on laboratory results, to see whether the lab has received or processed specimens, but it makes it easy to do holistic patient care follow-ups. Furthermore, the nurses were of the inclination that the use of an EMR makes it easy for the patients to access their information.

Supporting quote(s):

"… now I see that electronic system is easy to store and if ever there is a litigation information pertaining is stored on the hard drive and it can be retrieved easily years down the line… " – N365

"All patient's results will be in the system, and it is easy to see if Lab did not receive specimens or not processed." – N309

"All the patient get their information easy. No long waiting period because all information is in the computor. Save time." – N225

"Computers easily use …" – N100

"Data is easily captured." – N116

"Easy follow up care for each patient …" – N264

"Easy to access previous admissions notes" – N086

"Laboratory Results and Scane Result are easly to access it with EMR." – N199

"With the EMR system, patients notes are easily accessible in order for patient care continuity." – N239

7.4.7. Error recovery

The ability of an EMR to allow nurses to undo erroneous actions may impact the acceptance of EMRs. The nurses attested to the fact that the EMR allows them to delete mistakes. Additionally, if a record was mistakenly deleted, the EMR allows the responsible nurse to undo the delete.

Supporting quote(s):

"… if u have made a mistake u delete you work appears clean …" – N069

"In the current system there is a lot of problems when writing patient notes, there is not enough alterations that can be done when deleted by mistake cannot be retrieved if not signed by that nurse" – N322

7.4.8. Information accessibility

The accessibility of information stored in the EMR may have a positive impact on how nurses accept EMRs. The nurses affirmed that the EMR made it possible for them to access information pertaining to the patient (including patient information, patient history, admission notes, X-rays, blood tests and charts). Additionally they attested to the fact that they were able to retrieve information stored in EMR even years down the line. The nurses argued that the ability to access patient information makes timely continuity of care possible. Hence, the accessibility of information may positively influence the acceptance of EMRs by nurses.

Supporting quote(s):

"… where as using the EMRs is much easier with a special and unique code the health care worker can see patients notes…" – N109

"… if ever there is a litigation information pertaining is stored on the hard drive and it can be retrieved easily years down the line … " – N365

"… All the patient get their information easy…" – N225

"… Data can be archived and retrieved much later." – N237

"… All the information about the patient is in one click (X-rays, blood test, etc)…" –
N264

"Its easy to access all the records, information of the patient care, diagnosis&
treatment. Records don't get lost." – N143

7.4.9. Information availability

The availability of information stored in the EMR may have a positive impact on how
nurses accept EMRs. The nurses seemed to find comfort in the knowledge that the
EMR availed information to them (patient information, notes and results). The nurses
argued that the availability of patient results on the EMR prevents the duplication of
investigations pertaining to the patient. Hence, the availability of information may
positively influence the acceptance of EMRs by nurses.

Supporting quote(s):

"1. Lab results are immediately available 2. Other results e.g. uls, x-ray are available
4. Patient visit history is available" – N328

"Data always captured and available in the system Patients information always
available" – N361

"Readily available information to monitor progress and response to treatment." –
N210

7.4.10.   Information protection

The ability, or lack thereof, of the EMR to promote and maintain the protection of
patient information may influence how nurses accept the EMR. The experience of
nurses with the EMR has made them aware of how vulnerable patient information can
be with regards to confidentiality, privacy and security in general. According to the
nurses, patient statuses and illnesses are exposed as it is easy for all staff members
to access the information, including charts. Any individual that has knowledge of the
patient number of a patient can access "everything" about a patient. The nurses
indicated that at times healthcare workers left workstations unattended whilst logged
on, therefore creating room for other individuals to view records or information that
does not involve them, including visitors. Additionally, the nurses revealed that the

EMR allows nurses to print out medical records. The picture that is painted by the nurses is that of an EMR that does not have a way to filter the records or information that should be accessible only to certain nurses. This is further backed by the fact that sometimes when a nurse feels ill, they attend the occupational health clinic and thus assume the role of a patient within the hospital. When such an instance occurs there is no mediation in place to ensure that the medical record or information of the unwell nurse is only accessible to a nurse(s) that is directly involved in the provision of care that the unwell nurse receives. However, some of the nurses were of the opinion that the EMR promotes and maintains the protection of patient information.

Supporting quote(s):

"… Patient statuses are exposed, and illnesses (diagnosis) are exposed." – N289

"Any staff member can access any patient's records. This information can be positively or negatively used against the patient." – N340

"Confidentiality - if HCW leave the EMR open for public to read. HCW should be informed on how to keep or provide confidentiality. There should be a monitory system eg using of password." – N087

"Confidentiality of patient information as the system is accessed by all users even those who are not in direct contact with that particular patient." – N210

"Dont expose the information, close the computer." – N072

"health work are able to print medical records." – N314

"If a person knows your number they are able to access everything about you." – N233

"Patients diagnosis and as well as staff is viewed by all users." – N253

"Privacy especially of staff is not maintained when attending occupational health clinic." – N229

"Confidentiality is maintained, password is needed to access patients records." – N214

7.4.11.   IT support

The unavailability of IT support for the EMR may negatively influence the acceptance of an EMR.

Supporting quote(s):

"… not adequate IT support." – N062

7.4.12.   Legality

The usefulness of an EMR during litigation may positively impact the acceptance of EMRs by nurses, as nurses realise that an EMR is a reliable storage system.

Supporting quote(s):

"… if ever there is a litigation information pertaining is stored on the hard drive and it can be retrieved easily years down the line …" – N365

"… Easy to have patients flow charts In times of litigation the information is easily accessed …" – N234

7.4.13.   Neatness

The neatness provided by an EMR may impact the acceptance of an EMR by nurses, especially when compared to a paper-based system. One of the nurses indicated that work done using an EMR appears neat in comparison to work done using a paper-based system.

Supporting quote(s):

"Its easy with EMRs because if u have made a mistake u delete you work appears clean but with a paper you scratch, you paste and you work or report appears untidy. …" – N069

7.4.14.   Nurse involvement

The lack of nurse involvement in the adoption of EMRs may negatively impact their acceptance of the EMR. The nurses indicated that they want to be involved in the initial designing stage of an EMR to ensure that they will find the system usable. Additionally,

the nurses expressed that they would like to be involved prior to the implementation of any changes to the EMR.

Supporting quote(s):

"Involvement of end-users (nurses) in the initial design of the EMR to ensure usability of the system. …" – N210

"involvement of health care staff if there is change in the system before it being change because it has had impact on the nurses specially" – N314

7.4.15. Paper-based system experiences/perceptions

The negative or positive experiences and perceptions of nurses regarding the use of a paper-based system could influence the acceptance of EMRs by nurses; especially if nurses have to resort to using the paper-based system when the EMR is not available. These experiences and perceptions include the protection of patient information, ease of use, error recovery, infection control, information accessibility, legalities, neatness, patient care, processing speed, proper filing, record accessibility, record accuracy, record completeness, record conservation, storage space, system accessibility, system availability, time and writing legibility.

Supporting quote(s):

"1. Paper based is time consuming 2. It is difficult to ensure safety of documents. 3. Documents are easily lost, mis filed or mis placed. Shortage of paper." – N328

"Staff signing for tasks before they are done eg. Medication due at 14h00 signed for at 10:00. Patients confidential information was easily accessible to non nursing personal (Persons not involved in the patients care)" – N222

"Lot of errors which used to increase work load, once you made an error you have take a ruler scratch mark error and sign, then start afresh in maybe in a new paper. It was time consuming." – N068

"Too much storage of written papers which is not good for infection control." – N219

"A lot of paper had to be used to write patients notes, it was very tedious as patient file/s would contain too much paper, which was used by many nurses, be it day or

night duty and eventually patients file/s will appear untidy due to errors, cancellation editing, poor care or handling of documents" – N213

"Nurse don't sign clearly, some attached papers are lost. Results takes long because they need to be sent to wards manually. Doctors and nurses actually all disciplines dont write clear notes. Files gets dirty and torn. Files are misplaced and at times lost with no trace. Previous history is not easily accessible." – N314

'The problem for using paper based is that at times the patients files get lost and the information is also lost. During litigation the file can be not found at all.' – N153

"Because you have to write time for nursing and essessing the patients was limited. Sometimes you don't have enough paper for writing you have to go around ordering. Place for record keeping not enough sometimes records, get lost." – N139

7.4.16.   Patient care

The impact of an EMR on patient care may influence the acceptance, or lack thereof, of EMRs by nurses. In this context patient care includes treatment administration, follow-ups, continuity of care and the monitoring of patient progress. According to the nurses, if the system is experiencing down time tasks such as the administering of treatment to patients taking longer than usual, they are unable to assist with bookings and the retrieval of files. Additionally, during down time the way they handle emergency situations is affected, thus general continuity of care. Furthermore, when the system is back-up, charting becomes a problem. When there are a lot of patients to attend to the nurse-EMR interaction becomes an obstruction to the provision of patient care, as nurses find it difficult to capture patients "on the system and observe patient at the same time". Nurses are of the opinion that they end up spending more time documenting by interacting with the EMR than attending to the patients, and thus neglecting patients and where relevant, compromising bedside nursing. Nurses are said to sometimes "sit next to the computer busy with their own things e.g. playing games; exploring internet; spending their time on emails" rather than focusing on patients. Moreover nurses are of the opinion that having to walk to the workstation further compromises bedside patient care and according to the nurses, staff that are unfamiliar with computers spend a lot of time on computers, decreasing time available for patient care. The nurses expressed that patient care is delayed if the system

experiences slowness. According to the nurses, during the use of an EMR it is possible to misadminister the medication due to confusing prescriptions. According to the nurses the EMR does not prevent the wrongful identification of patients. The inability to correctly identify a patient might influence the patient care offered to the patient. The inadequacy of computers or laptops may affect patient care as this is said to limit the entry of patient information. However, there were a variety of positives that the nurses associated with the use of an EMR. The record availability; availability and accessibility of patient information and notes; the accessibility of timely results (lab and scan); the accuracy of patient records; the usefulness of the EMR during the administration of medication; checking catering needs; the quicker involvement of the multidisciplinary team; the ability to liaise with the labs; the prevention of investigations conducted on and about the patient; the reduction of patient waiting time; ability to track patient progress, response to treatment and procedures; conserving of patient records leading to continuity of patient care; the ability of doctors to be involved in the provision of care to a patient even if not physically in the same room; easy to make follow-ups; nurses are able to use online resources to inform patient investigations, treatment and care; patient monitoring (including GCS); ability to redirect patients around the hospital, based on the information captured on the EMR, patient waiting time is improved; caters for incident reporting; the ability to spot trends; bedside nursing in units that have a computer next to the patient; ability to make comparisons based on the medical history of a patient.

Supporting quote(s):

"If there is downtime, it takes longer to give treatment and charting is the problem after the system is working." – N143

"When the computers are off line it is difficult to put patients on the system. When there are many patients at one time for example in a Recovery room, it is difficult to put patient on the system and observe patient at the same time." – N345

"Allways Nursing computers in order to nurse Patient Spent more time to computer that patient." – N278

"Bedside side nursing is compromised more time for typing on computers" – N172

"during down time not accessible to patients treatment especially during emergency situations. shortage of laptops and computers" – N152

"If system is always slow - delays patient care" – N304

"If we are on down-time / off-line we can not assist with certain tasks eg bookings, or access files" – N244

"Medication error - administering wrong dose because doctor prescription is sometimes not clear (Confusing)" – N044

"Neglect on patients while writing notes electronically. Using of laptops and computers at workstation that are far less than patient ratio. Moving from one to another leaves others neglected" – N254

"Nursing care of the patient can be negatively affected if the clinical staff will sit next to the computer busy with their own things eg playing games; exploring internet; spending their time on emails in such a way that the patient or client is scared to ask for some help." – N235

"Patient wrongly identified" – N248

"Staff that are not familiar with computers will spend a lot of time on the computer. This will decrease the time that patient care can be rendered." – N088

"Time consuming - At times as a nurse you are forced to be in front of the computer to record patient care but away from the patient himself/herself. This is frustrating as there is lack of mobile laptops and no tablets." – N243

"We focus on patients records more than focusing on patients care" – N240

"Accurate patient recording, time + date. Patient data are easily retrievable. Less waiting time. More information and quickly. Clearer about patient progress, procedures…" – N140

"All members of multi disciplinary team involved quicker" – N004

"All patient's results will be in the system, and it is easy to see if Lab did not receive specimens or not processed." – N309

"Continuation of patient care, so that all information is assesible to the MDT." – N061

"Easy to go internet, library - to check for other options for patient's investigations, treatment & care" – N079

"Get diagnosed faster as drs do not have to wait weeks for results." – N195

"Holistic patient care is possible as all notes are readily available even if it is not relevant to current problem." – N222

"... Easier for others to continue with follow up has all record on systems" – N357

"Improvement in service delivery with regards to waiting time." – N365

"Quick access, trends see at a glance." – N047

"To get patient's information faster e.g. blood results and other tests to continues patient's management." – N172

"With EMR you are able to nurse your patient while writing because even if you have to add something after you have finished writing (Edit)." – N139

"With ICU the nurse is always next to the patient, to give good quality care, as each patient has its own computer." – N322

"The benefit and interest of EMRs is that a doctor can manage the patient even if he is far from the patient by looking only at the images." – N264

7.4.17.   Processing speed

The way nurses experience the processing speed of an EMR may affect their acceptance of an EMR. The nurses indicated that sometimes the EMR was slow in handling certain processes. One of the nurses circumstantiated this claim by stating that the EMR displays an "arrow that says please wait while processing data". Specifically, the nurses pointed out that logging on to the computer takes too long, and that the system is slow when doing entries. The nurses argued that the slowness of the EMR delays patient care.

