HEALTH INFORMATION TECHNOLOGIES FOR IMPROVED CONTINUITY OF CARE: A SOUTH AFRICAN PERSPECTIVE

by

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Declaration

I, Nicolette Mostert-Phipps (9913042), hereby declare that the thesis for Philosophiae Doctor in Information Technology is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

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Nicolette Mostert-Phipps

Abstract

The fragmented nature of modern health care provision makes it increasingly difficult to achieve continuity of care. This is equally true in the context of the South African healthcare landscape. This results in a strong emphasis on the informational dimension of continuity of care which highlights the importance of the continuity of medical records. Paper-based methods of record keeping are inadequate to support informational continuity of care which leads to an increased interest in electronic methods of record keeping through the adoption of various Health Information Technologies (HITs).

This research project investigates the role that various HITs such as Personal Health Records (PHRs), Electronic Medical Records (EMRs), and Health Information Exchanges (HIEs) can play in improving informational continuity of care resulting in the development of a standards-based technological model for the South African healthcare sector. This technological model employs appropriate HITs to address the problem of informational continuity of care in the South African healthcare landscape

The benefits that are possible through the adoption of the proposed technological model can only be realized if the proposed HITs are used in a meaningful manner once adopted and implemented. The Delphi method is employed to identify factors that need to be addressed to encourage the adoption and meaningful use of such HITs in the South African healthcare landscape.

Lastly, guidelines are formulated to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve the continuity of care. The guidelines address both the technological requirements on a high level, as well as the factors that need to be addressed to encourage the adoption and meaningful use of the technological components suggested. These guidelines will play a significant role in raising awareness of the factors that need to be addressed to create an environment conducive to the adoption and meaningful use of appropriate HITs in order to improve the continuity of care in the South African healthcare landscape.

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It seems to me shallow and arrogant for any man in these times to claim he is completely self-made, that he owes all his success to his own unaided efforts. Many hands and hearts and minds generally contribute to anyone's notable achievements.
- Walt Disney

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Contents

CHAPTER 6: Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the South African Healthcare Landscape to Improve Continuity of Care

List of Tables

List of Figures

List of Acronyms Used

CEO	Chief Executive Officer
CPOE	Computerized Provider Order Entry
DHIS	District Health Information System
DOH	Department of Health
EHR	Electronic Health Record
EMR	Electronic Medical Record
GDP	Gross Domestic Product
GUI	Graphical User Interface
HIE	Health Information Exchange
HIS	Health Information System
HIT	Health Information Technology
HITECH Act	Health Information Technology Economic and Clinical Health Act
ICT	Information and Communication Technology
IMIA	International Medical Informatics Association
IQR	Interquartile Range
IT	Information Technology
NHI	National Health Insurance
NHIS/SA	National Health Information System of South Africa
NMMU	Nelson Mandela Metropolitan University
NPfIT	National Programme for IT
HPCSA	Health Professions Council of South Africa
PDU	Professional Development Unit
PHC	Primary Healthcare
PHR	Personal Health Records
ROI	Return on Investment
SAHIA	South African Health Informatics Association
SLA	Service Level Agreement
STS	Socio-technical Systems
UK	United Kingdom
UPS	Uninterrupted Power Supply
USA	United States of America
WHO	World Health Organization

List of Publications Stemming from this Research

The following publications stemmed directly from the research conducted in order to complete this thesis:

- Mostert-Phipps, N., Pottas, D., Korpela, M. *Improving Continuity of Care Through the Use of Electronic Records: A South African Perspective*. (Accepted for publication in the South African Family Practice journal).
- Mostert-Phipps, N., Pottas, D., Korpela, M. (2010). A Socio-Technical Approach to Continuity of Care and Electronic Records in the South African Context. In: Safran C, Reti S, Marin HF, eds. *Medinfo 2010 - Proceedings of the 13th World Congress on Medical Informatics*, Cape Town, 12-15 September 2010, p. 406-410. Amsterdam: IOS Press, 2010. Studies in Health Technology and Informatics 160.
- Mostert-Phipps, N. & Pottas, D. (2007). *Stakeholder Perceptions Towards Establishing a Health Information Network in South Africa*. INDEHELA Conference, Cape Town, 25-26 June 2007.

The following paper has also been submitted to the International Journal of Medical Informatics for review:

- Mostert-Phipps, N., Pottas, D., & Korpela, M. *A South African Perspective on Factors that Impact the Adoption and Meaningful Use of Health Information Technologies.*

List of Appendices

(All Appendices are available electronically on the CD distributed with this thesis.)

A   Delphi Round 1 E-Mail and Questionnaire

B   Delphi Round 1 Completed Questionnaires

C   Delphi Round 1 Phase 1 Analysis

D   Delphi Round 1 Phase 2 Analysis

E   Delphi Round 2 E-Mail and Questionnaire

F   Delphi Round 2 Completed Questionnaires

G   Delphi Round 2 Results

H   Delphi Round 3 E-Mail, Information Sheet and Questionnaire

I   Delphi Round 3 Completed Questionnaires

J   Delphi Round 3 Results

K   Delphi Round 3 Results with Motivations

L   Report on Final Delphi Results Sent to Participants

M   Publications Stemming from this Research

CHAPTER 1

INTRODUCTION

This chapter serves as an introduction to the remainder of this thesis. The reader is introduced to the problem domain and the problem addressed by this research project is stated. In addition, the objectives of this study are established.

In the next chapter the research design as well as the research methods that were employed to complete this research project will be described.

1.1 Background

In earlier years patients typically had a single healthcare provider who took care of all their healthcare needs from birth to death. Currently, this is rarely the case with patient care typically distributed amongst various healthcare providers (Freeman, Olesen, & Hjortdahl, 2003; Sturmberg, 2000). The fragmented nature of modern healthcare provision is due to greater specialization, which means that during his lifetime a patient will receive care from a myriad of healthcare providers, including general practitioners, specialists, pharmacists, dieticians, occupational therapists, social workers, and so forth (Anderson, 2009). This has an impact on the continuity of care that a patient receives.

Continuity of care can be defined as the degree to which distinct healthcare encounters are experienced as coherent, connected, and consistent with the medical needs of the patient (Saltman, Rico, & Boerma, 2006). There are various factors that contribute to continuity of care, including adequate access to care for patients, good communication between the patient and healthcare provider, and good coordination and flow of information between various healthcare providers to maintain consistency (Heller & Solomon, 2005). In a fragmented healthcare system, as described above, healthcare providers have to rely on coordination and teamwork to achieve continuity of care (Saltman et al., 2006). Heller and Soloman (2005) describe two significant aspects relating to the continuity of care viewed from the perspective of the healthcare provider. The first is a need to have sufficient information and knowledge about the patient available at the point of care to provide suitable care to the patient. Secondly, it is important to the healthcare provider that the care provided to the patient will be recognized and pursued by other healthcare providers involved in the care of the patient.

The need for an adequate flow of patient information between various healthcare providers in a fragmented healthcare system is thus becoming increasingly important for effective medical decision-making (President's Information Technology Advisory Committee, 2004; Shortliffe, 1999;

Waegemann, 2003). A patient possesses multiple medical records, one for every healthcare provider that he has ever visited and this implies that paper-based methods of record keeping may contribute greatly to the discontinuity of care among healthcare providers (Dick, Steen, & Detmer, 1997). A lack of adequate patient information at the point of care has a direct impact on patient outcomes and can lead to medical errors, increased morbidity and mortality (Pirnejad, Bal, Stoop, & Berg, 2007). Communication and the transfer of information between healthcare providers are essential to improved continuity of care and as a result, paper-based methods of record keeping are widely considered to be inadequate in an industry that is continually growing in both complexity and sophistication (Dick et al., 1997; Hillestad, Bigelow, Bower, Girosi, Meili, Scoville, & Taylor, 2005; Pillai, Thomas, & Garg, 2004; President's Information Technology Advisory Committee, 2004; Reid, Compton, Grossman, & Fanjiang, 2005). Relevant patient information is as necessary for the effective provision of health care as are trained healthcare staff, adequate buildings, and the required medical equipment (Sheaff & Peel, 1995).

Some of the problems with paper-based patient records that directly influence patients and their healthcare providers are (Dick et al., 1997; Tang, La Rosa, & Gorden, 1999):

- The impact of missing, illegible, or inaccurate data on patient safety.
- The lack of easily shareable information between healthcare providers.
- Missing information that often leads to unnecessary costs, for example when it becomes necessary to duplicate tests because the previous results are not available to the present healthcare provider during consultation.
- Challenges related to continuity of care when a healthcare provider does not have readily available relevant information about the medical history of the patient.

One factor that has a direct impact on whether the patient receives high-quality healthcare is the availability of accurate, accessible, and shareable

health information (Dick et al., 1997; Tang, 2003). Since a paper-based patient record cannot satisfy these requirements, the focus has shifted to technology-based solutions.

Various technological advances have had a significant impact on the healthcare sector in the past decades, however, the focus has primarily been on financial and administrative applications (Chaudhry, Wang, Wu, Maglione, Mojica, Roth, Morton, & Shekelle, 2006; Herbst, Littlejohns, Rawlinson, Collinson, & Wyatt, 1999; Reid et al., 2005). The maintenance of medical records has failed to evolve sufficiently to meet the needs of healthcare providers (Dick et al., 1997; President's Information Technology Advisory Committee, 2004).

Health information technologies (HITs) employ hardware and software to process, store, retrieve, and share health information, data, and knowledge for communication and decision making in the healthcare sector (Thompson & Brailer, 2004; Cegarra-Navarro, Wensley, & Sánchez-Polo, 2011; Cohen & Stussman, 2010). HITs have the potential to support inter-organizational communications and address the limitations of paper-based systems (Cegarra-Navarro et al., 2011; Chaudhry et al., 2006). It is stated that the increased use of HITs is the only way that healthcare costs can be controlled in the long term without decreasing the quality of health care delivered to patients (President's Information Technology Advisory Committee, 2004; Westbrook, Braithwaite, Gibson, Paoloni, Callen, Georgiou, Creswick, & Robertson, 2009).

Health information technologies lead to the realization of the following benefits (Bowens, Frye, & Jones, 2010; Carr-Bains & De Lusignan, 2003; Dick et al., 1997; Harrison, Koppel, & Bar-Lev, 2007[b]; Miller & Sim, 2004; Ondo, Wagner, & Gale, 2002; President's Information Technology Advisory Committee, 2004; Tang et al., 1999; Westbrook et al., 2009):
- The quality of and access to the health data of the patient is improved, which in turn leads to more appropriate care being delivered to the patient.

- Information about the patient can be integrated over time and between various healthcare providers.

- It is easier to ensure the security and confidentiality of medical records.

- It is easier to control and audit access to records.

- Team-based care is more efficiently supported.

- Decision support tools are available to healthcare providers.

- The integration of best practices in routine care is improved.

- Unnecessary duplication of tests are avoided, which reduces costs.

- Medical knowledge is made more accessible for use by healthcare providers as they make treatment decisions.

- There is a reduction in medical errors.

Results of recent studies have shown that the adoption of HITs can lead to greater efficiency, better access to quality healthcare, patient safety, and improved health.

It is important to note that these benefits can only be realized if HITs are used in a meaningful manner once adopted and implemented (Simon, Kaushal, Cleary, Jenter, Volk, Orav, Burdick, Poon, & Bates, 2007). In the United States of America (USA) under the Health Information Technology Economic and Clinical Health Act (or HITECH Act) an incentive programme has been established to reward health providers for the adoption and meaningful use of HITs such as electronic records (Blumenthal, 2010; Blumenthal & Tavenner, 2010; Bowens et al., 2010; Hendricks, 2011). Healthcare providers must firstly adopt HITs that comply with certain certification criteria and demonstrate their meaningful use to qualify for the financial incentives (Blumenthal, 2009). The meaningful use is measured by specific criteria, for example providing proof that 40% of permissible prescriptions are transmitted electronically using certified HIT technology, amongst others (Crosson, Etz, Wu, Straus, Eisenman, & Bell, 2011). In order to further encourage adoption and meaningful use, the HITECH Act provides for financial penalties where adoption and meaningful use cannot be demonstrated (Blumenthal, 2009; Hendricks, 2011). In the context of the USA's healthcare system, the term

meaningful use has a specific meaning with certain evaluation criteria associated with its use. It should be noted that in the context of this thesis, the term *meaningful use* is viewed from a different perspective. This term, when used in this thesis, is in the context of its general meaning, that HITs are used in a manner that employs the most meaningful functionality offered by the specific HIT to share health information, data, and knowledge for communication and decision making in the healthcare sector.

1.2 Problem Statement

It becomes clear from the background discussion that paper-based methods of record keeping in the healthcare sector constitute a barrier to continuity of care. This is the case in the context of the South African healthcare sector as well (Cochrane & Ramokolo, 2009). In South Africa, much of the healthcare sector still relies on paper-based medical records, leading to extreme data fragmentation (Accenture, 2006).

The problem addressed in this research project thus relates to a lack of adoption and meaningful use of HITs resulting in a discontinuity of care between the healthcare providers in South Africa.

1.3 Research Questions

The background discussion and problem statement raise the primary research question that this research project will answer which is:
How can the lack of adoption and meaningful use of HITs in the South African healthcare landscape be addressed to improve continuity of care?

The following sub-questions will be answered to answer the primary research question:

1. What is the impact of the South African healthcare landscape on continuity of care?
2. Which HITs would be appropriate to address the improvement of continuity of care in the South African healthcare landscape?

3. Which factors need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape?

4. How can the answers of the above questions be incorporated to formulate guidelines to improve continuity of care through the adoption and meaningful use of HITs in the South African healthcare landscape?

1.4 Research Objectives

The adoption of HITs is an uncertain and challenging task in the context of the healthcare system of a country and thus calls for a sensitive matching of local needs to available technologies and resources (Fraser, Biondich, Moodley, Choi, Mamlin, & Szolovits, 2005). Any solution to this problem must be sensitive to the South African healthcare landscape and employ appropriate HITs that will aid in improving continuity of care in this particular context. The main objective of this research project is to formulate guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

The following sub-objectives need to be addressed to reach the main objective:

1. Firstly, it is necessary to understand the nature of the South African healthcare landscape and its impact on continuity of care in this country.

2. Secondly, it is necessary to investigate the HITs that would be appropriate to address the improvement of continuity of care in the context of the South African healthcare landscape.

3. Once these HITs are identified an appropriate technological model should be developed to address the improvement of continuity of care in South Africa through the adoption of these HITs.

4. It is necessary to identify the factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape.

5. Finally, it is necessary to formulate the guidelines that create an environment that is generally conducive to the adoption and meaningful

use of HITs in the South African healthcare landscape to improve continuity of care.

1.5 Chapter Outline

The main objective and sub-objectives of this research project are addressed in the following chapters:

Chapter 1 introduced the reader to the problem area and specified the research questions and objectives that will be addressed by this research project.

Chapter 2 will specify the research design in terms of the research approach and philosophy of the researcher, and the research process that was followed. In addition, the research methods and ethical considerations are described.

In **Chapter 3** the concept of continuity of care is be described in more detail, as well as the impact of different healthcare systems on continuity of care. Finally, the South African healthcare landscape is explored in terms of its impact on continuity of care.

Chapter 4 explores the problems associated with paper-based medical records in the context of continuity of care and introduces HITs that could aid in addressing these problems. In this chapter, a technological model is introduced that employs appropriate HITs to address the problem of continuity of care in the South African healthcare landscape.

In order to ensure the success of the technological model proposed in Chapter 4, it would be imperative that the proposed HITs are adopted and used in a meaningful manner. **Chapter 5** will describe factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape.

In **Chapter 6** the main objective of this project is addressed through the formulation of guidelines to create an environment that is generally conducive to the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

Chapter 7 concludes this research project.

CHAPTER 2

RESEARCH METHODOLOGY

The previous chapter established the necessity of the research documented in this thesis and introduced the reader to the problem domain and objectives of this research project.

In this chapter the research design and the research methods that were employed to complete this research project are described. The research design is described in terms of the research approach and philosophy of the researcher. The research methods discussed include a literature review, argumentation and the Delphi method. Ethical considerations are also discussed.

The next chapter will describe various aspects related to the concept of continuity of care in more detail, and the South African healthcare landscape and its impact on continuity of care in this country.

2.1 Introduction

The way in which research is conducted may be regarded in terms of the research design and research methods employed in the pursuit of accomplishing the research objectives and answering the research questions, as outlined in Chapter 1. In this chapter, the research methodology is described in terms of the research philosophy, research design, and the research process followed to answer the research questions. Additionally, the research methods employed to gather and analyse the data necessary to complete this study are described.

2.2 Research Design

The research design is described in terms of the research philosophy, approach and process.

2.2.1 Research Philosophy and Approach

The research philosophy of a researcher (referred to as the research paradigm) influences the way that knowledge is studied and interpreted (Creswell, 2009; Mackenzie & Knipe, 2006; Roux & Barry, 2009). The social constructivist research philosophy guided the researcher during the completion of this research project. Researchers guided by social constructivist philosophical worldviews tend to rely on the views of participants about the situation being studied to inductively develop a theory or pattern of meanings (Mackenzie & Knipe, 2006). The researcher attempts to understand the subjective patterns of meaning constructed by participants (Roux & Barry, 2009). The researcher addresses the process of interaction among the participants to enable them to construct the meaning of a situation and for the researcher to interpret the meaning that the participants have about the situation being studied (Creswell, 2009).

Social constructivist researchers are most likely to rely on qualitative or mixed data collection and analysis methods (Mackenzie & Knipe, 2006). When mixed methods are employed, quantitative data is utilized to support or expand upon qualitative data. The research approach followed in this study is

mainly qualitative with elements of mixed methods, as is discussed in Section 2.3.3. Qualitative research allows the researcher to explore and understand the meaning that individuals or groups attribute to a problem. A researcher conducting qualitative research follows an inductive style that allows the researcher to make interpretations about the meaning of data (Creswell, 2009).

In the next section the research process that was followed is discussed in more detail.

2.2.2 Research Process

Figure 2.1 summarizes the research process followed to complete this research study.

Once the research questions and objectives were identified, a literature review was conducted to determine the impact of the South African healthcare landscape on continuity of care. Next, a literature review identified the HITs that could be employed to improve continuity of care in the South African healthcare landscape. Through argumentation, a technological model that employs these HITs and that is cognisant of the South African healthcare landscape and its impact on continuity of care was developed.

The Delphi method was employed to gather the ideas, views, and opinions of knowledgeable participants to identify factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape. To realise the final objective of this study, argumentation was again employed to formulate the guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.
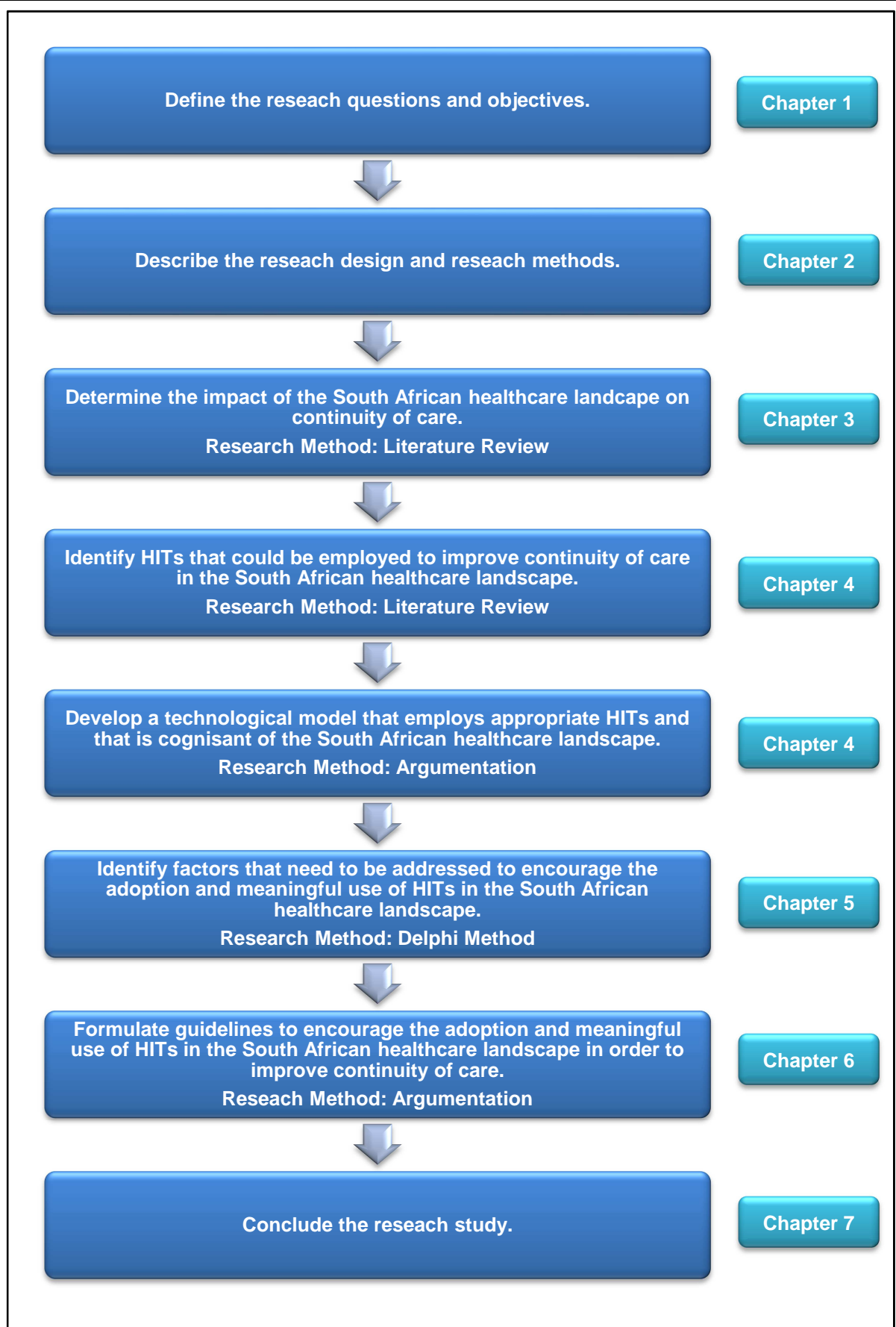
Figure 2.1: Research process.

This discussion has revealed that the following research methods are employed:

- Literature review.
- Argumentation.
- Delphi method.

These research methods are described in more detail in the following section.

2.3 Research Methods

2.3.1 Literature Review

An extensive literature review forms the basis of this study. Literature from current, authoritative publications in the relevant fields were reviewed to gather the information necessary to realize the relevant research objectives, as indicated in Figure 2.1.

2.3.2 Argumentation

Argumentation involves collating and analysing information whilst identifying conflicts and supporting or negating information while attempting to understand problems and reach conclusions. According to Besnard and Hunter (2008) an argument is "*a set of assumptions (i.e., information from which conclusions can be drawn), together with a conclusion that can be obtained by one or more reasoning steps (i.e., steps of deduction). The assumptions used are called the **support** (or, equivalently, the premises) of the argument, and its conclusion (singled out from many possible ones) is called the **claim** (or, equivalently, the consequent or the conclusion) of the argument. The support of an argument provides the reason (or, equivalently, justification) for the claim of the argument.*"

Argumentation is used during the development of the technological model and the formulation of the guidelines, as indicted in Figure 2.1.

2.3.3 Delphi Method

The Delphi method is a very versatile technique that has evolved over time with many variations in the way it can be conducted (Mullen, 2003). This makes it difficult to find a universal definition of the Delphi method. In their seminal book on the Delphi method, Linstone and Turoff recognised this and offered the following broad description of the Delphi method (1975):

"Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem."

The Delphi method allows for the progressive refinement of a diverse panel of participants' ideas, views, and opinions through controlled feedback during multiple rounds of questionnaires. These participants are selected for their knowledge of the topic under investigation and typically remain anonymous (De Loe, 1995; Mash, Couper, & Hugo, 2006; Mullen, 2003; Yousuf, 2007).

There are two main variations of the Delphi method, namely the conventional Delphi and the policy Delphi. The difference between the two is that the conventional Delphi is used as a *decision-making* tool with a very strong focus on reaching consensus amongst the participants, whilst the policy Delphi is seen as a *decision-analysis, or decision-facilitation,* tool where there is not such a strong focus on reaching consensus (Ali, 2005; Critcher & Gladstone, 1998; De Loe, 1995; De Meyrick, 2003; Klenk & Hickey, 2011; Loo, 2002; O'Loughlin & Kelly, 2004). The policy Delphi employs both quantitative and qualitative elements to investigate differing positions and explore consensus and the reasons for any lack of consensus (Collins, Hanlon, More, Wall, & Duggan, 2009; Cramer, Klasser, Epstein, & Sheps, 2008; Hahn, Toumey, Rayens, & McCoy, 1999; O'Loughlin & Kelly, 2004; Thollier & Jansen, 2008; Yousuf, 2007). The use of the conventional Delphi method was ruled out for this study since identifying the factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape does not require the narrowing typical of conventional Delphi studies. It seemed more appropriate to employ a method that would identify a

broad range of factors, rather than aim for consensus on one or a few factors given the broad range of factors that could impact on the adoption and meaningful use of HITs. The policy variation of the Delphi method was thus employed in this research study. All further discussions in this thesis relating to the Delphi method relates to the policy variation of this method.

The basic steps that should be followed while conducting a Delphi study include the following (Keeney, Hasson, & McKenna, 2001; Yousuf, 2007):

1) Elicit the ideas, views, and opinions on the issue under investigation from the panel through an open-ended questionnaire.

2) Collate the responses received and distribute these to the participants in the form of a second questionnaire, asking them to rate each item according to a rating scale that is appropriate for the problem under investigation.

3) Analyse these ratings and distribute the results to the participants in the third questionnaire, indicating the ratings, and any consensus found. Ask the participants to revise their ratings, or discuss their reasons for not agreeing with the majority of other participants.