Supporting quote(s):

"An arrow that says please wait while processing data," – N034

"Computer taking long to log in …" – N357

"Slow when doing entries …" – N116

7.4.18. Record accessibility

The accessibility of records stored in the EMR may have an impact on how nurses accept EMRs. The nurses seemed positive about how accessible records are on the EMR. They conveyed that the EMR gives them the ability to timeously refer to records that are on the system, when the need arises, as these records are accessible to them. Additionally, the nurses articulated that regardless of the unit that registered the patient or how long ago the patient had consulted with the hospital, the record is accessible throughout the hospital. Furthermore, the nurses expressed that the EMR assists with searching for a missing patient. However, one of the nurses was of the opinion that the ease of accessibility of records was a negative aspect about the EMR.

Supporting quote(s):

"If patient is registered under certain clinic then she appears in the system list, when the dr see the patient during consultation sometimes forgets to to sign note or to write note of dr's consultation the AME will phone clinic after few days when the nurse that was working with the doctor even forget the history of that patient, because nurses in outpatient don't have lap tops to do outpatient notes, they have to wait for the clinic to be over when drs finished to see pts. I will request laptops for nurses in outpatient department." – N309

"Files of patients are more easily accessible eg. a patient that comes to hospital often. The file can be easily accessed instead of searching through lots of paper-work." – N088

"Its easy to access all the records, information of the patient care, diagnosis& treatment. Records don't get lost." – N143

"Difficult to secure privacy because of easy access…" – N011

7.4.19.   Record accuracy

The accuracy of records stored in an EMR may influence the acceptability of EMRs by nurses. According to the nurses, the records stored in the EMR are not always accurate, as it is possible to record information on the wrong patient file due to having more than one file open at a time. The nurses voiced that this has the ability to create confusion. The system seems to allow nurses to copy and paste across records; to capture a task as complete though that is not so. The nurses expressed that through the use of EMRs, sometimes errors occur during the administration of records due to unclear prescriptions from doctors; and that it is possible to wrongly identify patients. The inability to backdate records may make records seem inaccurate, as the records may lack logical order. However, there were a few positive aspects from the nurses that could be associated with record accuracy. The nurses expressed that the EMR lends a helping hand during data capturing as it has the ability to correct spelling errors. Furthermore, the nurses reported that no errors emerged during the use of the EMR and that the EMR had the ability to accurately record data pertaining to the patient and clearly capture their particulars.

Supporting quote(s):

"Annotating something that is done but not done. No backtiming events in crisis." – N004

"... A mistake can be done in writing in another patient's file - causing confusion." – N264

"If Health Care worker did copy & paste or did not close the file of the previous patient and write information of the current patient to the wrong file." – N309

"Patient wrongly identified" – N248

"The entries are done long after it has been done physically. Unable to backdate which makes the notes having no sequence" – N016

"… Computer corrects your language in case wrong spelling done"

"Accurate patient recording, time + date. …" – N094

"Capturing the data of the patient, name and surname written clearly" – N209

7.4.20.   Record availability

The availability of records stored in the EMR may have a positive impact on how nurses accept EMRs. The nurses seemed to find comfort in the knowledge that the EMR availed patient records. The nurses argued that the availability of patient results on the EMR prevents the duplication of investigations pertaining to the patient. Hence, record availability may positively influence the acceptance of EMRs by nurses.

Supporting quote(s):

"If patient are referred to other discipline all all investigation done will have record. Saves on time and repeat of same tests. Easier for others to continue with follow up has all record on systems" – N357

7.4.21.   Record completeness

The completeness of records stored in the EMR may influence the acceptance of EMRs by nurses. According to the nurses, whilst using the EMR it is possible to have incomplete records. This can be due to doctors forgetting to sign or write a note for a consultation; the sudden unavailability of the EMR due to load shedding before a nurse could sign off on a record after capturing data pertaining to patient care. However, one of the nurses asserted that "everything" about a patient can be accessed from the EMR, thus the EMR has the ability to contain the complete record of a patient.

Supporting quote(s):

"… when the dr see the patient during consultation sometimes forgets to to sign note or to write note of dr's consultation the AME will phone clinic after few days when the nurse that was working with the doctor even forget the history of that patient…" – N309

"All nursing care benefits can be negatively affected with this load shedding because it just goes when you are in the middle of writing the patients care having not signed." – N139

"That everything about patient e.g Side effect it is easly seen since it always appors you don't have to write about it papers or note every day" – N111

7.4.22. Record conservation

The ability of an EMR to conserve patient records may have an impact on the acceptance of EMRs by nurses. The responses collected from the nurses ranged from "records or information gets lost" to "records or information is seldom lost" to "records or information is never lost". Some of the nurses associated the EMR with loss, stating that information and records stored in an EMR get lost. According to the nurses, during down time, whilst using the EMR, it is possible to lose unsaved documents. Additionally, information can be lost due to damaged equipment or if a nurse forgets to save the information. However, some of the nurses were of the opinion that the EMR has the ability to conserve information and records. The nurses revealed that records stored in the EMR are backed up. They can be archived and retrieved at a later stage, thus supporting longevity. One of the nurses stated that in an EMR patient records are kept for "life". The responses collected from nurses indicated that this longevity of patient records is useful during litigation. Furthermore, since an EMR is electronic, it plays a role in the prevention of loss of records by staff or patients. The nurses indicated that the EMR goes as far as disallowing the "delete" option for records, unless the action is initiated by the nurse that created the record.

Supporting quote(s):

"Power failure resulting in the lost of Unsaved documents Good Record" – N273

"Damage of equipment can lead to loss of information" – N003

"Loss of information if not saved properly." – N018

"… In computer the files are always stored safely…" – N094

"It is advisable to use computers for safe keeping of patient's records" – N157

"Continued care of patients (as there will be no information regarding patients health being lost." – N248

"Data can be archived and retrieved much later." – N237

"Data is always available - not lost by staff or patient and not left at home by patients" – N360

"No option to delete information when it is not entered by you, only the person who entered it can do it." – N011

7.4.23. Reliance on paper

Having to rely on a paper-based system when the EMR is unavailable may have an impact on the acceptance of EMRs by nurses. The nurses indicated that during system down time, they have to rely on a paper-based system. When this happens, they experience some of the problems they associate with the use of a paper-based system, such as improper completing of records and loss of information. Additionally, there was an indication that though the hospital uses an EMR, the nurses still have to print out certain documents, such as the documentation for receiving of goods, prescriptions and logging of calls.

Supporting quote(s):

"… sometimes when the system is down we have to use the papers so it difficult for us sometimes we do not write proper as we supposed to fill in the papers like we used from other hospital And the paper get lost too easily. If not scanned" – N268

"… On down time paper is used for documentation causing a risk of losing these papers." – N266

"Even with computer we are still printing stuffs. Eg. when receiving stuffs, prescription, logging of calls." – N357

"I wish we dont have duplicate work if we use EMR to use it only and not paper and computer it makes work to be too much" – N346

7.4.24. Standard system

The lack of a standard system that may be used across all hospitals may negatively influence the acceptance of EMRs by nurses. Nurses are of the opinion that interacting with a standard system, regardless of the hospital, may improve quality of care.

Supporting quote(s):

"One system should be used in hospital groups eg government hospitals, Net-care hospitals or Life Hospitals, so as to improve quality of care." – N304

7.4.25.   Support

The existence of support, or lack thereof, may influence the acceptance of EMRs by nurses. Nurses indicated that it is important that they are monitored and they receive support during the adoption and implementation of an EMR. One of the nurses affirmed that it is the support received from colleagues, the EMR provider, as well as the EMR trainer that assisted the nurse to adjust to working with patient records and the EMR. Thus it can be concluded that lack of support may dissuade the acceptance of EMRs by nurses.

Supporting quote(s):

"... Contineous monitoring and support of staff during implementation and adoption." – N210

"When I came to hospital I was from the area where we had no much Access to System especial Documentation of Patients Records on but Adjusted in time with help of collegues and Sorian and Educatetor about system since they are always available to help." – N111

7.4.26.   System accessibility

The inaccessibility of an EMR may negatively influence the acceptance of EMRs by nurses. The nurses revealed that they are not always able to access the EMR due to a shortage of laptops and computers, stating that the number of laptops and computers do not match up to the patient ratio. Owing to the shortage, the nurses expressed that they had to default to waiting on each other to get a chance to interact with the system. Furthermore, it was evident from the responses that the nurses were of the point of view that this inaccessibility had an impact on their work flow, reporting that there was a delay in the capturing of patient notes. They attested to the fact that the shortage of laptops has an impact on the patient care they are able to offer patients as they go about their job, reporting that bedside care is affected as they did not have

enough computers or laptops to allow them to remain by the bedside of the patient as they interact with the EMR. This is also due to a lack of Tablet devices.

Supporting quote(s):

"If patient is registered under certain clinic then she appears in the system list, when the dr see the patient during consultation sometimes forgets to sign note or to write note of dr's consultation the AME will phone clinic after few days when the nurse that was working with the doctor even forget the history of that patient, because nurses in outpatient don't have lap tops to do outpatient notes, they have to wait for the clinic to be over when drs finished to see pts. I will request laptops for nurses in outpatient department."

"Few laptops and computers making it difficult to record in time." – N116

"during down time not accessible to patients treatment especially during emergency situations…" – N152

"Increased cost [arrow] increased no. of computers needed. Delay in recording notes etc. while waiting for available computer." – N121

",,, Using of laptops and computers at workstation that are far less than patient ratio. …" – N254

"… there is lack of mobile laptops and no tablets." – N243

"There should have enough computer | tablet units in the wards. Where I am currently there are enough units but in other wards where there are more patients need more units either tablets or pcs." – N292

7.4.27. System availability

The unavailability of an EMR may have an impact on how nurses accept EMRs. The nurses expressed that when the EMR is experiencing down time, they have "nowhere to record" and are unable to access patient information stored on the EMR and data can get lost. According to the nurses, after the system has been unavailable they have to capture all the relevant data (including charts) once the system is running. The nurses expressed that patient care is negatively affected during down time, as tasks

such as the administration of treatment takes longer than with an EMR. Additionally, continuity of care is affected as the following problems were related by the nurses in relation to down time: the inability to access the recorded treatment of a patient during emergencies; recording of procedures; viewing of the records of patients was reported to take too long; inability to assist patients with bookings; frustration is triggered from the nurses; and time is wasted. Furthermore, the nurses voiced that relying on a paper-based system during down time interferes with proper record keeping and they run at a risk of losing the paper-based records if not scanned. The nurses pointed out that other hospitals that are not using EMRs are able to continue working as usual during load shedding.

Supporting quote(s):

"If there is downtime, it takes longer to give treatment and charting is the problem after the system is working." – N143

"If you depend on computers sometimes are off line and you have to wait for a long period ,,," – N117

"All nursing care benefits can be negatively affected with this load shedding because it just goes when you are in the middle of writing the patients care having not signed." – N139

"Due to load shedding Downs system. Freezing of system." – N140

"during down time not accessible to patients treatment especially during emergency situations. ..." – N152

"During down time some data gets lost"

"If systems are down, its hard to access information & to record procesures ..." – N109

"If we are on down-time / off-line we can not assist with certain tasks eg bookings, or access files" – N244

"… When the system goes down it causes frustration & delayed patient care. On down time paper is used for documentation causing a risk of losing these papers." – N266

"When the system goes on downtime we cannot access patient files therefore making it extremely hard to administer drugs or any form of treatment." – N267

"Negatively affect the patient when there no electricity" – N180

"Other Govt hospitals like R.KlChan, Addington, KEH are not using EMRs, but still delivering the required nursing care. especially now with load shedding." – N263

7.4.28. System functionality

The functionality included, or excluded, within an EMR may have an impact on the acceptance of EMRs by nurses. Nurses seemed to express grievances regarding some of the following functionality: having to interact with more than one screen or interface at a time; the ability to copy and paste information across records; the ability to capture a task as complete though not complete; the dissimilarities between a paper-based system functionality and the EMR functionality; as well as functionality that has been excluded from the EMR, such as the inability to backdate a record; inability to monitor system access; the inability to prevent errors such as when a nurse captures patient information in the wrong file; the inability to pick up public holidays when booking appointments for patients; limited alteration capabilities; the inability to delete a record that was not captured by the nurse; lack of applications. However, one of the nurses viewed the inability to delete a record that was not entered by the nurse, as a positive quality about the EMR.

Supporting quote(s):

"… Different pages are used for different things eg. for medication, writing patients notes and it is time consuming" – N041

"things like fluid chart are not similar as on the paper. And that not everything is on the system." – N314

"1. Copying & pasting of records is very negligent. 2. It is easy to record on the wrong patients file if more than one file is open." – N328

"Annotating something that is done but not done. No backtiming events in crisis."

"… There should be a monitory system eg using of password." – N004

"The entries are done long after it has been done physically. Unable to backdate which makes the notes having no sequence" – N016

"In outpatient if we do bookings the calender allows bookings in public holidays but before when we use old system (Medicom) did not allow booking in public holidays that need to be corrected." – N309

"In the current system there is a lot of problems when writing patient notes, there is not enough alterations that can be done when deleted by mistake cannot be retrieved if not signed by that nurse" – N322

"To add more apps" – N090

7.4.29. System updates

System updates may impact the acceptance of EMRs by nurses. The nurses expressed discontent with the fact that changes are made by the IT personnel to the system as they become familiar with the EMR in place. Additionally, they seemed unhappy about having to attend frequent in-service training after a change on an upgrade has occurred. However, one of the nurses stated that sometimes no formal workshops are provided regarding a system change.