Each round thus builds on the results of the previous round. This iterative process can continue for several rounds, but the payoff typically tends to diminish quickly after the third round (Yousuf, 2007). The type of data collected during the first round is typically qualitative with the data collected during the subsequent rounds being quantitative in nature.

The Delphi method is an example of a sequential explorative mixed methods research design. Mixed methods research involves the collection and analysis of qualitative and quantitative data in a manner that complements each other (Johnson & Onwuegbuzie, 2004). Data may be collected concurrently or sequentially and should involve the integration of the data at one or more stages in the research process (National Institute of Health, 2011; Tashakkori & Teddlie, 2003). In terms of the Delphi method that is followed in this study, an initial round of qualitative data collection and analysis will be followed by

subsequent rounds of quantitative data collection and analysis, as described above. This implies that the mixed methods research design that is followed is sequential exploratory in nature.

A sequential exploratory mixed method research design involves the collection and analysis of qualitative data which is followed by a phase of quantitative data collection and analysis (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007; Hanson, Creswell, Plano Clark, Petska, & Creswell, 2005). The initial qualitative data collection and analysis is often used to design a quantitative data collection instrument with the purpose of gaining a better understanding of the research problem under investigation (National Institute of Health, 2011). The purpose is to answer a research question by collecting and analysing two types of data (qualitative and quantitative) and finally drawing inferences based on both types of data (Creswell, 2003; Driscoll et al., 2007; Tashakkori & Teddlie, 2003).

In terms of the discussion above, the research process that is followed to identify the factors that need to be addressed to encourage the adoption and meaningful use of HITs is illustrated in Figure 2.2.
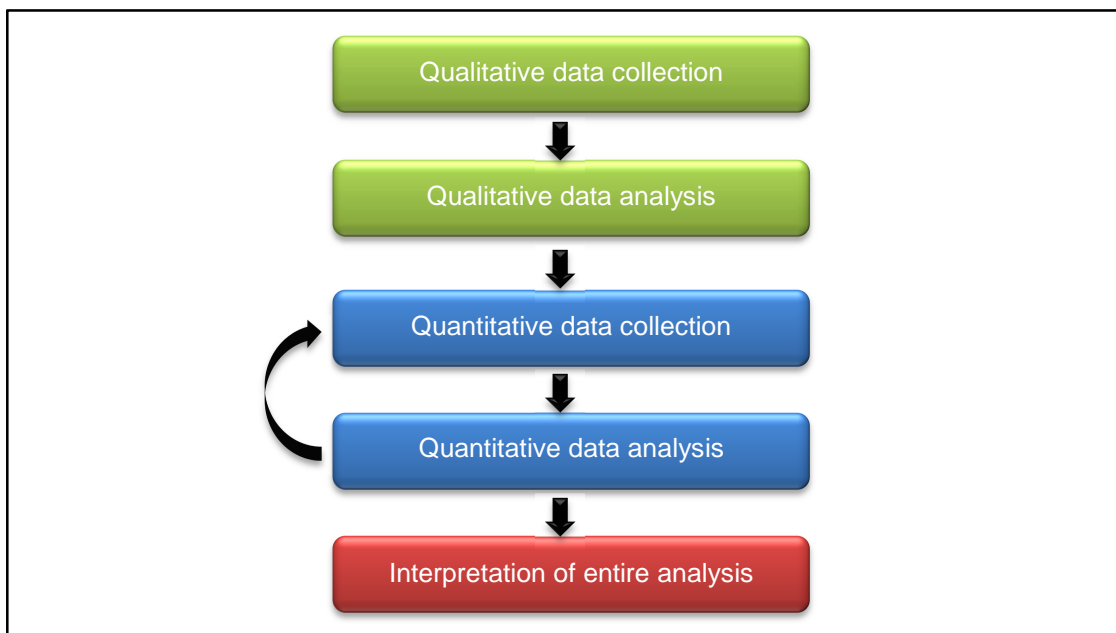
Figure 2.2: Research process followed to identify factors that need to be addressed to encourage the adoption of HITs.

In the following sections the following aspects related to the Delphi method are explored:

- The Delphi panel.
- The Delphi rounds.
- Strengths of the Delphi method.
- Weaknesses of the Delphi method.
- The reliability and validity of Delphi results.
- The appropriateness of the Delphi method for this study.

2.3.3.1 Delphi Panel

Although the term *expert* is often used to describe the participants in a Delphi study, the use of the term has been criticised since it is very difficult to define what an *expert* is (Beaumont, 2003; Hasson, Keeney, & McKenna, 2000; Mullen, 2003). The focus is rather on ensuring that the participants are well informed about the area under investigation and are able to provide relevant input based on their knowledge and experience (Beaumont, 2003; De Meyrick, 2003; Mullen, 2003; O'Loughlin & Kelly, 2004). Heterogeneous panels, consisting of panel members with significantly different perspectives on the area under investigation, are more likely to produce a higher proportion of high quality ideas, views, and opinions than homogeneous groups (Powell, 2003; Steinert, 2009). The nature of the problem under investigation has an influence on the selection of the panel. A purposive sampling approach should be followed and the panel members should be selected based on their useful knowledge and experience in the area under investigation (Glass, Scott, & Price, 2009; Mash et al., 2006).

It should be noted that regarding the size of the panel that a Delphi study should not be confused with conventional surveys where a statistically large number of participants are required for validity (Barry, Steyn, & Brent, 2008; Loo, 2002; Mullen, 2003; Okoli & Pawlowski, 2004). While it is clear that the Delphi panel size does not

depend on statistical power, there are no clear guidelines on the size of the panel, as can be gathered from the recommendations of these various authors:

- Barry et al. (2008): 7 to 30 participants.
- Okoli & Pawlowski (2004): 10 to 18 participants.
- De Loe (1995): 10 to 50 participants.
- Liu & Yuan (2009): at least 15 participants.
- Loo (2002): 15 to 30 participants.
- Critcher & Gladstone (1998): 20 to 30 participants.

Another defining feature of the Delphi panel is its anonymity, and this is seen as one of its strengths (Mullen, 2003). Panel members take part in the Delphi study anonymously and this removes the impact and effects of status, powerful personalities, and group pressure (Keeney et al., 2001; Mullen, 2003).

2.3.3.2 Delphi Rounds

Multiple rounds with feedback to the participants between rounds and the opportunity to revise their earlier responses are some of the defining features of the Delphi method. Whilst a minimum of two rounds are required to achieve this, the number of rounds required beyond the initial two depends entirely on the design of the study. It is recommended to not have more than three rounds in order to balance time, cost, and possible participant fatigue (Hasson et al., 2000; Linstone & Turoff, 1975; Mullen, 2003; Powell, 2003). It is very difficult to retain a high response rate if there are many rounds (De Meyrick, 2003; Keeney et al., 2001; Loo, 2002).

The first round questionnaire is typically open-ended in order to elicit the varying ideas, views, and opinions of the participants about the problem under investigation (Cramer et al., 2008; Keeney et al., 2001; Powell, 2003). Whilst some Delphi studies employ a more structured questionnaire in the first round, the open-ended nature of the first

questionnaire is seen as a criterion for judging whether a study is well conducted or not (Mullen, 2003). By allowing participants to make their contributions during the first round, without a seed list, assists in the development of a set of ideas, views, and opinions that are more representative of those of the participants. The use of structured questionnaires during the first round implies there is the risk that the items offered may be open to researcher bias which could influence the results of the study (Hasson et al., 2000; Keeney et al., 2001).

The qualitative data received during the first round is analysed and collated to identify unique ideas, views, and opinions. This is done by grouping responses that address similar aspects together to work towards providing one universal description of the aspect (Hasson et al., 2000; Powell, 2003). Some studies suggest omitting aspects that occur infrequently in the responses received from participants. However, this goes against the basic principles of the Delphi method since participants should judge the relevance of the aspects identified, not the researcher (Hasson et al., 2000). These aspects identified through the analysis of the first round responses form the basis of the second round questionnaire (O'Loughlin & Kelly, 2004; Powell, 2003).

The second and subsequent round questionnaires are more structured and seek quantification of the first round findings, usually through rating techniques (Hasson et al., 2000; Powell, 2003). During the second round, participants are asked to rate the items that were generated during the first round according to a rating scale appropriate for the purpose of the problem under investigation.

There are various methods used to determine whether consensus was reached during the second round on the rating of an aspect. One of the methods involves the median and inter-quartile range (IQR) to summarize the point of consensus and the amount of spread in the distribution. The median indicates the point of consensus and the IQR

is used to assess the extent of agreement between participants, with a lower value indicating a higher degree of consensus. De Loe (1995) uses an example to illustrate how these statistics are unsatisfactory to determine the response of the panel when using a policy Delphi approach.

In Table 2.1 the IQR works well for examples 1 to 3, but the median score is not such an accurate indication of the ratings provided by participants for all three of these examples. While the median perfectly describes the rating of the panel in example 1, it is less adequate in example 2, and completely inadequate in example 3. Example 4 is a case of almost complete ambiguity, whilst in examples 5 and 6 there is moderate and weak support towards a specific rating. Despite these rating distributions the IQR is the same for all three examples. Hsu and Sandford (2007) note that the median can be misleading in instances where there is polarization or clustering around two or more ratings (Hsu & Sandford, 2007).

EXAMPLE NO	RATING				MEDIAN	IQR
	1	2	3	4		
1	20	0	0	0	1.0	1
2	10	0	10	0	2.0	2
3	10	0	0	10	2.5	3
4	5	4	6	4	3.0	2
5	10	3	4	5	2.0	2
6	8	8	6	1	2.0	2

Table 2.1: Example rating distributions (De Loe, 1995).

De Loe (1995) proposed the following described system to overcome the problems illustrated in Table 2.1.

The system devised by De Loe (1995) classified each set of ratings according to the degree of consensus reached, and the level of support for a particular rating. The polarity of responses is calculated to determine whether the group was polarized (for example, half

supporting and half opposing a specific rating). De Loe's expression of polarity, degree of consensus, and level of support is provided in Chapter 5 and applied to analyse the results of the Delphi study from the second round onwards.

The results of this analysis are reported back to the participants in each subsequent round. From the third round onwards, participants would typically receive a personalized questionnaire according to their responses in the preceding round. The questionnaire would indicate the analysis of the responses of the panel, as described above, and the response of the individual. This allows the participant to compare and reflect on his response in light of the panel response and adjust his response if desired. Participants are typically asked to provide motivations for their deviation from the majority response if they do not wish to adjust their response according to the majority response (Forrest, 2009; O'Loughlin & Kelly, 2004). When these motivations are read together with the analysis of the ratings, it allows for the identification of patterns and trends (De Loe, 1995).

2.3.3.3 Strengths of the Delphi Method

The strengths of the Delphi method can be summarized as follows (De Loe, 1995; De Meyrick, 2003; Forrest, 2009; Keeney et al., 2001; Klenk & Hickey, 2011; O'Loughlin & Kelly, 2004; Yousuf, 2007):

▪ *Economy and efficiency*. The Delphi is executed as a series of questionnaires which can be mailed, or e-mailed, to participants. This eliminates the need to get participants together in the same location and allows the interaction of a diverse group of participants, making a Delphi study relatively inexpensive.

▪ *Effectiveness*. Participants have time to consider their contributions, unlike face-to-face focus groups, interviews, or workshops. Participants have the opportunity to revise their responses in the context of responses from other participants, if desired. This results in a substantial number of ideas, views, and

opinions expressed by participants, and a thoroughly considered analysis of these contributions.

- *Flexibility*. The design of the questionnaires can be implemented in a wide variety of ways, depending on the problem under investigation.
- *Anonymity*. The anonymity of participants prevents the dominance of any individual in the group and promotes free expression of ideas, views, and opinions.

2.3.3.4 Weaknesses of the Delphi Method

The Delphi method is not without weaknesses like all other research methods. These weaknesses are summarized below (De Loe, 1995; Forrest, 2009; Klenk & Hickey, 2011; Yousuf, 2007):

- *Time taken to complete*. Multi-round Delphi studies takes a long time to complete, especially when taking into account the time needed to analyse the results after each round and personalizing the questionnaires from the third round onwards.
- *High attrition rate*. The rounds of the Delphi study may span over many weeks or months, which can lead to a high drop-out rate during the process. The fact that participants have to complete multiple questionnaires and the lack of face-to-face contact may make it difficult to maintain high panellist motivation.
- *Risk of false consensus*. It might happen that participants adjust their responses to be in line with those of other participants despite the fact that they do not entirely agree with the response.
- *Researcher bias*. If the first round questionnaire is not open-ended it may impose the view of the researcher and his preconceptions about a problem on the participants and this may influence their contributions and subsequently the results of the study. Researcher bias may influence the analysis of results, especially the qualitative analysis of the first round responses received from the participants.

It is argued that the strengths of the Delphi method outweigh the weaknesses, and that appropriate execution of the method can eliminate most, if not all, of the weaknesses (De Loe, 1995). However, it is still necessary to investigate the reliability and validity of Delphi results.

2.3.3.5 Reliability and Validity of Delphi Results

The undertaking of a research study means it is necessary to give consideration to the concepts of reliability and validity. Reliability relates to the consistency of research results, and validity relates to the accuracy of the results. The reliability and validity of the research results should be determined according to whether the research was conducted in the qualitative or quantitative paradigm and this is further explored below (Golafshani, 2003).

It should, firstly, be iterated that a Delphi study should not be confused with conventional surveys where a statistically large number of participants are required to validate the results of the study (Barry et al., 2008; Loo, 2002; Mullen, 2003; Okoli & Pawlowski, 2004). It should be understood that the results of a Delphi study represents the ideas, views, and opinions of a knowledgeable group of participants in a particular field, and are not indisputable facts (Powell, 2003). Once it is understood and accepted that the results of the Delphi study are based on the constructed reality of panel members, it becomes clear that it does not fit into the reliability criteria traditionally associated with the positivistic paradigm (Keeney, McKenna, & Hasson, 2011). Instead, the criteria for qualitative studies based on the following four major issues can be applied to ensure that credible interpretations of the findings are produced (Hasson et al., 2000):
1. Credibility (truthfulness).
2. Fittingness (applicability).
3. Auditability (consistency).
4. Confirmability.

The issue of fittingness is addressed in the next section (2.3.3.6), while the remaining three issues regarding reliability are addressed in Chapter 5.

In terms of validity, the Delphi method is based on the assumption that several knowledgeable participants are less likely to arrive at invalid results than a single individual (Hasson et al., 2000). Keeney et al. (2001) argue that providing there is no researcher bias imposed on the participants and that the participants have appropriate knowledge of the area under investigation, content validity can be assumed. The results of a Delphi study is further strengthened and the validity increased by the successive rounds of the study that are interspersed with feedback to participants (Hasson et al., 2000). The validity of results is affected by the response rates (Hasson et al., 2000). It should, lastly, be noted that since the Delphi method is intended to draw on the knowledge and experience of participants, it should not be subjected to the same validation criteria as positivistic methods. The Delphi method should not be viewed as a method for creating new knowledge, but rather as a method that makes the best use of available data, whether that is scientific data, or the collective ideas, views, and opinions of participants (Powell, 2003).

The validity of the results obtained through the execution of the Delphi method as part of this study are addressed in Chapter 5.

2.3.3.6 Appropriateness of the Delphi Method for this Study

One issue that should be addressed to determine the reliability of the Delphi results relates to the appropriateness, or fittingness, of the method to the problem under investigation. The Delphi method has been established as one of the standard methods used to accumulate and assess the ideas, views, and opinions of a panel of knowledgeable participants in problem areas where a body of evidence does not already exist (Beaumont, 2003; Steinert, 2009).

The Delphi method was considered to be a suitable method to identify the factors which need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape. Obtaining these factors from a heterogeneous, knowledgeable group of participants would have been difficult using another method (O'Loughlin & Kelly, 2004). The responses received from the participants during the first round produced rich qualitative data that could not have been extracted from a literature review. Methods such as surveys do not allow participants to contribute their own ideas, views, and opinions, and do not allow for the refinement of the results through multiple rounds and feedback provided to participants. The employment of another group process, such as a focus group, runs the risk of one or a few participants dominating the discussion, and it is often not possible to consistently gather the same heterogeneous group of knowledgeable participants together at the same time and in the same place. The Delphi method is a powerful, flexible, inexpensive method that can be used to draw on the knowledge of a widely dispersed group of knowledgeable participants (De Loe, 1995; Powell, 2003).

The Delphi method is particularly suitable to address the following types of problem areas; Critcher & Gladstone, 1998; Walley & Webb, 1997; Yousuf, 2007):

1. Where the problem under investigation does not lend itself to precise analytical techniques but can benefit from the collective subjective ideas, views, and opinions of knowledgeable participants.
2. Where time, distance, cost and other factors make frequent group meetings difficult or impossible.
3. Where likely disagreements and dominance by strong personalities make it essential that the communication process is refereed and anonymous.

4. Where the heterogeneity of the participants is important to ensure the validity of the results.

All four of these issues are applicable to this research study, which makes the Delphi method particularly suitable to identify the factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape.

2.4 Ethical Considerations

Ethical constraints should be taken into consideration to ensure that the work of the researcher does not harm an individual, group of individuals, organizations, animals, or the environment by the collection of data, publication of the work, or in any other way (Hofstee, 2006). This is especially important when working with vulnerable groups, for example children. The participants in this research study are all professional members of society and are not regarded as a vulnerable group.

A further ethical consideration relates to the openness of the researcher. The researcher should be open about why she wants to collect data, and should be willing to share the results of the research. Participants should not be forced to participate in the study and be allowed to withdraw at any time (Hofstee, 2006).

All participants were invited to take part in this study and received information about its purpose as part of the invitation. Participants were free to decide whether they would like to participate or not, and they were allowed to withdraw at any point. After the completion of the study each participant received a report summarizing the results of the study. Participants took part in this study anonymously and every effort was made to ensure that participants remained anonymous, including removing any details that could identify a participant from the completed questionnaires that are included in the appendices.

2.5 Conclusion

This chapter provided a detailed discussion of the research design that guided this study, and the research methods that were employed to execute the research study. The research design highlighted the research philosophy and approach, and the research process that was followed to complete this study. It was revealed that a social constructivist philosophical worldview guided this study and that a qualitative and explorative approach was followed. This chapter specified that literature reviews, argumentation and the Delphi method were employed as research methods in the completion of this study. Ethical considerations were also highlighted.

CHAPTER 3

CONTINUITY OF CARE AND THE SOUTH AFRICAN HEALTHCARE LANDSCAPE

In the previous chapter the research design in terms of the research approach and philosophy of the researcher, and the research process followed to complete this research project were described. In addition, the research methods and ethical considerations were described.

This chapter describes the concept of continuity of care in more detail, including a discussion of the various dimensions of continuity of care and the relevance of these dimensions in the modern healthcare landscape. The impact of various types of healthcare systems on continuity of care are discussed. Next, the focus shifts to the South African healthcare landscape and its impact on continuity of care.

This chapter sets the scene for Chapter 4, which aims to identify appropriate HITs to improve continuity of care in the South African healthcare landscape.

3.1 Introduction

This chapter describes the concept of continuity of care that was introduced in Chapter 1 in more detail, including a discussion on the impact of various types of healthcare systems on continuity of care. The South African healthcare landscape needs to be described first in order to describe its problems experienced with continuity of care. The South African healthcare landscape is described in terms of the healthcare sectors, namely the private and public sectors, and the government planned National Health Insurance (NHI). Some barriers to continuity of care were already described in Chapter 1. This chapter investigates this issue in more depth.

3.2 Continuity of Care

Continuity of care is a concept that has many dimensions, best summarized as a phenomenon that results from a combination of adequate access to care for patients, good interpersonal skills, a good information flow between providers and organizations, and good care coordination between the providers to maintain consistency (Heller & Solomon, 2005). The concept of continuity of care is better understood when this concept is viewed from the perspectives of the patient and the healthcare provider.

Continuity of care for the patient and his family relates to the perception that a healthcare provider knows about his health history, that his different providers agree on how to manage his health, and that a provider, who has sufficient knowledge about him and his health, will care for him in the future.

Continuity of care from the perspective of the healthcare provider relates to whether he has sufficient knowledge and information about a patient to be able to best apply his professional competence to care for the patient and it relates to the confidence that the provider has that his care inputs will be recognized and pursued by other healthcare providers who provide care to the patient (Haggerty, Reid, Freeman, Starfield, Adair, & McKendry, 2003).

It is significant to note that one theme that is repeated in the perspectives of both the patient and the healthcare provider on continuity of care relates to the availability of relevant information.

According to Saultz (2003), continuity of care can best be defined as a hierarchical concept that ranges from the basic availability of information about the patient to a complex interpersonal relationship between the healthcare provider and the patient. In Figure 3.1 these concepts are depicted in a hierarchy of increasing complexity. The arranging of these concepts in a hierarchy implies that informational continuity is required to ensure longitudinal continuity and that longitudinal continuity should be present for interpersonal continuity to exist.
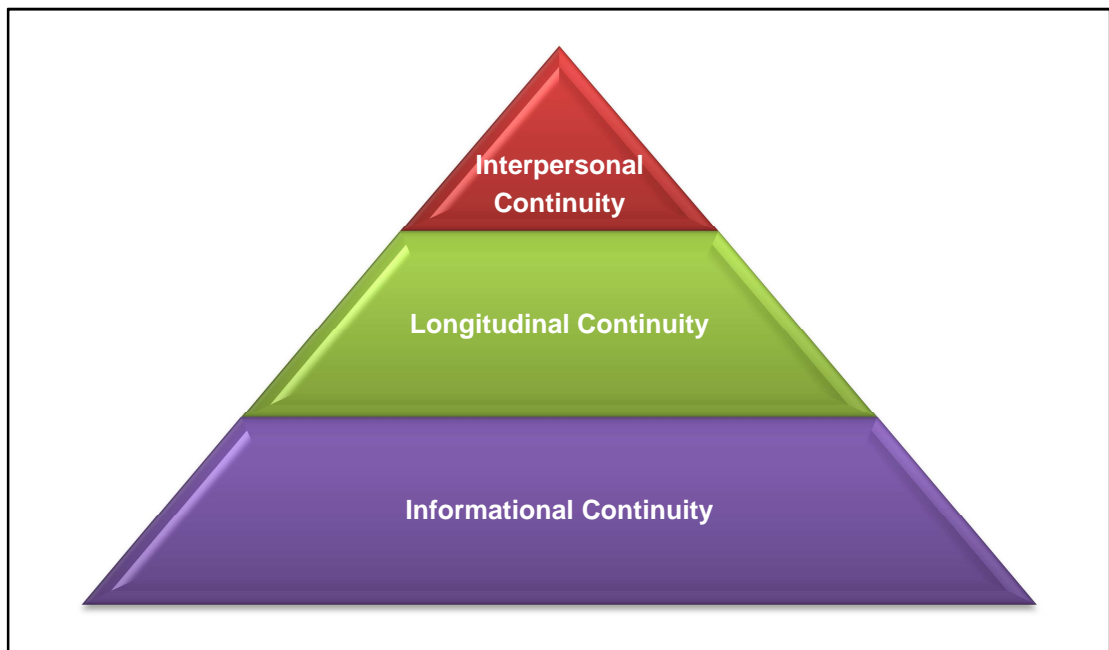
Figure 3.1: Hierarchical dimensions of continuity of care.

At the apex of the hierarchy is interpersonal continuity of care which implies that a patient has an on-going relationship with a healthcare professional from whom he receives most of his care. This relationship is based on trust and a sense of responsibility. This healthcare professional would typically practice at the *medical home* of the patient – the healthcare facility where the patient receives most of his health care. This is known as longitudinal continuity of

care and allows the care to occur in an accessible and familiar environment. The team of healthcare professionals at the *medical home* assume responsibility for coordinating the quality of care, which includes preventative services. At the base of this hierarchy is informational continuity of care which suggests that relevant information about a patient should be readily available to any healthcare provider caring for the patient.

Informational continuity is considered to possibly be the most important aspect of continuity when it comes to preventing medical errors and ensuring patient safety (Saultz, 2003). Informational continuity is the common thread that links care from one provider to another and from one healthcare event to another (Haggerty et al., 2003; Schers, Van den Hoogen, Grol, & Van den Bosch, 2006).

According to the World Health Organization (2008) improved informational continuity of care leads to:

- Lower all-cause mortality.
- Better access to care.
- Less re-hospitalization.
- Fewer consultations with specialists.
- Less use of emergency services.
- Better detection of adverse effects of medical interventions.

The type of healthcare system adopted by a country and the nature of healthcare services offered may have an impact on continuity of care. The next section provides an overview of the three basic types of healthcare systems, and a summary of the impact from the type of healthcare system and the nature of modern healthcare provision on continuity of care.

3.3 Healthcare Systems and Continuity of Care

The major role-players in the healthcare system of a country include consumers of care, providers of care, purchasers of care, and the government and other professional bodies (Creese, 1994). The interaction between these role-players is illustrated in Figure 3.2.