Supporting quote(s):

"When the IT people changing the system." – N321

"As you become familiar with an application, then there is a change eg Medicom the Soarian now there is change pending" – N338

"Frequent inservices with latest changes or upgrades" – N019

"Systems get changed often, sometimes no formal workshop" – N020

7.4.30. Time

The amount of time involved when using an EMR may have an impact on the acceptance of EMRs by nurses. According to the nurses, interacting with the system was time consuming. Additionally, the nurses were of the opinion that a lot of time is spent interacting with the EMR instead of delivering or providing patient care or offering bedside nursing to the patients. Furthermore, the nurses indicated that time is wasted when a nurse plays games or engages in social networks, using the infrastructure that has been availed for the EMR; when a nurse has to queue to access the EMR, due to shortage of laptops and computers, as well as when "slow typers" interact with the system. Some of the nurses indicated that using an EMR consumes more time than using a paper-based system. However, some of the nurses were of the opinion that using the EMR saves them time. Specifically, one of the nurses stated that no time is wasted when locating the file of a patient on the EMR. There is less waiting time for patients; the interdisciplinary team of the hospital gets involved quicker; saves time as it eliminates the unnecessary duplication of tests; orders can be reviewed fast; quick access to information and spotting of trends; elimination of delays with diagnosis and treatment of patients; saves time during the ordering of investigations or medication and obtaining of results; and the EMR gives nurses the ability to provide timeous care to patients.

Supporting quote(s):

"Logon takes long. Different pages are used for different things eg. for medication, writing patients notes and it is time consuming" – N041

"… Delay in recording notes etc. while waiting for available computer." – N121

"It is time consuming if compared to paper work … It takes more staff time" – N020

"It may be time-consuming as some nurses and staff take longer than others to type notes." – N222

"More time at workstation doing documentation than at patient's bedside observing the patient." – N355

"Nursing care of the patient can be negatively affected if the clinical staff will sit next to the computer busy with their own things eg playing games; exploring internet; spending their time on emails in such a way that the patient or client is scared to ask for some help." – N235

"Staff that are not familiar with computers will spend a lot of time on the computer. This will decrease the time that patient care can be rendered." – N088

"… When the system goes down it causes frustration & delayed patient care. …" – N266

"Wasted time when we have 'down time'" – N318

"Because we always had the documents of the patients we don't used or waist time for checking the files of the patients is always available on the system" – N115

"All members of multi disciplinary team involved quicker" – N004

"Fast to review other orders" – N155

"… Saves on time and repeat of same tests. …" – N357

"Improvement in service delivery with regards to waiting time." – N367

"Quick access, trends see at a glance." – N047

"… No delays with treatment." – N267

"Speeds up the process with regards to ordering if investigation, medication because it all done quicker. …" – N236

"Results are loaded on system - not lost no delay on patients diagnosis and treatment." – N360

7.4.31.   Training

Lack of training or lack of appropriate training may have an impact on the acceptance of EMRs by nurses. One of the nurses indicated that at times no formal training is provided after a system change, and another indicated that lack of proper training results in time wasted for patients and nurses.

Supporting quote(s):

"Systems get changed often, sometimes no formal workshop" – N020

"The only time it is a positive implementation is when the staff are properly trained if not then the delay is worse for the patient and other nurses." – N345

The following section presents the validation results.

7.5. Summary of the validation findings

A summary of the validation findings is presented in Table 7-4 (see Appendix 10 [on CD] for the overall feedback comments). In the table the "Do not know" column represents the percentage of participants who selected "Do not know" when presented with the "Strongly agree"; "Agree"; "Do not know"; "Disagree"; and "Strongly disagree" options. On the other hand, the "Unknown" column represents the percentage of participants who did not respond to the question.

Table 7-4: Summary of validation results

Factor	Strongly agree	Agree	Do not know.	Disagree	Strongly disagree	Unknown
1. Attitude	31.9	52.3	5.4	2.5	0.7	7.2
2. Back-up	29.4	54.5	4.3	2.9	1.4	7.5
3. Certification	29.7	58.8	5.7	3.2	1.1	1.4
4. Computer literacy	28.3	59.1	3.9	6.1	1.1	1.4
5. Cost	20.1	58.8	14.0	4.3	1.8	1.1
6. Ease of use	26.9	53.4	7.5	3.2	1.1	7.9
7. Error recovery	20.1	57.0	8.2	4.7	0.4	9.7
8. Information accessibility	22.6	58.4	6.1	3.2	1.4	8.2
9. Information availability	23.7	66.3	6.8	2.2	0.0	1.1
11. Information protection	22.6	60.9	8.2	4.3	2.2	1.8
10. IT support	23.3	55.6	8.2	4.3	0.4	8.2
12. Legality	21.1	59.5	6.1	3.6	1.1	8.6
13.Neatness	30.8	57.7	1.4	1.8	0.4	7.9
14. Nurse involvement	27.6	55.9	6.5	1.8	0.7	7.5
15. Paper-based system experiences/perceptions	17.6	68.1	7.5	2.5	0.4	3.9
16. Processing speed	24.4	63.8	3.2	5.4	0.4	2.9
17. Patient care	16.8	55.9	10.8	2.9	0.7	12.9
18. Record accessibility	21.9	64.2	7.5	1.8	0.4	4.3
19. Record accuracy	17.6	66.3	8.6	2.5	1.4	3.6
20. Record availability	16.5	65.9	5.7	1.8	1.1	9.0
21. Record completeness	14.0	67.4	6.1	2.2	0.0	10.4
22. Record conservation	15.8	65.9	9.3	2.9	0.0	6.1
23. Reliance on paper	23.3	63.4	7.2	2.9	0.4	2.9
24. Standard system	16.1	65.6	5.4	2.9	0.4	9.7
25. Support	21.9	63.4	6.8	1.8	0.4	5.7
26. System accessibility	17.9	56.6	4.7	7.9	1.4	11.5
27. System availability	16.1	58.1	4.7	8.6	1.8	10.8
28. System functionality	16.1	61.3	11.8	5.0	0.4	5.4
29. System updates	14.3	64.2	5.7	9.0	1.8	5.0
30. Time	15.8	63.4	5.4	8.2	2.5	4.7
31. Training	14.0	59.5	6.5	7.5	1.1	11.5

As may be observed in Table 7-4, all the factors demonstrated an agreement level of more than 70% and, thus, no changes were made to the factors.

7.6. Summary of factors

The table below, Table 7-5, presents a summary of the factors identified. It also indicates whether the factors were found to have a negative and/or positive influence on the acceptance of EMRs.

Table 7-5: Summary of case study-based factors

No.	Factor	Influence (+)	Influence (-)
1.	Attitude	+	
2.	Back-up	+	
3.	Certification		-
4.	Computer literacy		-
5.	Cost	+	-
6.	Ease of use	+	
7.	Error recovery	+	-
8.	Information accessibility	+	
9.	Information availability	+	
10.	Information protection	+	-
11.	IT support		-
12.	Legality	+	
13.	Neatness	+	
14.	Nurse involvement		-
15.	Paper-based system experiences/perceptions	+	-
16.	Patient care	+	-
17.	Processing speed		-
18.	Record accessibility	+	-
19.	Record accuracy	+	-
20.	Record availability	+	

No.	Factor	Influence (+)	Influence (-)
21.	Record completeness	+	-
22.	Record conservation	+	-
23.	Reliance on paper		-
24.	Standard system	+	-
25.	Support	+	-
26.	System accessibility		-
27.	System availability		-
28.	System functionality	+	-
29.	System updates		-
30.	Time	+	-
31.	Training		-

7.7. Conclusion

The purpose of this chapter was to present the factors that were found to influence the acceptance of EMRs by nurses, as derived from the data collected from the nurses via the questionnaires. The aim of this exercise was to realise RO 2, namely, to identify the factors that influence the acceptance of EMRs by nurses. Thirty-one (31) case-study based factors were identified. The factors were derived from an inductive content analysis. Subsequent to the analysis the factors were validated by the nurses by means of member checking. As may be observed from the results of this validation, all the factors demonstrated an agreement level of more than 70%.

CHAPTER 8

8. UNDERSTANDING EMR ACCEPTANCE BY NURSES: A FRAMEWORK

Ch. 7
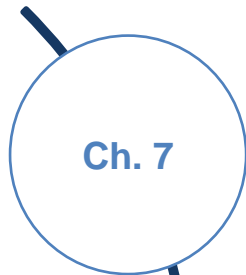
The previous chapter concluded with the presentation of factors that had emerged that had emerged from the case study and that influence EMR acceptance by nurses.

Ch. 8
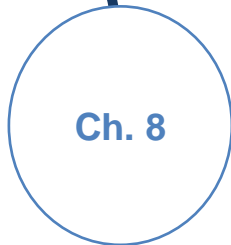
This chapter presents a framework which contains the analyses of the factors identified in Chapters 5 and 7 with the aim of contributing to a better understanding of the acceptance of EMRs by nurses in hospital settings. Using argumentation and STS theory as a lens, the chapter presents the framework and, by so doing, fulfils RO 3, namely, to create a framework that contributes to better understanding of factors that influence EMR acceptance by nurses.

Ch. 9
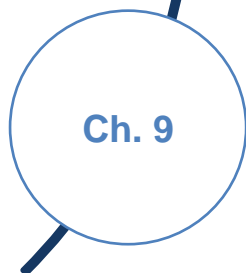
The next chapter concludes the research study.

8.1. Introduction

As highlighted in Chapter 1, section 1.2, the main problem addressed in this research study was the inadequate understanding of the factors that influence the acceptance of EMRs by nurses in hospital settings. Thus, the main purpose of the study was to create a framework that would contribute to a better understanding of factors that influence the acceptance of EMRs by nurses. In order to do this, a literature review and a case study were conducted in order to identify these factors. The literature review and case study factors were presented in Chapters 5 and 7, respectively. Table 8-1 below presents a summary of the factors that were identified. The table indicates the factors that emerged from the literature review as well as those that emerged from the case study. In addition, the table indicates whether each factor has a negative and/or positive influence on the acceptance of EMRs by nurses.

Table 8-1: Factors which play a role in the acceptance of EMRs by nurses (Literature and case study)

Factor	Literature	Case study	Influence (+)	Influence (-)
1. Attitude		√	+	
2. Back-up		√	+	
3. Braveness	√			-
4. Certification		√		-
5. Change acceptance	√			-
6. Communication	√		+	
7. Computer literacy	√	√	+	-
8. Cost		√	+	-
9. Ease of use	√	√	+	-
10. Error recovery		√	+	-
11. Information accessibility	√	√	+	
12. Information availability		√	+	
13. Information protection	√	√	+	-
14. IT support		√		-
15. Job facilitation	√		+	
16. Legality		√	+	
17. Neatness		√	+	

(*Table 8-1 continued.*)

Factor	Literature	Case-study	Influence (+)	Influence (-)
18. Nurse involvement	√	√	+	-
19. Nursing perceptions	√		+	-
20. Optimistic championing nurses	√		+	
21. Paper-based system experiences/perceptions	√	√	+	-
22. Patient care	√	√	+	-
23. Processing speed		√		-
24. Record accessibility		√	+	-
25. Record accuracy		√	+	-
26. Record availability		√	+	
27. Record completeness		√	+	-
28. Record conservation		√	+	-
29. Reliance on paper		√		-
30. Social influences	√		+	-
31. Standard system		√	+	-
32. Support		√	+	-
33. System accessibility		√		-
34. System availability		√		-
35. System functionality	√	√	+	-
36. System updates		√		-
37. Time	√	√	+	-
38. Training	√	√	+	-
39. Workload reduction	√		+	

As may be observed, 18 factors emerged the literature review and 31 from the case study, thus making 39 factors in total, as there were ten overlapping factors. As noted in Chapter 1, section 1.5, one of the ROs of this study (RO 3) was to create a framework that would contribute to better understanding of the factors that influence EMR acceptance by nurses. Thus, the purpose of this chapter is to present such a

framework comprising the factors that had been identified. It was anticipated that such a framework would lead to better understanding of EMR acceptance by nurses.

8.2. EMR acceptance

Chapter 2, section 2.3.1, argued for the inclusion of three acceptance stages when analysing the factors that influence the acceptance of EMRs by nurses, namely, adoption, implementation and use and, hence, the inclusion of these acceptance stages in the analysis presented in this section. The analysis is based on the factors presented in Chapters 5 and 7. This analysis contributed to a better understanding of the factors that influence EMR acceptance by nurses. The analysis is presented in Table 8-2. The table may be explained as follows :

- Column 1 highlights the names of the factors that influence the acceptance of EMRs by nurses, as indicated in Chapters 5 and 7.
- Columns 2, 3 and 4 indicate at which stage (Adoption, implementation, and/or use) each factor influences such acceptance in order to guide efforts made to address/maintain aspects related to each factor. In addition, for each acceptance stage, these columns indicate whether the factor has a negative influence (-) on acceptance, in which case it should be addressed, or a positive (+) influence, in which case it should be maintained, thus highlighting the way in which each factor should be either addressed or maintained.
- Column 5 provides the motivation for the association between each factor and the stage of influence. It should be noted that this motivation was based strictly on the detailed descriptions of the factors as provided in Chapters 5 and 7.

This analysis is presented in Table 8-2 below.