The government of a country and other professional bodies regulate the consumption, provision, and purchasing of healthcare. Depending on the type of healthcare funding model adopted by a country, the consumers of healthcare will obtain insurance coverage through the payment of taxes and/or insurance premiums. In the South African context tax payments by consumers contribute to general revenue that funds the public healthcare sector and insurance premiums take the form of medical aid contributions paid by some South Africans to obtain medical aid coverage (in Figure 3.2 referred to as insurance premiums and insurance coverage respectively). Consumers have to make out-of-pocket payments in certain instances to obtain health services from the providers of care. The providers of care in turn submit claims to the purchasers of care (such as the government, medical aid schemes, health insurance providers, and so forth) to secure payment for the health services that they provided to the consumers of care that was not covered by out-of-pocket payments.
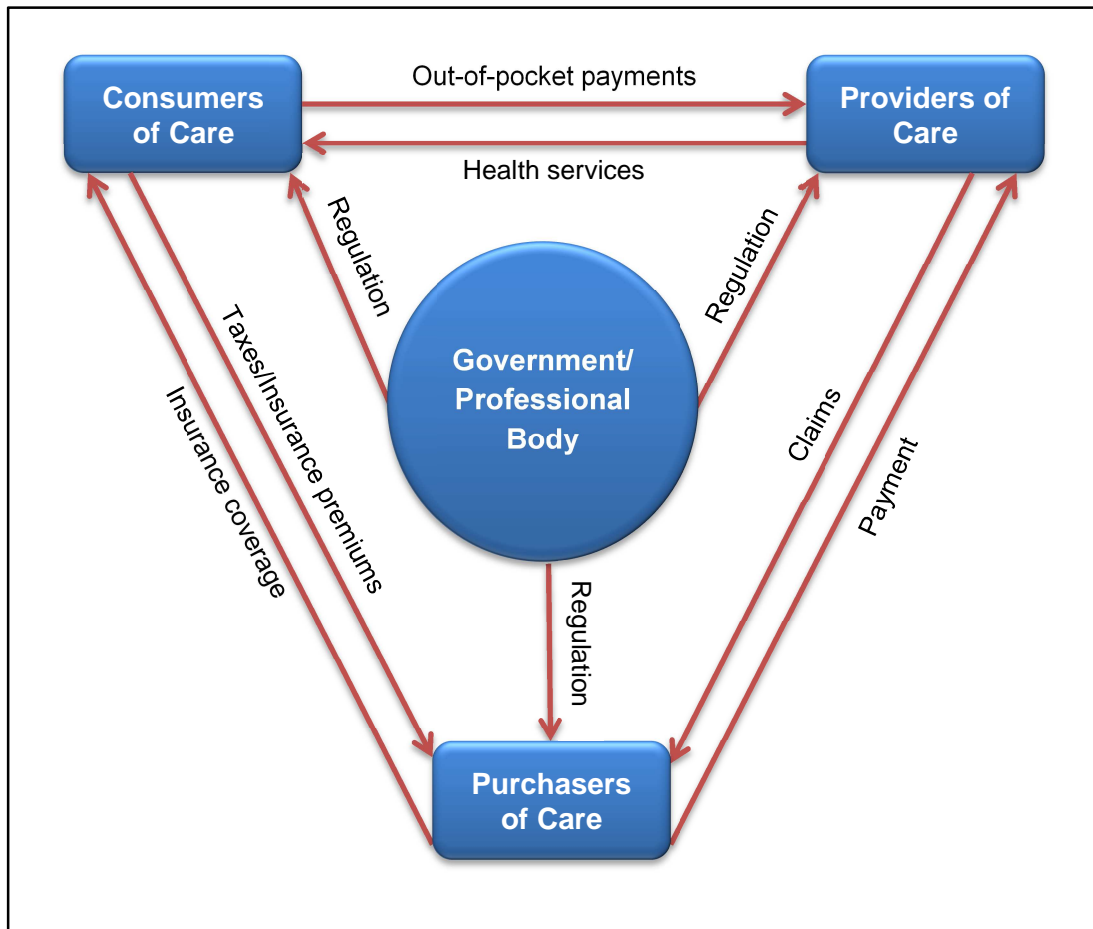
Figure 3.2: Main stakeholders in the healthcare system (Creese, 1994).

The healthcare system of a country can be classified based on the source of healthcare funding and three main models of healthcare systems can be distinguished (Lameire, Joffe, & Weidemann, 1999; Physicians for a National Health Program, 2010):

▪ Through the **Beveridge model** healthcare is provided and funded by government through tax payments and healthcare services are mainly provided by public providers or in some cases private providers that collect their fees from the government.

▪ The **Bismarck model** is a mixed model where healthcare services are funded through a health insurance system and healthcare services are provided by a mixture of public and private providers. The health insurance system covers everybody in the country and is not profit-driven.

- Through the **Private Insurance model** funding of the system is based on premiums that are paid to private insurance companies and the majority of healthcare services are provided by the private healthcare sector.

While most countries adopt a single model there are countries such as the USA that employ a mixture of these models. In the USA, healthcare is primarily privately funded, with the exception of social insurance such as Medicare and Medicaid that provide health insurance coverage to the elderly, physically disabled, and individuals and families with low incomes and resources (Lameire et al., 1999; Physicians for a National Health Program, 2010).

The type of funding model adopted by a country thus influences whether healthcare services are mainly provided by the private sector, the public sector, or by both sectors. This has an influence on continuity of care because it can happen that patients move between both the private and the public healthcare sector of the country receiving care from various healthcare providers in these sectors. Financing arrangements thus not only influence how and where a patient receives healthcare services, but whether the establishment of a longer term relationship between the patient and a primary care provider is possible (Saltman et al., 2006).

A further factor that impacts on continuity of care is the nature of modern healthcare provision. The days when a patient received care from the same healthcare provider for their entire life and where a single healthcare provider provided all the healthcare services that the patient needed are long gone (Sturmberg, 2000). Modern healthcare systems are highly fragmented due to many speciality and subspecialty domains in medical practice (Freeman et al., 2003; Haggerty et al., 2003; Hellesø & Lorensen, 2005; Pirnejad et al., 2007). During his lifetime a patient may receive healthcare services from various general practitioners, nurses, pharmacists, dieticians, physical therapists, occupational therapists, social workers, specialists specializing in different organ systems, and so forth. This leads to the creation of silos of information

about the patient as the patient receives care from multiple providers during his life which makes it very difficult for an individual provider to have adequate information about the health history of the patient available when treating the patient (Freeman et al., 2003; Reid et al., 2005).

At a high level health services are typically delivered at three levels of care, namely primary-, secondary, and tertiary care that further contributes to the fragmented nature of modern healthcare (Shah, 2011). These levels of care can be described as follows (Alberta Physician Link, 2011; Saltman et al., 2006; Shah, 2011):

- Primary care is typically the first point of contact for the patient and involves preventative, curative, and rehabilitative services. Primary care is delivered by general practitioners, family doctors, dentists, pharmacists, midwives, nurses, and so forth. Patients that require more specialized care are referred to higher levels of care such as secondary or tertiary care.

- Secondary care involves acute care and addresses more complex conditions. Care at this level is typically provided by specialists such as cardiologists, urologists, gynaecologists, dermatologists, and so forth.

- Tertiary care involves specialized consultative care on referral from primary or secondary care providers and typically addresses advanced medical investigation, treatment and surgical interventions. Examples of tertiary care services include cancer management, treatment for severe burns, neurosurgery, and so forth. Quaternary care is an extension of tertiary care and refers to the most complex and advanced level of medical and surgical care that is highly specialized and typically only offered in a limited number of regional or national centres.

In the next section the South African healthcare landscape and its impact on continuity of care is described in terms of healthcare funding in South Africa, the public and the private healthcare sectors, and the proposed National Health Insurance (NHI) that is expected to be introduced in 2012.

3.4 The South African Healthcare Landscape and Continuity of Care

High-, middle-, and low-income countries spend on average 7.7%, 5.8%, and 4.7% of their Gross Domestic Product (GDP) on health respectively, while South Africa spends 8.5% of its GDP on health care which is above the 5% recommended by the World Health Organization (WHO) (Department of Health, 2011). Table 3.1 compares the health care expenditure and health status indicators in selected high and middle income countries. The information presented in Table 3.1 makes it clear that despite the high expenditure on health, the health outcomes In South Africa remain poor when compared to similar middle income countries. The inequities between South African public and private healthcare sectors are largely blamed for this poor performance (Department of Health, 2011).

Country	Health care expenditure as % GDP	Life expectancy at birth	Infant mortality rate per 1000 live births
High income countries			
Australia	9.5	80	6
Canada	9.6	80	5
United Kingdom	7.7	78	5
Middle income countries			
Brazil	7.9	71	33
Chile	5.8	78	8
China	5.8	72	30
Costa Rica	9.3	78	8
Cuba	7.5	77	6
Egypt	4.9	70	33
Estonia	5.1	71	8
Malaysia	3.8	73	7
South Africa	8.3	48	53
Thailand	4.4	70	23

Table 3.1: Comparison of health care expenditure and health status indicators in selected high and middle income countries (McIntyre & Thiede, 2007).

In South Africa, healthcare is provided by a well-developed, resource intensive and highly specialised formal private health sector, and an under-resourced public sector that is often criticized because of the poor service that

patients receive (Harrison, Bhana, & Ntuli, 2007[a]; Naidoo, Jinabhai, & Taylor, 2010). The socio-economic status of a patient is the main determinant of the sector through which he will receive access to health care (Harrison et al., 2007 [a]). The South African government is planning to introduce an NHI in 2012 that is intended to ensure that all patients will have access to affordable, quality healthcare services regardless of their socio-economic status (Department of Health, 2011).

The socio-economic status of an individual, as mentioned, is the main aspect that determines whether the individual will get his health care through the private or the public healthcare system. There are vast discrepancies in the resources spent between these two sectors, which means that socio-economic status is often a determinant of the level and quality of health care that a person is able to access (Harrison et al., 2007[a]).

The South African healthcare system is financed through three main sources. The public sector is mainly financed from general revenue, while the private sector is mainly financed through medical schemes. The third source is out-of-pocket payments (Department of Health, 2011). There are significant imbalances in how the funding is spent. While only approximately 14% of the South African population are covered by medical schemes which makes it possible for them to access private health care services, 59% of the health care expenditure is spent on private sector services and administration, with only 41% spent on health services and administration in the public sector that must care for the majority of the population (McIntyre & Thiede, 2007; Rispel & Setswe, 2007). Medical scheme members make monthly contributions to their medical scheme, a portion of which is sometimes subsidised by employers (Harrison et al., 2007[a]). Two factors that further contribute to the disparities between private and public sector spending is that a portion of medical scheme contributions is currently tax deductible, together with the purchasing of medical scheme cover for civil servants (Harrison et al., 2007[a]). Figure 3.3 provides an overview of the flow of funds between key financing intermediaries and healthcare providers.
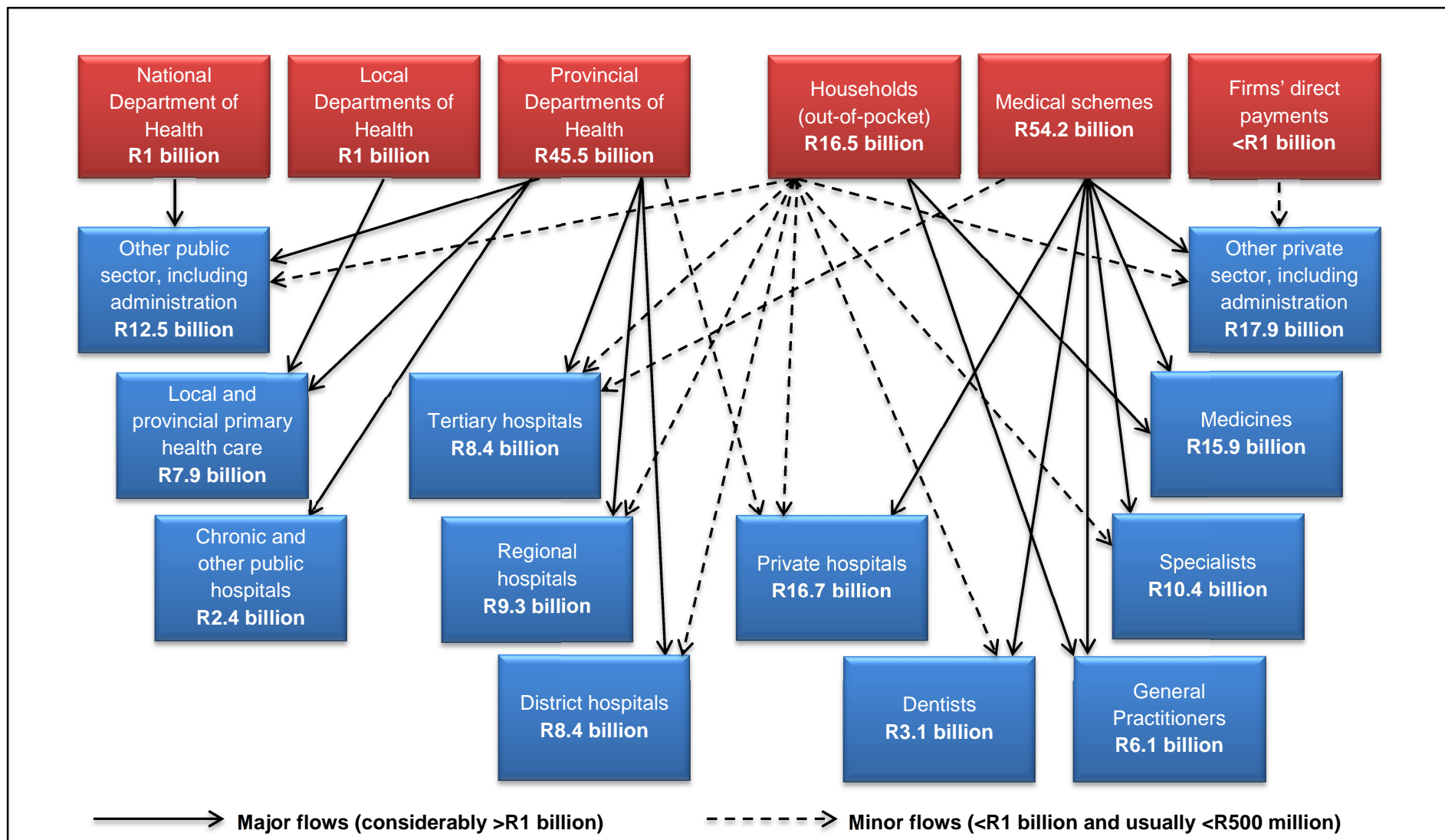
Figure 3.3: Health care expenditure in South Africa, 2005 (McIntyre & Thiede, 2007).

Due to the skewed funding many health professionals have been drawn to the private sector due to higher remuneration, better working conditions and more ready access to advanced technology. This has led to the public sector being under-resourced in terms of financing, infrastructure, and human resources (Harrison et al., 2007[a]). The severe effect of diseases such as HIV/AIDS and tuberculosis (TB) places the under-resourced public sector under further stress, leading to generally poor quality services offered to individuals accessing the public health care system (Department of Health, 2011; Naidoo et al., 2010). Problems in the private healthcare sector primarily relate to the high costs of services, however, problems commonly cited by individuals accessing public healthcare services include: cleanliness, safety and security of staff and patients, long waiting times, staff attitudes, infection control and drug stock-outs (Department of Health, 2011).

Figure 3.3, in addition to an overview of the flow of funds between key financing intermediaries and healthcare providers, presents an indication of the main healthcare providers who provide care to patients in the public and private sectors. In the public sector primary healthcare services are offered at primary healthcare (PHC) clinics where patients receive care free of charge from PHC-trained nurses, and sometimes doctors. Patients with conditions that cannot be treated at these PHC clinics are referred to various types of hospitals for higher levels of care, depending on their condition (Burger, 2006). Patients that belong to a medical scheme are not allowed to access these free services offered by the public healthcare system. In the private sector primary healthcare services are generally offered by dentists and general practitioners, from where a patient can be referred to a specialist or hospital if required. Any patient who belongs to a medical scheme, or who is willing to pay the necessary expenses out-of-pocket can access the services offered by the private healthcare sector. Patients that belong to a medical scheme are sometimes forced to pay for some services out-of-pocket if the specific service is not covered by their medical scheme plan, or if they have exhausted their medical scheme resources for the year.

It is clear that, similar to the USA, South Africa employs a mixture of funding models, as discussed in Section 3.3. While South Africa currently employs the Beveridge model and the Private Insurance model, there are plans to adopt an NHI in 2012 which falls in the realm of the Bismarck model.

The South African government is planning to introduce an NHI in 2012 to address problems related to the inequitable access to quality healthcare services. At the time of completing this thesis very limited information about the planned NHI is available. In the next section, a brief discussion summarizes the publicly available information on the NHI to illustrate how it intends to address the problem of the imbalance between the private and public sectors. Unless otherwise indicated, the information on the NHI below was obtained from a policy paper that was published for public comment in the Government Gazette in August 2011 (Department of Health, 2011).

The proposed NHI envisages to ensure that all South Africans, irrespective of their socio-economic status, have access to affordable, appropriate, efficient, and quality healthcare services. The government intends phasing the NHI in over 14 years, which will require major changes in service delivery structures, administrative and management systems. The service delivery model will be based on a referral system with primary healthcare providers acting as gatekeepers to other levels of care (McIntyre, 2010). Patients will be expected to follow the appropriate referral route and are only able to access secondary or tertiary services based on a referral from their primary health care provider (McIntyre, 2010; Ramjee & McLeod, 2010; Van den Heever, 2010). The NHI will provide a comprehensive package of services contracted to both public and private health care providers (McIntyre, 2010; Van den Heever, 2010). Patients will increasingly move between the public and private health care sectors. All members of the population will be entitled to this comprehensive package of services that will be defined to include health services at various levels of care including: primary, secondary, tertiary and quaternary. The NHI will pool funds and use these funds to purchase health services on behalf of the population from contracted providers in both the public and the private

sector. It is envisioned that an NHI card will be issued to the registered population to allow for ease of access to patient information.

Once the NHI is implemented, it is envisioned that PHC services will mainly be delivered according to three streams, namely district-based clinical specialist support teams supporting delivery of priority health care programmes at a district, school-based PHC services, and municipal ward-based PHC agents. In addition to these three main streams, accredited and contracted private providers practicing within a district will deliver PHC services.

Hospital-based services will be delivered at various levels of hospitals, namely district-, regional-, tertiary-, central-, and specialized hospitals.

District hospitals will provide generalist medical services and will be limited in terms of specialist care offered. Only four basic areas of specialist care will be offered at district hospitals, namely obstetrics and gynaecology, paediatrics and child health, general surgery, and family medicine. The NHI package of care that will be delivered at district hospitals will include trauma and emergency care, in-patient care, out-patient visits, rehabilitation services, geriatric care, laboratory and diagnostic services, and paediatric and obstetric care.

Regional hospitals will offer services at a general specialist level and will receive referrals from district hospitals and provide specialist services to district hospitals. The general specialist services that will be delivered at regional hospitals include general surgery, orthopaedics, general medicine, paediatrics, obstetrics and gynaecology, psychiatry, radiology, and anaesthetics.

Tertiary hospitals will deliver super and sub specialist care and will serve as the main platform for the training of health workers and research. The care offered at these hospitals will include cardiology, cardiothoracic surgery,

craniofacial surgery, diagnostic radiology, ear, nose, and throat, endocrinology, geriatrics, haematology, human genetics, infectious diseases, general surgery, orthopaedics, general medicine, paediatrics, obstetrics and gynaecology, radiology, and anaesthetics.

Central hospitals will be national referral hospitals attached to a medical school and will provide a training platform for the training of health professionals and research. These hospitals will deliver highly specialized tertiary and quaternary services on a national basis and will function as highly specialized referral units for the other hospitals.

Specialized hospitals will typically be focused on one discipline and the range of services offered at such a hospital will be highly vertical. The two most common specialities that could be focused on include tuberculosis and psychiatry, but other focus areas could include spinal injuries, maternity, heart, orthopaedics, urology, and infectious diseases.

It is clear from these discussions that the South African healthcare sector is highly fragmented with both a private and a public healthcare sector offering healthcare services to patients and this situation will remain once the NHI is implemented. The NHI will lead to more patients receiving care from both the private and the public sector thus exacerbating problems associated with continuity of care. There is fragmentation within each of these sectors as well. In the public sector patients receive care from PHC clinics as well as various types of hospitals. In the private sector patients receive care from general practitioners, dentists, specialists, and hospitals.

Chabikuli, Murray, Fehrsen and Hugo (2008) describe a phenomenon that they call "shopping for doctors" where South African patients often switch providers, often in reaction to poor service, amongst other reasons. Patients switch providers within and across sectors. Some reasons that patients switch providers include (Chabikuli et al, 2008):

- Switching to a new provider when they do not consider their current provider to be a "good" provider any more. This could be attributed to many different factors.

- The costs involved for the patient and his family to travel to a specific provider.

- The popularity of the provider in the community.

- If the patient experiences problems with the provider and the treatment received is not good.

- If the provider is too busy.

- Perceived discrimination.

- Personal circumstances of migrant workers.

- Restrictions imposed on medical scheme members that dictate which doctors are covered by the medical scheme.

- Unwillingness of doctor to book the patient off sick.

The highly fragmented nature of the South African healthcare sector, together with the problems with continuity of care as discussed in Chapter 1 and patients who often change providers combine to make it increasingly difficult to achieve interpersonal and longitudinal continuity of care. As a result, it becomes increasingly important to look beyond these dimensions of continuity of care to ensure that some level of continuity is achieved. To ensure continuity of care between different sectors and different healthcare providers in a fragmented healthcare system, it is necessary to focus on the informational dimension of continuity of care, which means that there is a strong emphasis on the continuity of medical records (Norden, Marincowitz, & Fehrsen, 2004).

3.5 Conclusion

This chapter explored the various dimensions of continuity of care, the impact of various types of healthcare systems on continuity of care, and the impact of the South African healthcare landscape on continuity of care. The barriers described in Chapter 1, and a discussion of the barriers to continuity of care in the South African healthcare landscape in this chapter reveal that it is

increasingly difficult to achieve interpersonal and longitudinal continuity of care, thus shifting the focus to informational continuity of care. It has been suggested that various HITs, such as electronic records, could play a role in improving informational continuity and quality of care by ensuring that up to date information about a patient is available at the point of care when needed (Hellesø & Lorensen, 2005; Jha, Des Roches, Campbell, Donelan, Rao, Ferris, Shields, Rosenbaum, & Blumenthal, 2009; Kaushal, Blumenthal, Poon, Jha, Franz, Middleton, Glaser, Kuperman, Christino, Fernandopulle, Newhouse, Bates, & The Cost of National Health Information Network Working Group, 2005; Lehmann, Abbott, Roderer, Rothschild, Mandell, Ferrer, Miller, & Ball, 2006; Pirnejad et al., 2007; Sheaff & Peel, 1995). In the next chapter various electronic records systems that could be useful in improving informational continuity of care are explored and a technological model for improved continuity of care that employs these electronic records systems and that is cognisant of the South African healthcare landscape is presented.

CHAPTER 4

HEALTH INFORMATION TECHNOLOGIES FOR IMPROVED CONTINUITY OF CARE

The previous chapter explored the concept of continuity of care and the impact of various healthcare systems and the South African healthcare landscape in particular on continuity of care. It was concluded that it is increasingly difficult to achieve interpersonal and longitudinal continuity of care. The focus has shifted to informational continuity of care and the continuity of medical records.

In this chapter the purpose and ownership of medical records and attitudes towards electronic records are described. It has been suggested that various HITs, such as electronic records, can play a role in improving informational continuity. Various HITs including Personal Health Records, Electronic Medical Records, Electronic Health Records and Health Information Exchanges are described. Finally, a technological model employing various HITs that can play a role in improving informational continuity of care in the South African healthcare landscape is introduced.

The next chapter will identify factors that need to be addressed to encourage the adoption and meaningful use of such HITs in the South African healthcare landscape.

4.1 Introduction

Problems with achieving continuity of care in modern healthcare were explored in Chapter 1 with a further focus on problems related to the South African healthcare landscape in Chapter 3. Chapter 3 concluded that it is necessary to focus on informational continuity of care, and the continuity of medical records, to ensure that some level of continuity is still achieved.

This chapter describes the purpose and ownership of medical records, and the problems associated with paper-based medical records. Various HIT solutions related to electronic means of record keeping will be described, including Personal Health Records (PHRs), Electronic Medical Records (EMRs), and Electronic Health Records (EHRs). The chapter concludes by presenting a technological model for improved continuity of care that employs these electronic record systems and that is cognisant of the South African healthcare landscape.

4.2 Medical Records

4.2.1 The Purpose and Ownership of Medical Records

According to the World Health Organization (2006) a medical record can be defined as: "*a collection of facts about a patient's health history, including past and present illness(es) and treatment(s) written by the healthcare professional treating the patient.*"

The primary purpose of a medical record is to support patient care and act as an aide memoir for the healthcare professional treating the patient, therefore, facilitate informational continuity of care (Mann & Williams, 2003; Medical Protection Society, 2011; Nair, 2011). Its secondary purposes include (Mann & Williams, 2003; Nair, 2011; World Health Organization, 2006):

- Communicating with other healthcare providers that care for the patient.
- For medico-legal purposes.
- For quality assurance activities.

- Management and planning of health care facilities and services.
- Resource allocation.
- Performance monitoring.
- Epidemiology.
- Production of health care statistics.
- For later clinical audit.
- Medical research.

An adequate medical record should enable a healthcare professional or anyone else to reconstruct the essential parts of each patient contact without reference to memory and as such should be comprehensive, contemporaneous, comprehensible, accurate, and attributable (Medical Protection Society, 2011).

Medical records have traditionally been loosely structured, handwritten documents used to record relevant medical information and facts about a specific patient. Although there are rough guidelines for imposing some structure on these records they vary in content by speciality and there are no rules as such governing the organization of these paper-based records (Chamisa & Zulu, 2007; Ferranti, Musser, Kawamoto, & Hammond, 2006). Some providers follow the problem-oriented SOAP (subjective, objective, assessment, and plan) format when taking notes. This format is described as follows (Ferranti et al., 2006; Nair, 2011; Nursing Link, 2007):

- Subjective: Information regarding symptoms, complaints, and condition are gathered from the patient and noted in the medical record.
- Objective: Findings from the physical examination of the patient are noted.
- Assessment: The analysis by the provider of the information gathered is noted, including possible diagnosis.
- Plan: The plan of action by the provider is noted. This could include ordering various diagnostic tests, referrals, procedures performed, medications given, and so forth.

Medical records are generally a combination of notes, test results, referral letters, patient discharge summaries, and so forth, bundled together in a folder with the identification data of the patient on the cover (Health Professions Council of South Africa, 2008; Schoenberg & Safran, 2000; World Health Organization, 2006). The content of these folders are extremely diverse and in certain instances the records of an entire family can be bundled together in one folder. The Health Professions Council of South Africa (HPCSA) recommends that healthcare professionals should enter and maintain at least the following information for each patient consulted (2008):

- Personal (identifying) particulars of the patient.
- The bio-psychosocial history of the patient, including allergies and idiosyncrasies.
- The time, date, and place of every consultation.
- The assessment of the patient's condition.
- The proposed clinical management of the patient.
- The medication and dosage prescribed.
- Details of referrals to specialists.
- Any reactions to treatment or medication, including adverse effects.
- Test results.
- Imaging investigation results.
- Information on the times that the patient was booked off from work and the relevant reasons.
- Written proof of informed consent, where applicable.