Table 8-2: EMR acceptance stages

Factor	Adoption Influence		Implementation Influence		Use Influence		Motivation
	(+)	(-)	(+)	(-)	(+)	(-)	
1. Attitude					+		A positive attitude on the part of a nurse towards an EMR may positively influence the use of the EMR by other nurses. Thus, the positive influence is during the use stage.
2. Back-up					+		The backup plan allows nurses to continue with their work. Thus, nurses may experience a positive influence during the use stage.
3. Braveness		-		-		-	The unease nurses may experience due to the introduction of EMRs may be experienced in all three stages (Adoption, implementation and use). Thus, lack of braveness may negatively influence the acceptance of EMR by nurses during all three stages.
4. Certification						-	The absence of certification in respect of their computer literacy skills may negatively influence the acceptance of EMRs by nurses during the use stage.
5. Change acceptance		-		-		-	Resistance to change may be experienced by nurses in all three acceptance stages. Thus, lack of change acceptance may negatively influence the acceptance of EMRs by nurses during all three stages.
6. Communication					+		The enhanced communication referred to in this factor is may be credited to the use of the EMR . Thus, it may positively influence the acceptance of EMRs by nurses during the Use stage.
7. Computer literacy	+		+		+	-	Computer literacy has a positive influence on the views and attitudes of nurses towards an EMR. The attitudes and views of computer literate nurses during the adoption, implementation and use stages may positively influence their acceptance of EMRs during these stages. On the other hand, nurses who lack computer literacy during the use stage may take a while to capture information into the EMR and, thus, a lack of computer literacy may negatively influence the acceptance of EMRs by nurses during the use stage.

(Table 8-2 continued.)

Factor	Adoption		Implementation		Use		Motivation
	Influence		Influence		Influence		
	(+)	(-)	(+)	(-)	(+)	(-)	
8. Cost		-		-	+	-	The cost/financial obligation referred to in this factor is negatively associated with the acquisition and maintenance of an EMR. It may be argued that acquisition takes place during the adoption and implementation stages while maintenance occurs during the use stage. Thus, the adoption, implementation and use stages may be negatively influenced by cost. However, a positive influence may be experienced during the use stage due to the reduced costs associated with preventing the duplication of medical investigations on patients during the use of an EMR.
9. Ease of use					+	-	Depending on the ease of use experienced by nurses when interacting with the EMR, this factor may have wither a positive or a negative influence on the acceptance of EMRs by nurses during the use stage.
10. Error recovery					+	-	The errors referred to in this factor are those that occur during the use of an EMR by nurses. Thus, error recovery, or the lack thereof, may positively or negatively influence the acceptance of EMRs by nurses during the use stage.
11. Information accessibility					+		The accessibility of information that is referred to in this factor occurs during the use of an EMR. Thus, information accessibility may positively influence the acceptance of EMRs by nurses during the use stage.
12. Information availability					+		The availability of information that is referred to in this factor is experienced during the use of an EMR. Thus, information availability may positively influence the acceptance of EMRs by nurses during the use stage.
13. Information protection					+	-	The protection of information, or lack thereof, that is referred to in this factor is experienced during the use of an EMR. Thus, information protection may either positively or negatively influence the acceptance of EMRs by nurses during the use stage.

(Table 8-2 continued.)

Factor	Adoption		Implementation		Use		Motivation
	Influence		Influence		Influence		
	(+)	(-)	(+)	(-)	(+)	(-)	
14. IT support				-		-	IT support is required to assist nurses when they interact with an EMR. Thus, a lack of IT support may negatively influence the acceptance of EMRs by nurses during the implementation and use stages.
15. Job facilitation					+		The helpfulness of an EMR in the carrying out of their nursing duties referred to in this factor is evident during their use of the EMR. Thus, this factor may positively influence the acceptance of EMRs by nurses during the use stage.
16. Legality					+		The usefulness of an EMR during litigation, as discussed in this factor, is experienced during the use of an EMR. Thus, this factor may positively influence the acceptance of EMRs by nurses during the use stage.
17. Neatness					+		The neatness referred to in this factor is experienced by nurses in respect of the presentation of their administrative work. Thus, this factor may positively influence the acceptance of EMRs by nurses during the use stage.
18. Nurse involvement	+	-	+	-	+	-	A lack of nurse involvement may have a negative influence during all three stages as a result of the fact that nurses would want to be involved during the acceptance stages. However, a positive influence may be experienced during the adoption, implementation and use stages due to the fact that the involvement of nurses during these stages should result in what they would deem to be a usable EMR.
19. Nursing perceptions	+	-	+	-	+	-	Nurse perceptions may positively or negatively influence the acceptance of EMRs by nurses during all three stages because the positive and negative perceptions referred to in this factor impact on all three stages.
20. Optimistic championing nurses					+		This factor may positively influence the acceptance of EMRs by nurses during the use stage because the role of the optimistic nurses, as referred to in this factor, revolves around promoting the use of an EMR by nurses.

Factor	Adoption Influence		Implementation Influence		Use Influence		Motivation
	(+)	(-)	(+)	(-)	(+)	(-)	
21. Paper-based system experiences/perceptions					+	-	This factor may positively or negatively influence the acceptance of EMRs by nurses during the use stage because the aspects referred to in the factor are related to the use of EMRs.
22. Patient care					+	-	The patient care referred to in the factor may be either improved or compromised during the use of an EMR. Thus, patient care may positively or negatively influence the acceptance of EMRs by nurses during the use stage.
23. Processing speed						-	The lack of processing speed may have a negative influence during the use stage due to the fact that the impact of this factor is realised by nurses during the use of an EMR.
24. Record accessibility					+	-	The accessibility of records, or lack thereof, that is referred to in this factor occurs during the use of an EMR. Thus, record accessibility may either positively or negatively influence the acceptance of EMRs by nurses during the use stage.
25. Record accuracy					+	-	The ability, or lack thereof, of an EMR in assisting with the accuracy of records is realised during the use of an EMR. Thus, record accuracy may either positively or negatively influence the acceptance of EMRs by nurses during the use stage.
26. Record availability					+		The availability of records that is referred to in this factor is experienced during the use of an EMR. Thus, record availability may positively influence the acceptance of EMRs by nurses during the use stage.

(Table 8-2 continued.)

Factor	Adoption Influence		Implementation Influence		Use Influence		Motivation
	(+)	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	
27. Record completeness					**+**	**-**	The ability, or lack thereof, of an EMR in ensuring the completeness of records is realised during the use of an EMR. Thus, record completeness may either positively or negatively influence the acceptance of EMRs by nurses during the use stage.
28. Record conservation					**+**	**-**	The negative and positive experiences associated with this factor take place during the use of an EMR. Thus, record conservation may either positively or negatively influence the acceptance of EMRs by nurses during the use stage.
29. Reliance on paper						**-**	The reliance on paper that is referred to in this factor is due to down time that may occur while nurses are using an EMR. Thus, defaulting to using a paper-based system may negatively influence the acceptance of EMRs by nurses during the use stage.
30. Social influences	**+**	**-**	**+**	**-**	**+**	**-**	Social influences may have a positive or negative influence during all three stages depending on the source of the influence. The effect of decisions made by decision makers, for example, may be experienced during the adoption, implementation and use stages. It is worth noting that, from adoption, nurses may decide to accept the EMR with the aim of pleasing their superiors.
31. Standard system					**+**	**-**	The standardisation of EMRs, or lack thereof across hospitals, may positively or negatively influence the acceptance of EMRs by nurses, based on the benefits that nurses associate with the use of a standard EMR.
32. Support	**+**	**-**	**+**	**-**	**+**	**-**	Support may have a positive or negative influence during all three stages due to the availability of support for nurses, or lack thereof, from colleagues, the EMR provider as well as the EMR trainer.

(Table 8-2 continued.)

Factor	Adoption Influence		Implementation Influence		Use Influence		Motivation
	(+)	(-)	(+)	(-)	(+)	(-)	
33. System accessibility						-	The lack of accessibility of an EMR is experienced during the use of an EMR. Thus, system accessibility may negatively influence the acceptance of EMRs by nurses during the use stage .
34. System availability						-	The unavailability of an EMR discussed in this factor is experienced during the use of an EMR. Thus, lack of system availability may negatively influence the acceptance of EMRs by nurses during the use stage.
35. System functionality					+	-	The functionality of an EMR discussed in this factor is experienced during the use of an EMR. Thus, system functionality may positively or negatively influence the acceptance of EMRs by nurses during the use stage.
36. System updates						-	System updates are experienced during the use of an EMR that has already been implemented. Negative experienced associated with system updates may negatively influence the acceptance of EMRs by nurses during the use stage.
37. Time					+	-	The negative or positive experiences associated with time, as discussed in this factor, are all associated with the use of an EMR. Thus, this factor may positively or negatively influence the acceptance of EMRs by nurses during the use stage.
38. Training					+	-	Training, or a lack of proper training, has an influence on the acceptance of an EMR by nurses during the use stage. A lack of training may result in delays for patients and other nurses during the use stage.
39. Workload reduction					+		The reduction of workload is realised during the use of an EMR. Thus, this factor may positively influence the acceptance of EMRs by nurses during the use stage.

The results presented in Table 8-2, above indicate the stage(s) at which each factor has an influence on the acceptance of an EMR by nurses as well as whether the influence is either positive or negative. This provides an indication of when aspects related to a specific factor should be addressed (negative influence) or maintained (positive influence) in order to encourage the acceptance of EMRs by nurses.

The following section focuses on the STS analysis.

8.3. STS analysis of the factors which play a role in the acceptance of EMRs by nurses

Chapter two, section 2.3.2, argued that the STS theory was suitable as a theoretical lens through which to gain a better understanding of the factors that influence the acceptance of EMRs by nurses. STS theory discourages organisations from limiting their focus to technology alone, for example, EMRs, but, instead, encourages a comprehensive view that includes the human centric approach. In terms of this view, for the purposes of the study, nurses (social dimension) were seen as people who use technology such as an EMR (technical dimension) as a tool to assist in the rendering of services to customers (provision of care to patients – environmental dimension) while being influenced by various environmental aspects.

As already noted, the factors presented in this section had been identified as factors that influence the acceptance of EMRs by nurses. This meant that RO 2 had been realised. In order to realise RO 3, this section analyses these factors through an STS lens so as to obtain a broader understanding of the factors that influence the acceptance of EMRs by nurses. In positioning the factors which had been identified in the STS dimensions, the researcher examined each factor and, through logical argumentation, concluded on the appropriate position of each factor in terms of the social, environmental and technical dimensions.

The factors were positioned in the dimensions based on the dimension(s) from which the factor *originated*, as well as the dimension that was *influenced* by the factor. For example, based on the positioning of the "attitude" factor, the researcher claimed that, in this context, the attitude factor originated from the social and technical dimension because it was a factor demonstrated by the nurse (social dimension) while the attitude was triggered by an EMR (technical dimension). Furthermore, the social

dimension was also influenced because the attitude of an individual nurse may influence the acceptance of other nurses of EMRs in the hospital. Thus, based on where a factor is positioned, the reader is able to understand the STS dimension from which the factor originates as well as the STS dimension influenced by the factor. The positioning of the factors is presented in Table 8-3. The researcher was of the opinion that this STS analysis contributed to better understanding of factors that influence EMR acceptance by nurses than would otherwise have been the case.

The presentation of the analysis is structured as follows:

- Factor

  Column 1 indicates the name of the factor.

- Origin of factor

  o Column 2 indicates the STS dimension(s) from which the factor originates (S and/or E and/or T).

  o Column 3 provides the motivation for the classification of the STS dimension(s) from which the factor originated. If the factor originated from two (2) or three (3) dimensions, the motivation in respect of these dimensions is provided.

- Dimension(s) influenced by factor

  o Column 4 indicates the STS dimension(s) that is/are influenced by the factor, as well as whether the factor has a negative influence (-) on the dimension, in which case it should be addressed, or a positive (+) influence, in which case it should be maintained, in order to improve acceptance of EMRs by nurses.

  o Column 5 provides the motivation for the classification of the STS dimension(s) influenced. If the factor influenced two (2) or three (3) dimensions, this is motivated. It should be noted that the motivation for the origin and influence of the factors was based strictly on the detailed descriptions of the factors as provided in Chapters 5 and 7.

<p style="text-align:center"><strong style="color:#4a80b4">Table 8-3: STS analysis</p>

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
1. Attitude	S	The positive attitude referred to in this factor is that a nurse who belongs within the social dimension. Thus, the attitude originates from the social dimension (nurse).	S+	This attitude may positively influence other stakeholders (other nurses) situated within the social dimension. Thus, it has a positive influence on the social dimension (the acceptance of other nurses).
	T	The positive attitude referred to in this factor is triggered by an EMR. In this context, it is demonstrated in the responsible use of an EMR. Thus, the attitude originates from the social dimension as well as the technical dimension since it has to be triggered by an EMR.		
2. Back-up	T	This factor refers to the backing up of the data and information that is contained in an EMR. A back up plan is of a technical nature as it is a tool that nurses are able to use to enable them to continue with their work. Thus, the backup originates from the technical dimension.	S+	Nurses – situated within the social dimension - are positively influenced by the existence of a backup plan. Thus, the availability of backup has a positive influence on the acceptance of EMRs by nurses.
3. Braveness	S	The fear of loss of control or the unknown, after the introduction of an EMR into the workspace of nurses, stems from the social dimension (nurses).	S-	A lack of braveness may negatively influence the social dimension because it has a negative influence on the acceptance of EMR by nurses.
	T	The fear referred to in this factor is triggered by a change in technology, an EMR, in the of the study. Thus, it originates from social dimension as well as the technical dimension.		