In South Africa the ownership of medical records depends on various factors and is summarized as follows (Health Professions Council of South Africa, 2008; Medical Protection Society, 2011):

- State institutions own all original records created by that institution and should retain such records.
- If a patient is required to pay for records and images, for example private patients, the patient owns the original record and must be allowed to retain such record unless a healthcare provider deems it necessary to retain such a record for the purpose of monitoring treatment for a given period. Should

the patient however require the original record he must be allowed to obtain the original record.

▪ In multi-disciplinary practices, the ownership of records depends on the legal structure of the practice.

A patient in South Africa, independent of who owns a record, should be allowed to obtain a copy of his medical record on request except in instances where access might cause the patient serious harm to his physical or mental health or well-being (Medical Protection Society, 2011). A healthcare professional may only make the medical record available to a third party after obtaining written authorization from the patient or his legal representative, except in the following instances (Health Professions Council of South Africa, 2008):

▪ Where a court order orders the record to be handed to a third party.

▪ If the third party is a healthcare professional who is being sued by a patient or who has had disciplinary proceedings instituted against him by the HPCSA and needs access to the record to mount a defence.

▪ Where the healthcare professional is under a statutory obligation to disclose certain medical facts (for example in a case of suspected child abuse).

▪ Where non-disclosure would represent a serious threat to public health.

The patient medical record may be shared with another healthcare professional involved in his care, depending on consent from the patient, but consent may be assumed if a patient agrees to be referred to the specific healthcare professional (Medical Protection Society, 2011).

Chamisa and Zulu (2007) conducted a study into the quality of medical records in a surgical department at a South African public hospital and concluded that "*medical records are grossly inadequate in many respects*", and continued that there is no reason to suspect that the problems they encountered are not widespread in other surgical services throughout the country. Many of the problems associated with the quality of medical records

can be traced back to their paper-based nature (Accenture, 2006). The next section addresses the attitudes of South Africans regarding paper-based versus electronic medical records, thus highlighting problems associated with paper-based medical records in South Africa. The status quo regarding the use of electronic records is discussed.

4.2.2 Status Quo of and Attitudes towards Electronic Records: A South African Perspective

In 2006 a study into the attitudes of South Africans towards medical records was developed by Accenture and executed by AC Nielsen (Accenture, 2006). The findings of this study clearly indicated that South Africans view electronic records as a more reliable alternative to traditional paper-based medical records. Some of the results of this study are described next.

There was a high degree of concern about the use of paper-based records amongst respondents. The majority of respondents were extremely to very concerned about the following:

- The privacy and security of paper-based records (54%).
- Different doctors not having access to their full health history and relevant information (54%).
- Being rendered unconscious and unable to report relevant medical information in an emergency situation (65%).

Respondents were of the opinion that paper-paper based records were more likely to be lost and incomplete and expressed confidence in the potential of electronic records to improve the quality of care that they receive.

Interestingly, 50% of those respondents that belong to a medical aid were so positive about the potential benefits of electronic records that they indicated they would be prepared to pay a monthly fee to have their records maintained electronically, as presented in Figure 4.1.
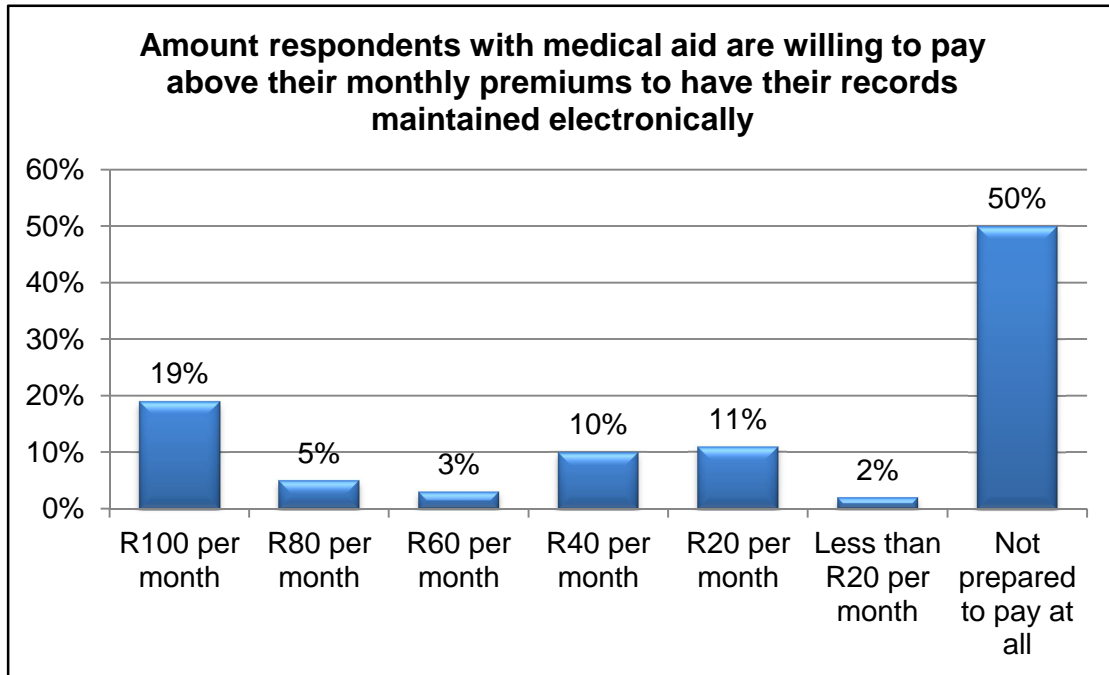
Amount respondents with medical aid are willing to pay above their monthly premiums to have their records maintained electronically

Figure 4.1: Amount respondents with medical aid are willing to pay above their monthly premiums to have their records maintained electronically (Accenture, 2006).

Since patients do not always have the expertise to recount their full medical history accurately and in sufficient detail the fact that most patients have to repeat their medical history every time that they visit a new healthcare provider is a cause for concern. 51% of respondents indicated that they are asked to answer questions related to their medical history every time that they visit a new healthcare provider.

It is clear that an alternative to paper-based records should be investigated for adoption in the South African healthcare landscape given the problems associated with paper-based records as discussed in Chapter 1 and the results of the Accenture study. The importance of informational continuity of care in modern healthcare further stresses the importance of improved medical records.

One of the strategies proposed by numerous authors to improve the quality of medical records and the exchange of information between various healthcare

providers is the use of electronic records, as opposed to paper-based records (Anderson, 2007; Chaudhry et al., 2006; Gunter & Terry, 2005; Hellesø & Lorensen, 2005; Kalra & Ingram, 2006; Kaushal et al., 2005; Lehmann et al., 2006; Miller & Sim, 2004; Mitchell, McConnachie, & Sullivan, 2003; Schers et al., 2006; Shapiro, Kannry, Lipton, Goldberg, Conocenti, Stuard, Wyatt, & Kuperman, 2006; Simon et al., 2007).

There is a lack of publicly available information about the status of electronic record adoption in the South African healthcare landscape. What is known is that much of the South African healthcare sector still relies on paper-based medical records (Accenture, 2006; Khan, 2011). While the 849-bed Inkosi Albert Luthuli Central Hospital in KwaZulu-Natal is one example of a paperless hospital where electronic records are successfully used, the adoption of HITs in the majority of other public hospitals are limited to the streamlining of administrative tasks, such as billing (Khan, 2011). Due to a lack of available bandwidth, these hospitals are not linked to each other (Khan, 2011). Published information regarding electronic record adoption in the private sector is lacking.

In the following sections three different types of electronic record systems are described, namely PHRs, EMRs, and EHRs.

4.2.3 Personal Health Records

A PHR is a patient-oriented electronic record, usually web-based, that allows an individual to manage his own healthcare and contains his health related information that has been gathered from many sources (Christopherson, 2005; Sprague, 2006; Tang, Ash, Bates, Overhage, & Sands, 2006). The PHR is typically owned, created, and managed by the individual and allows him to have a lifelong summary of all of his health information in one convenient place. A PHR should typically contain information on past and current illnesses, allergies, immunizations, medication, procedures, tests results, and more (Neal, 2008; Tang et al., 2006). This is especially useful for individuals who manage chronic conditions such as diabetes and

hypertension or diseases such as cancer, tuberculosis, or HIV/AIDS (Markle Foundation, 2004).

A PHR enables individuals to provide their healthcare provider with a detailed summary of their medical history from their PHR and provides their healthcare provider with often-missing information, for example, the medication that they are actually taking (Markle Foundation, 2004).

Three types of PHRs can be distinguished, namely standalone-, tethered-, and interconnected PHRs (Jeong, Kim, & Bae, 2009; Kaelber & Pan, 2008; Tang et al., 2006).

Standalone PHRs do not integrate with any other systems and are typically commercially available web-based systems (Kaelber & Pan, 2008; Tang et al., 2006). Although certain standalone PHRs may allow an individual to give his healthcare provider access to the PHR to aid in populating it, the individual or a family member/caregiver is usually responsible for entering information into the PHR (Jeong et al., 2009).

Tethered PHRs contain a subset of data compiled by a healthcare provider or healthcare payer, such as a medical aid provider (Jeong et al., 2009). Such PHR systems are known as provider-tethered or payer-tethered PHRs. These tethered PHRs are only linked to the healthcare data within the information system of the specific organization (Kaelber & Pan, 2008; Shah, Kaelber, Vincent, Pan, Johnston, & Middleton, 2008).

Interconnected PHRs can be populated from various sources including the individual entering information himself, EMRs of healthcare providers, medical aid claims, pharmacy data, home diagnostic equipment, and so forth (Jeong et al., 2009; Tang et al., 2006). Interconnected PHRs provide a more complete view of health information related to the individual.

Figure 4.2 illustrates the range of complexity associated with these different types of PHRs. Tethered and standalone PHRs are the least complex, with interconnected PHRs being the most complex.
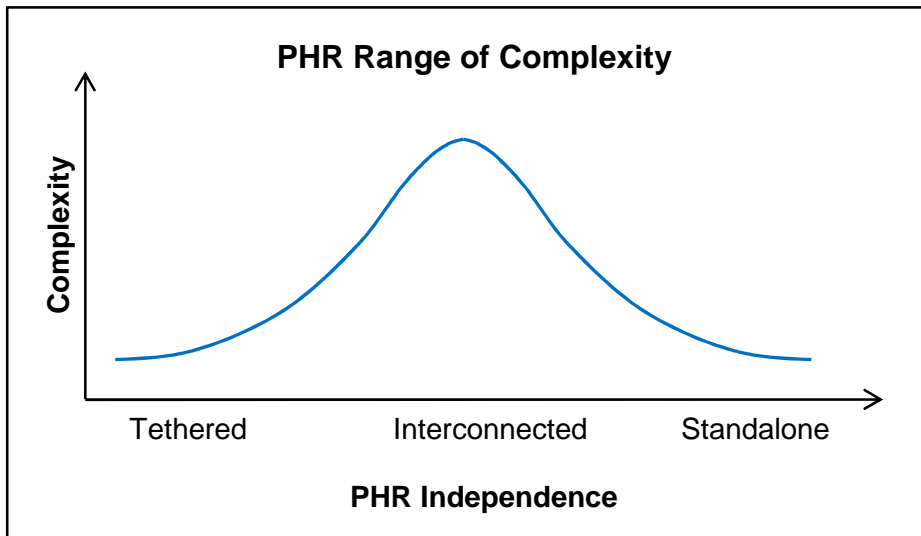
Figure 4.2: PHR Range of Complexity (Tang et al., 2006).

An interconnected PHR that allows data from the PHR to be uploaded to EMRs of several healthcare providers, and vice versa can play a significant role in improving informational continuity of care. The population of the PHR of an individual by the EMRs of his various healthcare providers ensures that the PHR contains a reliable and accurate reflection of his health history (Tang et al., 2006).

General benefits associated with the use of PHRs include the following (Markle Foundation, 2004; Tang et al., 2006):
▪ Empowering patients and their families by:
  – Allowing them to verify the accuracy of the medical records kept by their healthcare providers.
  – Providing them with relevant and credible information to gain a deeper understanding of the health issues and decisions they face.
  – Enabling them to assume a greater responsibility for their care and share in the decision-making process.

- Monitoring important indicators such as blood pressure, symptoms, glucose levels, and so forth. This is especially beneficial for individuals managing chronic conditions.
- Provide a way for patients to involve friends and family in their care when necessary.
- Reminding individuals to schedule relevant preventative services.

▪ Improving the relationship between a patient and healthcare provider by improving both communication and the sharing of information.

▪ Increasing patient safety by alerting patients and healthcare providers of potential drug interactions, contraindications, side effects, and allergies, and alerting them to missed procedures and lapses in adherence to treatment regimes.