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
4. Certification	T	The certification refers to certification for computer literacy. Computer literacy involves the use of a technical skill or technical knowledge. Skills and knowledge belong within the technical dimension. Thus, the need for certification originates from the technical dimension.	S-	The unavailability of certification that may be used for future references and experience has a negative influence on the social dimension because it has a negative influence on the acceptance of EMR by nurses.
5. Change acceptance	T	The change itself, in this context, originates from the introduction of an EMR – the technical dimension.	S-	The introduction of an EMR introduces change into the nurses' workplace (the social dimension). This change may elicit a certain reaction from the nurses, i.e. resistance to EMRs. This negative reaction may influence whether or not nurses accept the EMR and, thus, it has a negative influence on the social dimension.
6. Communication	T	In the main communication is enhanced by an EMR and the fact that nurses are able to spend less time communicating is due to the EMR. Thus, this factor originates from the technical dimension.	S+	The communication, or enhanced communication, referred to in this factor, is between the health care providers. The health care providers, including the nurses, are internal stakeholders in the hospital context (i.e. the social dimension). Thus, the enhanced communication has a positive influence on the work of nurses and, ultimately, on their acceptance of EMRs.
			E+	The enhanced communication or diminished communication is about the patients who are stakeholders in the environmental dimension. In addition, an improvement in communication results in improved patient safety. Thus, communication may have a positive influence on the patients.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
7. Computer literacy	S	The computer literacy levels referred to in this factor are those of the nurses. Thus, the computer literacy factor originates from the social dimension.	S+-	Computer literacy, or a lack thereof, has an influence on the acceptance of EMRs by all nurses within the hospital.
	T	Computer literacy on the part of the nurses results from the interaction of the nurses with the computers. Thus, it originates from both the nurses as well as from the computers. Computer literacy is technical as it may be classified under tools, techniques and knowledge. This factor, thus, also originates from the technical dimension.	E+-	Nurses with low computer literacy levels tend to spend considerable time away from the patients. Thus, computer literacy, or a lack thereof, has an influence on the patients within the environment.
8. Cost	T	Money is a tool and, thus, it may be regarded as a technical component. The financial cost or reduced financial cost to which the nurses referred was the cost that they associated with the acquisition, operation and maintenance of EMRs. Thus, it originates from the technical dimension.	S+-	The nurses associated EMR expenditure with the shortage of other resources in the hospital. However, they also attributed the reduction in the costs related to the prevention of duplicated medical investigations in relation to patients to EMRs. Hence, cost has both a positive and negative influence on the acceptance of EMRs by nurses.
			E+	The financial cost of acquiring an EMR is of benefit to the patients in that EMRs assist with the prevention of duplicated medical investigations in relation to patients. Thus, the factor has a positive influence on the environmental dimension.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
9. Ease of use	T	The opinions referred to in this factor stem from interaction with the EMR and, thus, originate in the technical dimension.	S+-	Depending on the ease of use, this factor may have either a positive or a negative influence on the acceptance of EMRs by nurses (social dimension).
			E+	The fact that patients benefit from the ease of accessibility to their information, as well as the holistic patient care which is made possible, means that "ease of use" has a positive influence on the environmental dimension.
10. Error recovery	T	An EMR facilitates in the recovery of errors. Thus, error recovery originates from the technical dimension	S+-	The positive view, or lack thereof, of the ability to undo erroneous actions that may occur when nurses interact with an EMR stems from nurses (social dimension). This appraisal, or lack thereof, has an influence on the acceptance of EMRs by nurses.
11. Information accessibility	T	In this context, an EMR is the provider of access to information. Thus, the opinion of the nurses regarding information accessibility was informed by their interaction with an EMR (technical dimension).	S+	The positive view about the ability to access information stems from the nurses (social dimension). In turn, this appraisal has a positive influence on their acceptance of EMRs.
			E+	The accessibility of the information stored in the EMR constitutes a benefit to the patients in that it enables timely continuity of care. Thus, it has a positive influence on the environmental dimension.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
12. Information availability	T	In this context an EMR ensure the availability of information (technical dimension). Thus, the opinion of the nurses on the information availability was informed by their interaction with an EMR, as well as the actual availability of the information stored in the EMR.	S+	The positive view about the availability of information stems from the nurses (social dimension). This appraisal has a positive influence on the acceptance of EMRs by nurses.
			E+	The prevention of duplicate medical investigations in relation to patients is seen as a result of the availability of information. Thus, it has a positive influence on the environmental dimension.
13. Information protection	T	The opinion of nurses regarding the ability of an EMR to protect information was informed by their interaction with an EMR in respect of the protection of information afforded by the EMR. This relates to the technical dimension.	S+-	The ability, or lack thereof, of an EMR to protect information has an influence on the acceptance of EMRs by nurses (social dimension).
			E+-	Information protection, or the lack thereof, has an influence on the patients (environmental dimension).
14. IT support	T	IT support is of a technical nature as it requires technical skills and, thus, it originates from the technical dimension.	S-	The unavailability of IT support may negatively influence the acceptance of EMRs by nurses (social dimension).

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
15. Job facilitation	T	The nurses' opinions on this factor was triggered by their interacting with an EMR (technical dimension) and founded specifically on the fact that nurses find the EMR helpful in the execution of their nursing duties.	S+	The positive view that nurses hold regarding the ability of an EMR to facilitate in their job has a positive influence on their acceptance of EMRs (social dimension).
16. Legality	T	Assistance with legal issues in the form of the information available stems from the presence of an EMR. Hence, it originates from the technical dimension.	S+	Nurses (social dimension) may find an EMR useful during litigation. Thus, this helpfulness has a positive influence on their acceptance of EMRs.
			E+	Patients also benefit in that their information may be easily accessed during litigation. Thus, these benefits positively influence the environmental dimension.
17. Neatness	T	The neatness factor results from the EMR, even in comparison to a paper-based system. Thus, it originates from the technical dimension.	S+	The neatness referred to in this factor refers to the physical space in which the nurses work (social dimension). This neatness, is witnessed by the nurses and has a positive influence on their acceptance of EMRs.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	**Motivation**	**STS Dimension and Influence (+/-)**	**Motivation**
18. Nurse involvement	**S**	The need for involving nurses (social dimension) during the adoption and implementation phase arises from their experience in the workspace.	**S+-**	Nurse involvement, or the lack thereof, may influence the acceptance of EMRs by nurses (social dimension).
			T+	The involvement of nurses would have an impact on the EMR design both in the initial design stage, as well as in any changes made prior to implementation to ensure they were satisfied. Thus, nurse involvement has a positive influence on the technical dimension.
19. Information perceptions	**S**	The information perceptions expressed in this factor originate from the nurses and are related to matters in their workspace. Thus, they originate from the social dimension.	**S+-**	The various perceptions of the nurses may have either a positive or a negative influence on the acceptance of EMRs by nurses (social dimension).
	E	Such perceptions are partly triggered by the demands on the hospital environment. For example, based on their experience of patient traffic in the hospital nurses may perceive that the EMR will, or will not, have an impact on the reduction of crowding in the hospital.		
	T	In addition to elements stemming from the environment, these perceptions are triggered by an EMR (technical dimension).		

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	**Motivation**	**STS Dimension and Influence (+/-)**	**Motivation**
20. Optimistic championing nurses	**S**	The optimistic, championing nurses referred to in this factor originate from the social dimension.	**S+**	These nurses "champion" or promote an EMR to the other nurses within the hospital (i.e. social dimension). Thus, they may have a positive influence on the acceptance of EMRs by other nurses.
21. Reliance on Paper	**E**	The reliance on paper factor originates from the unavailability of an EMR during load shedding in the environment.	**S-**	Having to rely on a paper-based system during EMR downtime may negatively influence the acceptance of EMRs by nurses (social dimension).
22. Paper-based system experiences/perceptions	**T**	The experiences and/or perceptions referred to in this factor are triggered by a paper-based system (technical), as well as by comparing the paper-based system to an EMR.	**S+-**	The positive and negative experiences and/or perceptions of nurses (social dimension) in respect of a paper-based system may influence their acceptance of EMRs

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	**Motivation**	**STS Dimension and Influence (+/-)**	**Motivation**
23. Patient care	**S**	This factor is informed by the use or misuse of an EMR, including its equipment, by nurses that was made available to promote meaningful interaction between a nurse and an EMR. The quality of patient care is based on a partnership between the nurses and an EMR. Therefore, patient care originates partly from the social dimension.	**S+-**	The ability, or lack thereof, of an EMR to assist nurses to offer the quality patient care they wish to offer has an influence on their acceptance of EMRs.
	T	The advancement, or cessation, of patient care referred to in this factor is one of the results of the introduction of an EMR. Thus, it originates partly from the technical dimension.	**E+-**	Patients are influenced through improved or compromised care offered a result of the partnership between healthcare providers and an EMR.
24. Processing speed	**T**	This factor refers to the processing speed of an EMR and, hence, it originates from the technical dimension.	**S-**	The slowness of the processing speed of an EMR may have a negative influence on the ability of nurses (social dimension) to offer timely patient care, thus, negatively influencing on their acceptance of EMRs.
			E-	A delay in processing has a negative influence on the care received by the patients and, thus, it has a negative influence on the environmental dimension.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
25. Record accessibility	T	In this context an EMR provides access to patient records. Thus, the opinion of nurses regarding the accessibility of such records is informed by their interaction with an EMR, as well as the accessibility of the records stored in the EMR (technical dimension).	S+-	The positive view, or lack thereof, of nurses regarding the ability of an EMR in facilitating access to records influences nurses (social dimension).
			E+	The accessibility of records in the EMR provides a benefit to patients in the form of the timeous retrieval and location of their record. Thus the environmental dimension benefits from a positive influence.
26. Record accuracy	S	The accuracy of a record is partly dependent on the nurse as the nurse is responsible for capturing patient records. There are also other stakeholders within the hospital who may contribute to the inaccuracy of records, for example, doctors who issue vague prescriptions. Thus, this factor originates partly in the social dimension.	S+-	The ability, or lack thereof, of an EMR in terms of the accuracy of patient has an influence on the acceptance of EMRs by nurses (social dimension).
	T	The accuracy of patient records is partly dependent on the EMR because the EMR has the ability to contribute to the accuracy of a record by correcting spelling errors, etc. Thus, this factor is influenced by both the nurse as well as the EMR (technical dimension).	E+-	The accuracy, or inaccuracy of records, has an influence on patients as they may be wrongly identified or subject to medication administration errors.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
27. Record availability	T	In this context an EMR plays a significant role in the availability of patient records. Thus, the opinion of the nurses regarding record availability was informed by their interaction with the EMR, as well as the actual availability of the records stored in the EMR (technical dimension).	S+	Nurses are positively influenced by the availability of records. Thus record availability has a positive influence on the acceptance of EMRs by nurses.
			E+	The prevention of duplicate medical investigations in respect of patients may be a result of the availability of patient records. Thus, this factor has a positive influence on the environmental dimension.
28. Record completeness	S	The completeness of a record is partly dependent on the healthcare provider as the healthcare provider (social dimension) is responsible for capturing the records.	S+-	The ability, or lack thereof, of an EMR to assist with record completeness has an influence on the acceptance of EMRs by nurses (social dimension).
	T	The completeness of a record is partly dependent on the EMR because the system contributes to record completeness, or a lack thereof. Thus, record completeness stems from the nurse as well as the EMR (technical dimension).	E-	Patient care may be negatively affected by incomplete patient records. Thus, this factor has a negative influence on the environmental dimension.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
29. Record conservation	T	The EMR plays the major role in the conservation of records. Thus, record conservation originates from the technical dimension.	S+-	The views of the nurses (in the social dimension) about the ability of an EMR to conserve records have an influence on their acceptance of EMRs.
			E+-	The conservation of their records means that patients will benefit from continued care. Thus, record conservation has a positive influence on the environmental dimension. In instances where records are lost this has a negative influence on patient care.
30. Social influences	S	Social influence originates from colleagues within the hospital and includes champion nurses in the hospital; nurses working on the same shifts as well as decisions made by managers regarding other users of the system. All these stakeholders are in the hospital (i.e. the social dimension).	S+-	These social influences have an influence on the acceptance of EMRs by nurses (social dimension).
31. Standard system	E	This factor originates from or is informed by the lack of standardisation of an EMR in hospitals outside of the hospital in question.	S-	The lack of standardisation of EMRs may negatively influence the acceptance of EMRs by nurses (social dimension).
	T	The provision of a standard EMR system has to do with the technical dimension. Thus, the lack of such standardisation would represent a gap in the technical dimension.	E+	The standardisation of EMRs may positively influence patients through an improved quality of care.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
32. Support	S	The support referred to in this factor refers to the support given to nurses in the hospital by internal stakeholders such as colleagues and the EMR trainer. Thus, the support originates from the social dimension.	S+-	The support they receive, or the lack thereof, may influence the acceptance of EMRs by nurses (social dimension).
	E	Support in this context also refers to that which is provided by the EMR provider from outside of the hospital (environmental dimension).		
33. System accessibility	T	The inaccessibility of an EMR is dependent on the lack of availability of computer devices within the hospital; hence the factor originates from the technical dimension.	S-	Opinions on the impact of the inaccessibility of an EMR on the nurses' work flow have a negative influence on the acceptance of EMRs by nurses (social dimension).
			E-	System inaccessibility has an influence on patient care as it is may be said to impact negatively on bedside nursing.
34. System availability	E	Load shedding itself may take place within the environment and, thus, the resultant system inaccessibility originates from the environmental subsystem.	S-	The unavailability of an EMR impacts on the way in which nurses carry out their work and it may cause them frustration. Thus this has a negative influence on the acceptance of EMRs by nurses (social dimension).
			E-	The unavailability of a system due to load shedding has a negative influence on patient care (environmental dimension).

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	Motivation	STS Dimension and Influence (+/-)	Motivation
35. System functionality	T	The system functionality that nurses enjoy is a function of the EMR. Thus, this factor it originates from the technical dimension.	S+-	The system functionality included in, or excluded from, an EMR has an influence on the acceptance of EMRs by nurses (social dimension).
36. System updates	T	System updates are triggered by technical changes required in the EMR. These changes are implemented on the EMR itself and, thus, they originate from the technical dimension.	S-	System updates introduces change into the working environment of nurses and also requires in-service training. These aspects may have a negative influence on the acceptance of EMRs by nurses (social dimension).
37. Time	S	The amount of time spent using an EMR usage is partly dependant on the computer literacy levels of nurses as well as the way in which they choose to use the equipment available for the use of the EMR. Thus, time originates from the social dimension.	S+-	The amount of time spent using an EMR has an influence on the acceptance of EMRs by nurses (social dimension).
13.	E	Time also originates from the environment, for example, the time that nurses have available to interact with an EMR is dictated by the occurrence of load shedding in the environment.	E+-	Patient care is affected by the time spent away from them while the nurses interact with an EMR. Thus, time has an influence on the environmental dimension as well.

(Table 8-3 continued.)

Factor	Origin of Factor		Influence of Factor	
	STS Dimension	**Motivation**	**STS Dimension and Influence (+/-)**	**Motivation**
37. Time (continued)	T	The amount of time spent on the EMR also depends on the EMR. For example, the processing speed of an EMR has an influence on how long it takes nurses to complete their tasks. Furthermore, time is also influenced by the number of available computer devices. This factor, thus, also originates from the technical dimension.		
38. Training	T	Training falls within the technical dimension as it involves equipping the nurses with the techniques and knowledge required to use the tool in question (EMR). Thus, this factor originates from the technical dimension.	S+-	Training, or a lack thereof, has an influence on the acceptance of EMRs by nurses (social dimension).
			E-	A lack of proper training results in time being wasted that should be spent on patient care. Thus, training has a negative influence on patients (environmental dimension).
39. Workload reduction	T	An EMR is the tool the use of which results in reduced workloads, thus workload reduction originates from an EMR (technical dimension).	S+	The positive view from nurses (social dimension) regarding reduced workload has a positive influence on their acceptance of EMRs.

In order to meet the objectives of this study, this STS analysis, as well as the preceding analysis of the acceptance stages, was incorporated into a framework. The resulting framework is presented in the next section.

8.4. Framework to understand the acceptance of EMRs by nurses

As noted in Chapter 1, section 1.4, this research study and, specifically, this chapter aimed to answer the RQ – How may the factors influencing the acceptance of EMRs be analysed such that their influence on such acceptance by nurses becomes clear? – in order to, ultimately, contribute to answering the main RQ, namely, "What are the constituents of a framework to better understand the factors that influence EMR acceptance by nurses?. The analysis of the EMR acceptance stages in section 8.2, as well as the STS analysis in section 8.3, both acted as building blocks in the creation of a framework for the better understanding of the acceptance of EMRs by nurses, thus answering the RQs cited above.

It was anticipated that the framework would contribute to a better understanding of the factors that influence EMR acceptance by nurses in the following aspects ways:

- It starts by highlighting the factors that influence the acceptance of EMRs by nurses, as discussed in Chapters 5 and 7.
- It indicates whether each factor has a negative influence (-) on acceptance, in which case it should be addressed, or a positive influence (+), in which case it should be maintained in order to offer guidance on how the factor should be dealt with.
- It indicates at which stage (adoption, implementation, and/or use) each factor has an influence on acceptance in order to guide efforts to address or maintain the aspects related to the factor.
- It indicates the STS dimension from which the factor originates as well as the STS dimension influenced by the factor in order to guide efforts to address or maintain aspects related to the factor.

Table 8-4 below presents the framework for the acceptance of EMRs by nurses

Table 8-4: Framework to understand the acceptance of EMRs by nurses

Factor	EMR Acceptance Stage						STS Originating Dimension			STS Influenced Dimension		
	Adoption (A)		Implementation (I)		Use (U)		Social (S)	Environmental (E)	Technical (T)	Social (S)	Environmental (E)	Technical (T)
	Influence (+)	Influence (-)	Influence (+)	Influence (-)	Influence (+)	Influence (-)						
1. Attitude					+		S		T	S+		
2. Back-up					+				T	S+		
3. Braveness		-		-		-	S		T	S-		
4. Certification						-			T	S-		
5. Change acceptance		-		-		-			T	S-		
6. Communication					+				T	S+	E+	
7. Computer literacy	+		+		+	-	S		T	S+-	E+-	
8. Cost		-		-	+	-			T	S+-	E+	
9. Ease of use					+	-			T	S+-	E+	
10. Error recovery					+	-			T	S+-		
11. Information accessibility					+				T	S+	E+	
12. Information availability					+				T	S+	E+	
13. Information protection					+	-			T	S+-	E+-	
14. IT support				-		-			T	S-		
15. Job facilitation					+				T	S+		
16. Legality					+				T	S+	E+	
17. Neatness					+				T	S+		
18. Nurse involvement	+	-	+	-	+	-	S			S+-		T+
19. Nurse perceptions	+	-	+	-	+	-	S	E	T	S+-		
20. Optimistic championing nurses					+		S			S+		
21. Paper-based system experiences/perceptions					+	-			T	S+-		
22. Patient care					+	-	S		T	S+-	E+-	
23. Processing speed						-			T	S-	E-	

Factor	EMR Acceptance Stage						STS Originating Dimension			STS Influenced Dimension		
	Adoption (A)		Implementation (I)		Use (U)		Social (S)	Environmental (E)	Technical (T)	Social (S)	Environmental (E)	Technical (T)
	Influence (+)	Influence (-)	Influence (+)	Influence (-)	Influence (+)	Influence (-)						
24. Record accessibility					+	-			T	S+-	E+	
25. Record accuracy					+	-	S		T	S+-	E+-	
26. Record availability					+				T	S+	E+	
27. Record completeness					+	-	S		T	S+-	E-	
28. Record conservation					+	-			T	S+-	E+-	
29. Reliance on paper						-		E		S-		
30. Social influences	+	-	+	-	+	-	S			S+-		
31. Standard system					+	-		E	T	S-	E+	
32. Support	+	-	+	-	+	-	S	E		S+-		
33. System accessibility						-			T	S-	E-	
34. System availability						-		E		S-	E-	
35. System functionality					+	-			T	S+-		
36. System updates						-			T	S-		
37. Time					+	-	S	E	T	S+-	E+-	
38. Training					+	-			T	S+-	E-	
39. Workload reduction					+				T	S+		
	5	7	5	8	30	28	12	6	33	S+ 11 S- 10 S+- 18	E+ 9 E- 5 E+- 6	T+ 1
										39	20	1

The interpretation of the results and findings is discussed in the next section.

8.5. Discussion

This section presents the interpretation of the results and findings based on the framework presented in the preceding section.

As may be noted from the number of factors included in the framework (39), there are various factors that influence the acceptance of EMRs by nurses. Knowledge of the stage (Adoption, implementation, and/or use) at which each factor originates has an influence on acceptance of the EMR; the STS dimension from which each factor originates as well as the STS dimension influenced by the factor contributes to a better understanding of these factors. In turn, this helps to guide the efforts made to address or maintain aspects related to each factor. A pictorial summary of the resulting framework is presented in Figure 8-1 below.
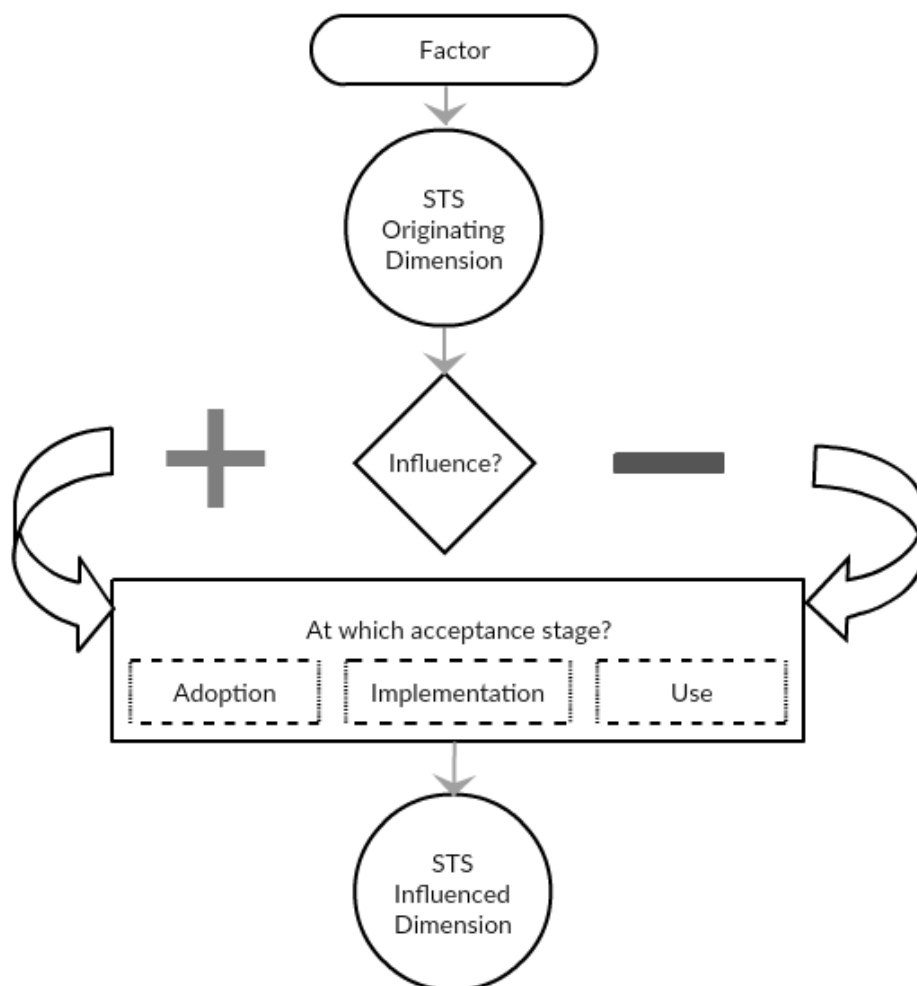
Figure 8-1: Summary of the constituents of the framework

8.5.1. Acceptance stages

As may be observed in the framework, all of the factors (39) had an influence on the use stage while nine factors had an influence on the implementation stage and eight factors had an influence on the adoption stage. As each factor was categorised according to the acceptance stages based on its description, the resulting distribution of the factors could be seen as an indication that factors influencing the use stage play a significant role in the successful use of EMRs in hospitals. However, this does not negate the importance of the adoption and implementation stages as some of the aspects that arise during the use stage are rooted in decisions that were made during the adoption and/or implementation stages. In fact, Cucciniello, Lapsley, Nasi, and Pagliari (2015) support this interpretation further by stating that socio-technical approaches recognise the central role that may be played by users "throughout the development process", including the implementation of an EMR.

Of the 39 factors that had an influence on EMR use, the influence of 30 was a positive influence and that of 28 negative. It is important to note that efforts to contribute to a better understanding of the acceptance of EMRs by nurses should focus not only on addressing problematic factors but also on addressing the problematic factors as well as maintaining the positive aspects relating to factors. This statement is further supported by Liu and Cheng (2015), who they assert that the acceptance of the information technology used within the healthcare context is influenced "by both positive and negative factors". Thus, it makes sense to focus on both types of influences. For example, a study conducted by Al-Jumeily, Hussain, and Crate (2014) makes it clear that attitudes towards technology may be either positive or negative. The study states that an "easy and understandable technological language" results in a positive attitude while a "difficult and complicated technological language" results in a negative attitude:

"When technological language is easy and understandable, the use of technology will be easy and flexible, which elicits positive attitudes towards that technology. The converse is also true, as difficult and complicated technological language generates negative attitudes towards technology" (p. 2).

It is, therefore, crucial to highlight that, although in this research study may identified a particular factor as having a negative and/or positive influence on the acceptance of EMRs by nurses, in other settings each factor has the potential to have a negative and/or positive influence on the acceptance of EMRs by nurses. A negative influence (-) should be addressed and a positive influence (+) should be maintained.

8.5.2. Socio-technical Systems Theory

STS dimensions of origin

Figure 8-2 below presents a summary of the distribution of factors across the STS dimensions from which they originated.

Note:

- For the purpose of fitting all the factors in each dimension, certain dimensions appear smaller than others.
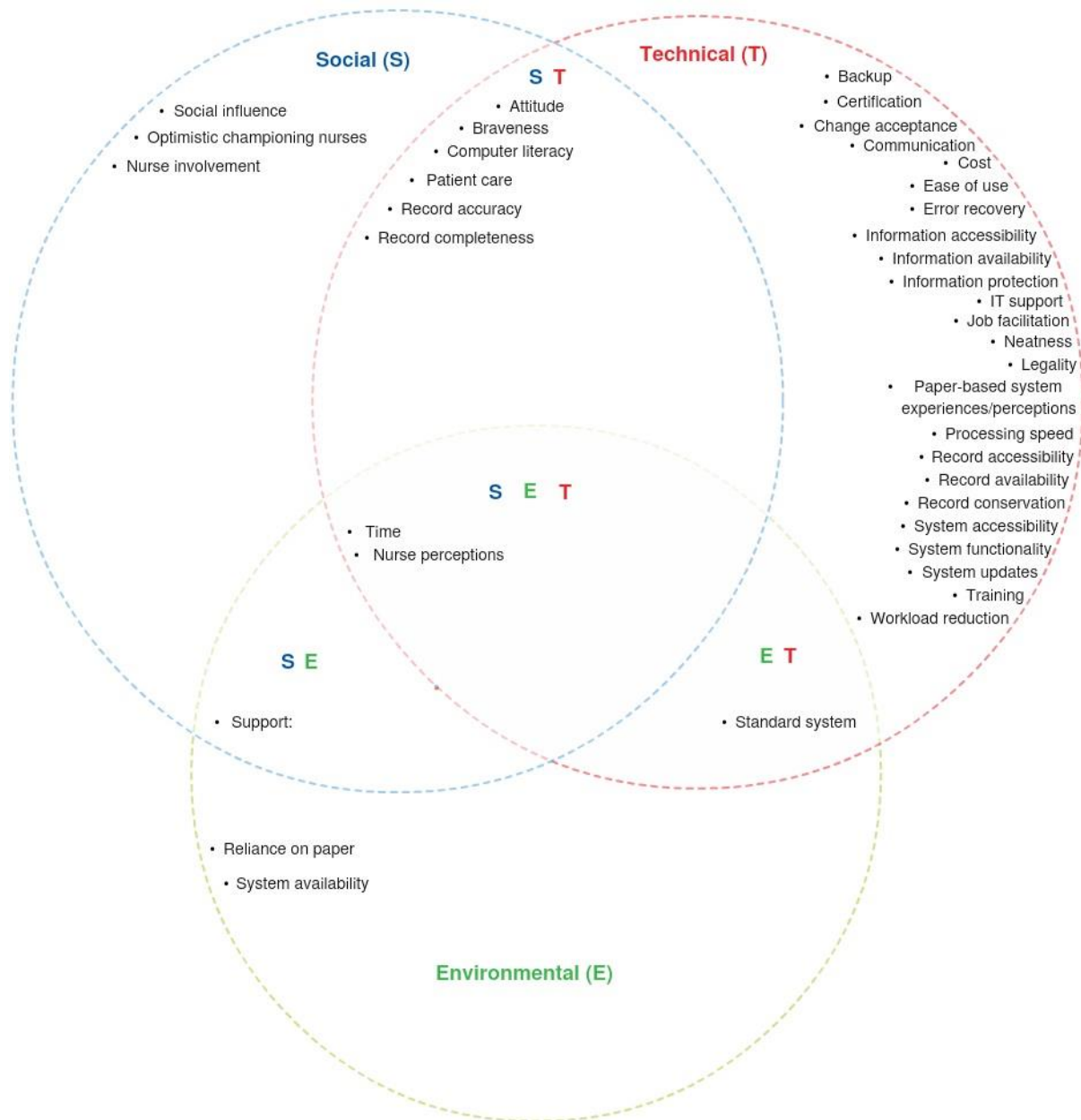
Figure 8-2: Distribution of factors across STS dimensions of origin

As may be noted, of the 39 factors, the majority (24) originated only from the technical dimension, nine were within intersections but also involved the technical dimension, while only six factors did not originate from the technical dimension. This may be seen as testimony to the fact that the introduction of an EMR (technology) into a hospital introduces a number of aspects that must be considered in order encourage the acceptance of the EMR.

Furthermore, it has been established that, although "human" factors play a significant role in the acceptance and successful implementation of information systems within a

hospital, "technological" factors also play an important role (Farzandipur, Jeddi, & Azimi, 2016). However, a study conducted by Lakbala, Lakbala, and Inaloo (2014) concluded that the most important factors that affect the acceptance of EMRs include both technical and social factors.

This study found that the second largest number of factors originated in the social dimension, with 15 factors originating from this dimension. This included nine factors in intersections. This finding hints at the fact that the use and, ultimately, the acceptance of EMRs imposes certain requirements on nurses, including the right correct; bravery and a certain level of computer literacy level. In addition, these nurses are role-players in the provision of patient care and also contribute towards the accuracy and the completeness of patient records. According to McCarthy, Eastman, and Garets (2013), users are required to change their behaviour; to learn the necessary skills; and to acquire knowledge about the functions they need to perform when interacting with an EMR. Furthermore, Park, Pine, and Chen (2013) assert that EMRs require users to conduct their documentation in a "precise, clear, and complete manner" (p. 61). Thus, one may conclude that that nurses are required a role if the implementation of the EMRs is to be successful.

Six factors originated in the environmental dimension, including four in intersections. This implied that there are aspects to the environmental dimension that contribute to the acceptance of EMRs by nurses.

STS influenced dimensions

Figure 8-3 below presents the distribution of factors across the STS dimensions influenced.

Note:
- For the purpose of fitting all the factors into each dimension, certain dimensions appear smaller than others.
- In each dimension influenced, the factors are ordered in terms of influence (i.e. negative influence; positive and negative influence; and positive influence) and ascending alphabetical order.

Social (S)   **Technical (T)**

• Braveness (-)
• Optimistic championing nurses (+)
• Certification (-)
• Workload reduction (+)
• Change acceptance (-)   **S T**
• IT support (-)
• System updates (-)   • Nurse involvement
• Error recovery (+-)   (S+- & T+)
• Nurse perceptions (+-)
• Paper-based system experiences/perceptions (+-)
• Reliance on paper (-)
• Social influence (+-)   **S E**
• Support (+-)
• System functionality (+-)   • Processing speed (S- & E-)
• Attitude (+)   • System accessibility (S- & E-)
• Backup (+)   • System availability (S- & E-)   **S E T**
• Job facilitation (+)   • Standard system (S- & E+)
• Neatness (+)   • Record completeness (S+- & E-)
• Training (S+- & E-)
• Computer literacy (S+- & E+-)
• Information protection (S+- & E+-)
• Patient care (S+- & E+-)
• Record accuracy (S+- & E+-)   **E T**
• Record conservation (S+- & E+-)
• Time (S+- & E+-)
• Cost (S+- & E+)
• Ease of use (S+- & E+)
• Record accessibility (S+- & E+)   • Information availability
• Communication (S+ & E+)   (S+ & E+)
• Information accessibility   • Legality (S+ & E+)
(S+ & E+)   • Record availability
(S+ & E+)

Environmental (E)

Figure 8-3: Distribution of factors across STS dimensions influenced

As highlighted in section 8.5.2, six out of the 39 factors only that influenced the acceptance of EMRs by nurses did not originate from the technical dimension. However, it is evident in Figure 8-3 that, although this was the case, the technical dimension had no influence except that which it receives from the nurse involvement factor in the ST intersection. On the other hand, the dimension that was influenced the most, the social dimension, had 18 factors that originated only from it as well as 21 factors within intersections.

Furthermore, based on the frequency of the social dimension in the distribution, it appeared to be the dimension most influenced by the factors affecting the EMR acceptance by nurses that emerged from this research study. This may, however, be due to the fact that the factors were collected from nurses who are stakeholders within the social dimension. However, this finding was significant in view of the assertion of

Petter, DeLone, and McLean (2013) that the users of a system determine its success. Thus, the influences on the nurses may result in the failure or success of the EMR.

It was noted that there were no factors that originated purely from the environmental dimension. However, the study found that, in the social-environmental intersection, the environmental dimension was influenced by 20 factors. This may be interpreted to mean that the majority of the struggles and successes that affect nursing professionals have an impact on patients, within the environmental dimension. Hughes (2008) affirms that the social working space of nurses during the provision of care has an influence on both the quality of care and patient safety, Hughes (2008) emphasises the complexity of the interactions that take place within the said social working spaces that involve "clinicians, technology, policies, procedures, and resources" (p. 1). However, according to Kieft, De Brouwer, Francke, and Delnoij (2014), the influence may also the other way around, with Kieft et al. (2014) arguing that the positive experiences experienced by patients during the provision of care also have a positive influence on the nurses and their social work space.

8.5.3. Applicability and application of framework

This framework is applicable to the following stakeholders:

- Nursing institutions (such as universities and colleges)
- Hospitals
- Government agencies (within healthcare)
- IT vendors.

Given what is described as a "contemporary and rapidly evolving ICT environment", Verdegem and De Marez (2011) highlight the importance of a comprehensive framework that focuses on understanding technology acceptance. The framework formulated in this chapter may be said to be comprehensive in that it was formulated using the holistic STS theory as a lens. This theory discourages organisations from limiting their focus to the technology itself (EMR), rather encouraging a comprehensive view that includes the human centric approach.

It is anticipated that this framework will be beneficial to the stakeholders identified above as it will assist them to understand the factors that affect the acceptance of

EMRs by nurses. In addition, the stakeholders should have a better understanding of these factors due to the fact that not only will they understand that a factor has the potential to exert both a negative and positive influence on the acceptance of EMRs by nurses. Furthermore, the framework reveals the acceptance stage(s) which each factor influences, the STS dimension(s) from which it originates as well as the STS dimension(s) which the factor influences.
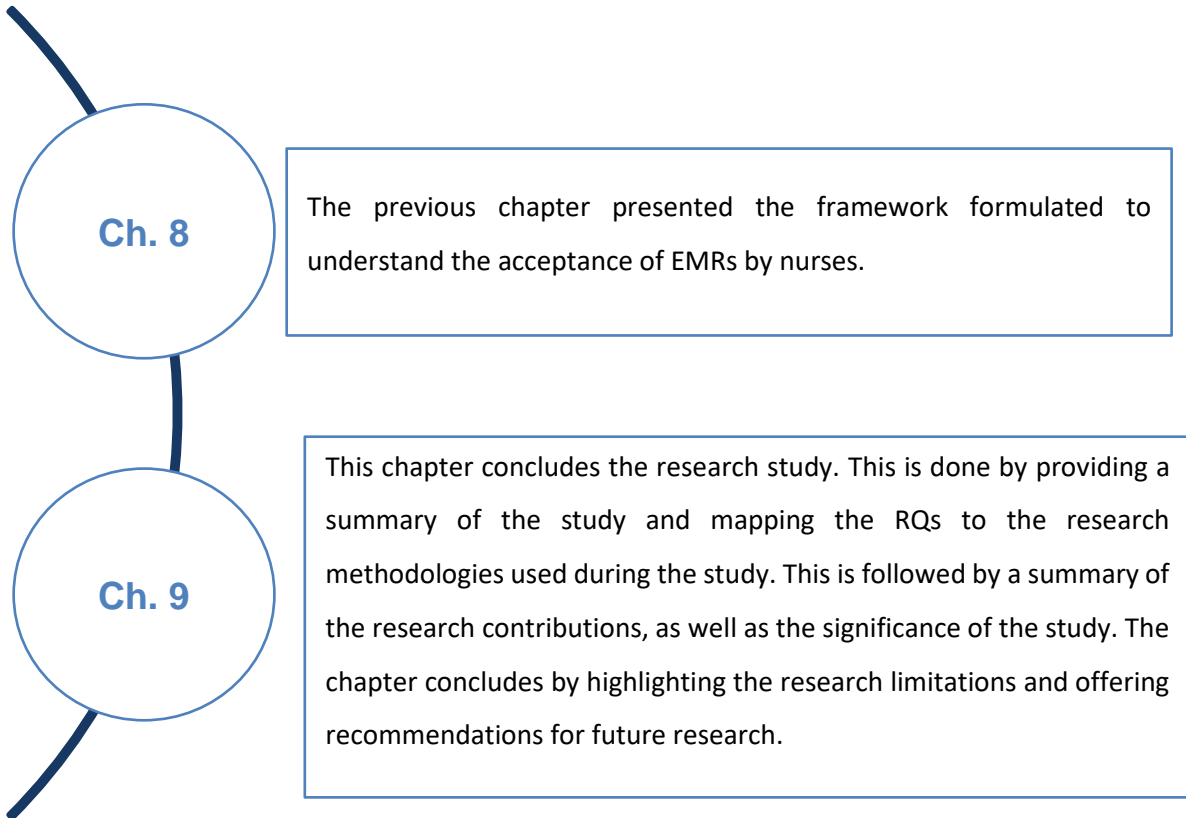
8.6. Conclusion

Chapters 5 and 7 presented the factors that influence the acceptance of EMRs by nurses. The purpose of this chapter was to answer the RQ ("How can these factors be analysed such that their influence on EMR acceptance by nurses becomes clear?"). This question was answered through the formulation of a comprehensive framework to understand the acceptance of EMRs by nurses. The chapter started by presenting the factors that influence the acceptance of EMRs by nurses, as derived from both the literature review that was conducted (Chapter 5) and the data that was collected from the nurses via questionnaires during a case study (Chapter 7). This was followed by an analysis of the acceptance stages (adoption, implementation and/or use) which each factor influences. Furthermore, the analysis of the acceptance stages, as well as the STS dimensions, were conducted in order to guide efforts to address and/or maintain the aspects related to each factor. The chapter was concluded with a discussion of the interpretation of the framework.

CHAPTER 9

9. CONCLUSION

Ch. 8	The previous chapter presented the framework formulated to understand the acceptance of EMRs by nurses.
Ch. 9	This chapter concludes the research study. This is done by providing a summary of the study and mapping the RQs to the research methodologies used during the study. This is followed by a summary of the research contributions, as well as the significance of the study. The chapter concludes by highlighting the research limitations and offering recommendations for future research.

9.1. Introduction

This chapter provides a summary of the research undertaken in this study. This discussion includes the significance of the study, the study's limitations and recommendations for future research.

9.2. Research summary

As highlighted in Chapter 1, section 1.2, the main problem addressed in this study was the inadequate understanding of the factors that influence the acceptance of EMRs by nurses. Thus, the main purpose of this study was to create a framework that would contribute to better understanding of the factors that influence such acceptance. In order to achieve this, a literature review and a case study were conducted to ascertain the factors that influence the acceptance of EMRs by nurses. The factors were then combined into a framework to contribute to a better understanding of how the factors influence EMR acceptance by nurses. This was done in alignment with the following sub-RQs:

- RQ 1: What is the role of nurses in recordkeeping in hospital settings?
- RQ 2: Which factors influence the acceptance of EMRs by nurses?
- RQ 3: How can these factors be analysed such that their influence on EMR acceptance by nurses becomes clear?
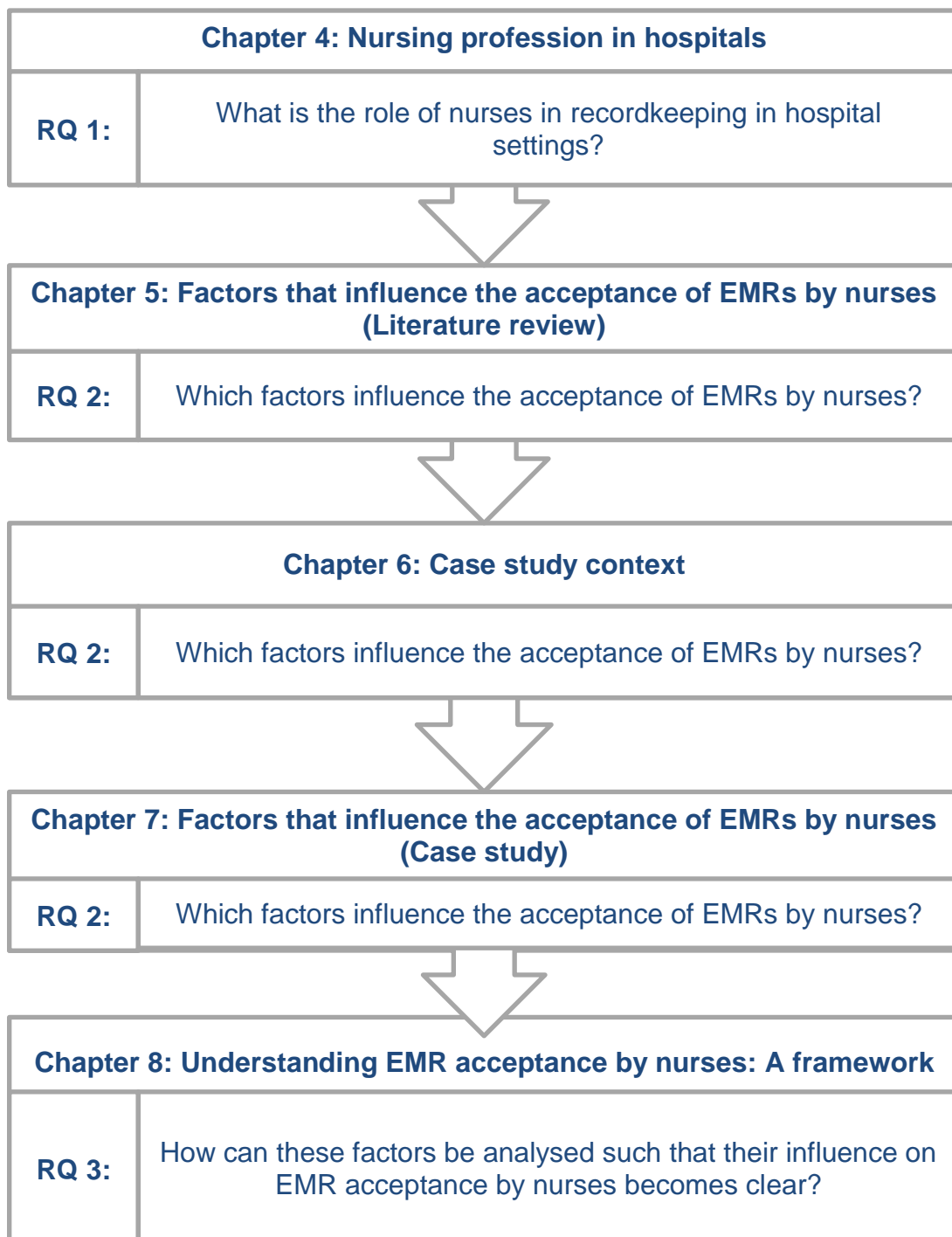
Chapter 2 discussed the theoretical framework that influenced the execution of this research study. The discussion involved explaining the influence of the disciplinary orientation as well as the existing literature reviewed in the study

Chapter 3 reported on the research methodology used to answer these RQs. The chapter included a discussion that encompassed the research paradigm, including the research approach and research process used in the study. In addition, the chapter discussed research methods used, the theoretical orientation of the study as well as the issue of research ethics.

The following section maps Chapters 4 to 8 to the RQs cited.

9.3. Mapping research questions to research chapters

The RQs were mapped to the chapters as follows (see Figure 9-1):

Chapter 4: Nursing profession in hospitals	
RQ 1:	What is the role of nurses in recordkeeping in hospital settings?

⬇

Chapter 5: Factors that influence the acceptance of EMRs by nurses (Literature review)	
RQ 2:	Which factors influence the acceptance of EMRs by nurses?

⬇

Chapter 6: Case study context	
RQ 2:	Which factors influence the acceptance of EMRs by nurses?

⬇

Chapter 7: Factors that influence the acceptance of EMRs by nurses (Case study)	
RQ 2:	Which factors influence the acceptance of EMRs by nurses?

⬇

Chapter 8: Understanding EMR acceptance by nurses: A framework	
RQ 3:	How can these factors be analysed such that their influence on EMR acceptance by nurses becomes clear?

Figure 9-1: Mapping research objectives to research chapters

As may be observed, Chapter 4 addressed RQ 1. The chapter discussed the role of nurses in recordkeeping within a hospital setting. It was established that nurses are idely regarded as the key providers of healthcare services to patients (Lee, 2004). Furthermore, it was established that the success of hospitals is "highly dependent" on nurses (Matsebula & Willie, 2007). However, in addition to the "usual view" of nurses as healthcare providers who perform bedside nursing, nurses also play an important

role in structuring and organising holistic care by carrying out the information retrieval, documentation and communication activities in respect of patient records (Ngin, 1994). This chapter presented the literature review that was conducted in order to answer RQ 1.

Using within-method methodological triangulation, RQ 2 was answered in Chapter 5 (literature review) and Chapters 6 and 7 (a case study). Chapter 5 began with a discussion on the formulation of factors that influence the acceptance of EMRs by nurses. Nineteen (19) factors were identified through the literature review.

Chapter 6 provided context to the case study and also discussed the data that emerged from the case study in order to illustrate the environment in which nurses work.

The factors that resulted from the case study and reported on in Chapter 6 were presented in Chapter 7 together with the results of the member checking. There were thirty-one (31) factors in all.

RQ 2 was addressed through a combination of a literature review, case study, content analysis, argumentation and member checking.

Chapter 8 addressed RQ 3 through argumentation. In Chapter 2, section 2.2.3, it was argued that STS theory was suitable as a theoretical lens through which to view and gain a better understanding of the factors that influence the acceptance of EMRs by nurses. Hence, Chapter 8 argued the nature of the influence of the factors (whether positive or negative influence) and the placing of the factors within the relevant STS dimensions and then presented the resulting framework.

9.4. Summary of contributions

As noted, this research study was aimed at contributing to a better understanding of factors that influence the acceptance of EMRs by nurses. This aim was met through the following contributions made by the study:

- A contribution towards the understanding of the role of nurses in recordkeeping in hospital settings by means of a literature review;

- A contribution towards the identification of thirty-nine (39) factors that influence the acceptance of EMRs by nurses by means of both a literature review and a case study;

- A contribution towards assisting nursing institutions (such as universities and colleges); hospitals; government agencies (within healthcare); and IT vendors to understand the factors which affect the acceptance of EMRs by nurses; and

- A Contribution towards guiding a better understanding of EMR acceptance by nurses through the factors identified by means of a framework. The framework incorporated the factors that influence the acceptance of EMRs by nurses and also provided an indication of the type of influence that each factor has on acceptance (positive or negative). Furthermore, the framework guided future efforts to be made to address and/or maintain aspects related to each factor by conducting an analysis of the acceptance stages (Adoption, implementation, and/or use). An STS analysis identified the STS dimension(s) from which each factor originated as well as the STS dimension(s) on which each factor has an influence

The following section discusses the significance of this research study.

9.5.   Research significance

It is hoped that this study may positively contribute to the healthcare sector globally, as the factors identified provided an indication of the aspects that hospitals considering EMR adoption should address in order to create a conducive environment for EMR acceptance by nurses within hospitals. Furthermore, as established by Kushniruk et al. (2014), as well as Delaney and D'Agostino (2015), the implementation of HISs within the health context results in various changes within an organisation, such as changes in the organisational structures, organisational environment, job descriptions and relations between patients, healthcare providers and healthcare provider teams. In terms of these diverse changes, the use of STS theory as a theoretical lens should contribute to providing a context for the factors that influence the acceptance of EMRs by nurses. In addition, the resulting framework provides guidance in terms of the factors which should be addressed during the various EMR acceptance stages, namely, adoption, implementation and use. Furthermore, the framework provides guidance on the STS dimensions which should be addressed to improve EMR acceptance in terms of both the origin of the aspects related to each factor, as well as

the influence of such aspects. It is important to note that the factors that make up the framework were validated by the nurses with the fact that the degree of agreement by the nurses ranged from 73.1 % to 90% per factor, thus supporting their validity of each factor.

9.6.   Trustworthiness of the study

As noted in Chapter 3, section 3.2.1, this research study was situated within the constructivist paradigm. Guba and Lincoln (2001) maintain that a trustworthiness criteria may be used to evaluate the trustworthiness of a constructivist study. Multiple researchers refer to this criteria when considering the trustworthiness of a research study (Elo et al., 2014). According to Guba and Lincoln (2001), the four constituents of the trustworthiness criteria include the following:

- Credibility

    Credibility is concerned with the value, believability and truthfulness of the findings based on the data collected from the participants (Cohen & Crabtree, 2006; Houghton et al., 2013; Anney, 2014). Credibility may be compared to the criterion of internal validity used in quantitative research.

- Transferability

    Transferability is concerned with the applicability of the findings in other contexts (Cohen & Crabtree, 2006; Anney, 2014). The transferability of research findings is established by the recipient(s) of the findings and not by the researcher who conducted the initial research study that produced the findings. Thus, the saoid recipient evaluates the findings to determine how viable they are for localisation rather than generalisation. Transferability may be compared to the criterion of external validity used in quantitative research.

- Dependability

    Dependability is concerned with consistency and repeatability of the findings of the study (Cohen & Crabtree, 2006). Credibility impacts positively on the dependability of research findings. Dependability may be compared to the criterion of reliability used in quantitative research.

- Confirmability

    Confirmability is concerned with the "degree of neutrality" of the findings. In other words, the extent to which the study is based on the data collected from the participants and not founded upon the bias of the researcher(s) (Cohen & Crabtree,

2006). Confirmability may be compared to the criterion of objectivity used in quantitative research. Similar processes are used to establish the dependability and confirmability of research findings (Houghton et al., 2013). Houghton et al., 2013 highlight that, in order to achieve dependability and confirmability, it is not necessary that the readers share the interpretations of the researcher. However, they should understand how the interpretations were derived by the researcher.

Table 9-1 below argues the trustworthiness of this research study. This table presents the descriptions of the abovementioned constituents of the trustworthiness criteria, as described by Guba and Lincoln (2001). Each description is accompanied by motivation as to how it was met in this research study.

Table 9-1: Trustworthiness criteria

Criteria	Motivation
Credibility	In order to promote the credibility of the study direct quotes were included, where relevant, as well as sources from the literature to support the research findings. This provided the researcher with an opportunity to show that the findings were a reflection of the experiences of the study participants. Furthermore, to ensure that multiple views and experiences had been sought, the researcher used within-method methodological triangulation by gathering views and experiences by means of both a literature review and a case study. The credibility of the findings was further achieved through member checking. During member checking the researcher presented the nurse participants with the research findings and sought to determine their degree of agreement (which ranged from 73.1 % to 90% per factor) with such findings.
Transferability	In order to assist the reader of the findings to evaluate the findings for the purposes of localisation, the researcher has described all research aspects in detail. This includes the research process followed, methods used, as well as the coding process that was followed to derive the codes and, ultimately, the factors. The resulting framework that was based on the factors that had emerged was discussed in detail. In addition, the relevant descriptive details about the natural setting (hospital) in which the research was conducted are provided. Finally, the findings of the study are supported by the findings of studies in other settings. Thus, sufficient information has been supplied to assist the reader to determine the transferability of the results.
Dependability	The fact that the researcher outlined and explained the research process used as well as the way in which the findings were derived meant that those seeking to test the research findings for repeatability would be able to do so.

Criteria	Motivation
Confirmability	The use of quotes supporting the research findings meant that the reader would be able to determine the degree of neutrality of the researcher. Linking all the findings to raw data eliminates bias on the part of the researcher as the researcher's conclusions are based solely on the data. Member checking further contributed to the confirmability of the study.

9.7.   Research limitations

The case study was conducted in a public hospital in South Africa as the site for the data collection. Thus, apart from the factors that emerged from the literature review of South African and international literature, the factors gathered in the research field were limited to the data collected from the participants who worked in a public sector hospital in South Africa. Owing to the qualitative nature of the study, the results may not be generalisable although they may be transferrable to other, similar healthcare settings.

9.8.   Future research recommendations.

Future research could extend this study by focusing on factors influencing the acceptance of EMRs by other user groups such as physicians. During this study the physicians were cited as a user group which had been resistant to EMRs. In certain instances, the resistance had been sufficiently strong to result in their opting out of using EMRs altogether. In addition, this study could be extended to investigate the factors that influence the acceptance of EMRs in other settings such as the private sector, clinics and primary healthcare facilities. This could be done either with nurses as the study participants or else the scope of the study could include all the user groups of EMRs within the relevant healthcare facility.

9.9.   Conclusion

This chapter concluded the research by discussing the significance and trustworthiness of the study, as well as the study's limitations and offering recommendations for future research.

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