▪ Improving the quality of care that patients receive by providing the healthcare provider with a more complete history of the patient and increasing the understanding of and engagement with treatment plans by the patient.

▪ Saving money by avoiding unnecessary duplicative tests and improving the outcomes of care for patients with chronic conditions.

▪ Promoting earlier interventions when patients with chronic conditions encounter a problem.

4.2.4 Electronic Medical Records

An EMR is a provider-oriented electronic version of the paper medical record created in most healthcare settings and belongs to the healthcare provider that created it, such as a clinic, general practice, or hospital (Garets & Davis, 2006; Hartley & Jones, 2005). The EMR is owned, created, gathered, managed, and consulted by healthcare professionals from a single organization (Garets & Davis, 2006). An EMR provides information on the medical history and documentation of each encounter, symptoms, diagnosis, and outcome for the patient. Pathology, radiology, or other laboratory test results can be uploaded into the EMR where the functionality is available. Many EMR systems offer functionality such as computerized provider order entry (CPOE), e-prescribing, clinical decision support, and so forth (Garets &

Davis, 2005; Garets & Davis, 2006; Hartley & Jones, 2005; Ludwick & Doucette, 2009). Interoperable EMRs that are based on relevant standards can exchange data with other EMRs, and PHRs, thereby supporting informational continuity of care.

Benefits associated with the use of EMRs include (Adler, 2004; Anaraki, Plugge, & Hill, 2003; Anderson, 2007; Carr-Bains & De Lusignan, 2003; Chaudry et al., 2006; Gunter & Terry, 2005; Harrison et al., 2007[b]; Hillestad et al., 2005; McGrath, Arar, & Pugh, 2007; Su, Win, & Chiu, 2009; Williams & Boren, 2008):

- Using EMRs will eliminate most handwritten clinical data, thereby reducing errors due to illegible handwriting.

- Most EMRs offer additional functionality to reduce medical errors, such as checking drug interactions and allergies when prescribing medication, and so forth.

- Interoperable EMRs can ensure that relevant, up-to-date data about a patient is available at the point of care when needed, thereby improving the quality of care, for example when a general practitioner refers a patient to a specialist for further care.

- Data from EMRs can be extracted by epidemiologists and researchers to protect and promote the health of the population through efficient surveillance, investigation, prevention, and control of communicable diseases.

- Patient care is further improved through features such as alerts informing providers of abnormal test results, preventative services and screenings that are due, follow-ups that are due, and so forth.

- The clinical decision support features of EMRs can improve adherence to guideline- and protocol-based care, thereby improving health outcomes.

- Data that is shared between interoperable EMRs can reduce costs, especially by avoiding duplicating tests because the healthcare professional does not have recent tests results available.

- EMRs that are interoperable with PHRs can increase patient compliance with preventive care recommendations through features such as reminders generated by the EMR.

- Data is backed up automatically, usually off-site, which ensures that the patient medical records would not be lost in the case of disaster. For example, when hurricane Katrina struck New Orleans in the United States of America in August 2005 many paper-based medical records were permanently destroyed, leaving many evacuees with no documentation of their medical histories. Many healthcare professionals treating these evacuees were placed in the difficult situation of treating patients with chronic conditions and serious diseases such as cancer with absolutely no reliable information available on their medical histories (Bower, 2005; Kontzer, 2005).

4.2.5 Electronic Health Records

An EHR is an inter-organizational patient medical record that contains a summarized subset of information that has been aggregated from various sources, such as individual healthcare providers' EMRs (Garets & Davis, 2006; Gunter & Terry, 2005; Orfanidis, Bamidis, & Eaglestone, 2004; West, Blake, Liu, McKoy, Oertel & Carey, 2009). An EHR can ensure that an aggregated health record is available to an authorized health care provider at the point of care when needed. This record may contain information from various providers, such as family physicians, specialists, social workers, pharmacists, radiologists, dieticians, physiotherapists, nurses, and so forth (Ludwick & Doucette, 2009). Most EHR initiatives are government initiated and funded and are national in scope (Gunter & Terry, 2005).

Benefits associated with the implementation of EHRs include (Baron, Fabens, Schiffman, & Wolf, 2005; Lee, Cain, Young, Chockley, & Burstin, 2005; Pirnejad et al. 2007; Valdes, Kibbe, Tolleson, Kunik, & Petersen; 2004):

- Providing healthcare providers with a secure, safe, and reliable way to access patient data from various sources.

- Improved access to patient data can improve the quality of care that patients receive and avoid various errors.
- Healthcare costs can be reduced, for example, access to recent tests results will reduce the unnecessary duplication of tests.

An EHR relies on the availability of standards-based EMRs to support the exchange of information between various healthcare providers which makes the adoption of EMRs an important step towards realizing the EHR vision (Garets & Davis, 2006; Hartley & Jones, 2005, Sujansky, Overhage, Chang, Frohlich, & Faus, 2009; Tang, 2003; Waegemann, 2003).

In the next section standards-based health information exchange that enable the exchange of information between PHRs, EMRs, and EHRs are discussed.

4.3 Standards-based Health Information Exchange

Interoperability between PHRs, EMRs, and EHRs is possible when these record systems are based on relevant standards to send and receive data (Christopherson, 2005; Sujansky et al., 2009). There are several standards required to produce the functional and semantic interoperability that is necessary to support the exchange of data between these systems, for example, a common patient identifier, reference information model, set of data elements, terminology, data structures, transport standard, and privacy and security standards (Blair & Cohn, 2005; Ferranti et al., 2006).

For some of these categories of standards a variety of standards development organizations have produced similar standards to address a similar purpose (Ferranti et al., 2006). A detailed discussion and breakdown of all the standards available in each of these categories is beyond the scope of this thesis. Future research should address investigating these various standards, and the standards currently adopted by both the private and the public sector of the South African healthcare system. There is currently little integration between the systems used in these two sectors (Harrison et al., 2007[a]). It is

necessary to investigate measures needed to ensure the integration of systems between these two sectors.

The adoption of relevant standards is necessary to facilitate the development of a health information exchange (HIE) (Shapiro et al., 2006). HIE can be defined as the capability and associated system(s) to, where appropriate and authorized, securely and effectively exchange health information electronically between various stakeholders (Christopherson, 2005; Deloitte, 2006; Simon, Evans, Benjamin, Delano, & Bates, 2009). These stakeholders could include patients, the primary healthcare provider, other healthcare providers, pharmacies, laboratories, radiology facilities, payers, government departments, and so forth.

There are examples of bilateral HIEs in the South African healthcare sector, for example, between private healthcare providers and medical schemes for the purposes of billing. The information exchanged in these bilateral exchanges is limited though, and not conducive to improved informational continuity of care. Achieving the HIE necessary to improve informational continuity of care will require multilateral HIEs (Christopherson, 2005).

There are four general business models related to HIEs (Deloitte, 2006):
▪ **Not-for-Profit:** Driven by their charter to help patients and the broader community in which they provide services.
▪ **Public Utility:** Created and maintained with the assistance of government funds and are provided direction by the government.
▪ **Provider and Payer Collaborative:** Created for/by certain healthcare providers and payers within a geographical region. These HIEs are either not-for-profit or for-profit but the focus remains on the collaboration and mutual benefit between the participating healthcare providers and payers.
▪ **For-Profit:** Created with private funding with the ultimate goal of reaping financial benefits from the HIE.

Independent of the business model adopted, the exchange of data in an HIE can occur in one of two ways: data can be pushed to or pulled from the HIE (HIMSS, 2009; HIMSS, 2010; Loonsk, 2010; Massengill, 2009; Memorial Healthcare System, 2010).

When data is pushed to the HIE its transmission is initiated solely by the sender. An example of pushing data to an HIE is when a primary healthcare provider refers a patient to a specialist and pushes relevant patient data from the medical record in his EMR system to the EMR system of the specialist. This ensures that the specialist has the relevant data about the patient available when he sees the patient for the first time. Another example is when blood test results for a patient are pushed from the pathologist lab to the medical record of the patient in the EMR system of the healthcare professional who ordered the tests.

Data is pulled from the HIE when the recipient solicits data from one or more sources and receives it in turn. An example is when a specialist sees a patient for the first time and realizes that more detailed information about the patient is needed to deliver appropriate care. The specialist will request data from the primary healthcare provider through the HIE and once the data is released, it can be pulled into the medical record of the patient in the EMR system of the specialist. A healthcare provider can search for data relating to a specific patient that may already be available in the HIE. If any such data is found the provider can pull it into the medical record of the patient in his EMR system.

It is not only the providers that make use of EMR systems that can benefit from the push and pull technology employed by HIEs (HIMSS, 2009; Marchand, 2010; Massengill, 2009). An HIE can make a web-based portal available where a provider can search for information on a certain patient and print it out, e-mail, or fax it. In terms of pushing information, it can happen by printing, e-mailing, or faxing the information where an EMR system is not in use.

As mentioned in the definition of an HIE it should be remembered that information will only be securely pushed and pulled between stakeholders where it is appropriate and authorized.

In the next section a technological model that allows standards-based HIE to occur between various electronic record systems to improve informational continuity of care in the South African healthcare landscape is proposed.

4.4 Improving Continuity of Care through the use of Electronic Records

This section proposes a technological model that implements PHRs, EMRs, and a multilateral public-utility standards-based HIE to promote informational continuity of care in the South African healthcare landscape. The inclusion of each component of this technological model is discussed and motivated.

4.4.1 Multilateral Public-utility Standards-based HIE

The technological model is based on a multilateral public-utility standards-based HIE to ensure the successful electronic exchange of health information between the various components of the proposed model. The multilateral nature of the HIE is necessary to ensure improved continuity of care between multiple stakeholders. A bilateral HIE would be insufficient to improve general informational continuity of care because it only allows HIE between, for example, a healthcare provider and payer, a healthcare provider and laboratory, and so forth.

Out of the four general business models related to HIEs discussed in the previous section, the public utility model would be the most appropriate when considering the South African healthcare landscape and the requirement of this technological model to improve informational continuity of care between multiple stakeholders. Once the NHI is implemented, the majority of funds to pay for healthcare services will flow via the South African government. This positions the South African government as the preferred funder of a national

HIE. National level government departments are seen as good initial investors since they are seen as the advocates of patient safety, quality, and community health (Deloitte, 2006). It is necessary for all stakeholders in both the public and private sector to realize that it is the responsibility of the Ministry of Health to exercise stewardship over the entire health system (Harrison et al., 2007[a]). This further motivates the appropriateness of the public utility model to ensure that the South African government exercise stewardship and provide direction in terms of national HIE across the entire healthcare system. In addition, the not-for-profit, provider and payer collaborative, and for-profit HIE models could all potentially hamper efforts to promote informational continuity of care if all relevant stakeholders are not included in the HIE.

The various components of the technological model should be based on relevant standards, as established by a national regulatory body, to ensure an effective HIE (Deloitte, 2006). There is currently little integration between the information systems used in the South African public and private sectors and it is recommended that measures should be implemented to ensure their integration. The establishment of a dedicated national health information standards body that is representative of all relevant stakeholders is necessary to ensure integration between public and private information systems and successful HIE (Harrison et al., 2007[a]).

4.4.2 Standards-based Interoperable EMRs

The primary data source for the HIE will be information contained in the standards-based interoperable EMRs of the various healthcare providers, including the primary healthcare provider of the patient. The reader will notice that whilst EMRs were included in the technological model, EHRs were excluded. There are various reasons for excluding EHRs from this technological model. The first relates to the fact that EHRs rely on the existence of EMRs to function and since EMR adoption is currently low in the South African healthcare landscape, EHRs are not currently viable. EHRs could prove to be valuable in the long-term, however, standards-based

interoperable EMRs are a viable solution to the immediate need to improve informational continuity of care in the South African healthcare landscape (President's Information Technology Advisory Committee, 2004). It has been stated that of all the HITs currently in use, EMRs have the most wide-ranging capabilities and thus the greatest potential to improve quality of care (Miller & Sim, 2004).

It has been shown that HIEs which allows each stakeholder to maintain control over their own EMR are more successful than HIEs that relies on centralized government databases, such as EHRs (Shapiro et al., 2006). As long as these distributed EMRs are based on relevant standards, healthcare providers that have adopted EMRs would still be able to exchange data through the HIE. While the technological model currently excludes EHRs, it does support the future adoption of EHRs through the standards-based nature of the proposed components. EHRs will ensure that aggregated data from various sources is always available without having to rely on the push and pull technologies described earlier, to obtain relevant data at the point of care. Whilst push and pull technologies are still used to populate the EHR, the EHR typically contains up-to-date patient information that is conveniently available from one central system at all times.

4.4.3 Standards-based Interconnected PHRs

A secondary, and optional, data source for the HIE will include individuals' interconnected PHRs.

Once the NHI is implemented in South Africa primary healthcare services will be re-engineered to focus mainly on health promotion and preventative care (Department of Health, 2011). PHRs can play a significant role in achieving these goals by enabling patients to better manage their care (Sprague, 2006). PHRs could be utilized to better educate patients about their medical conditions, improve adherence to medical and lifestyle changes, and engage them in medical decision-making. These features of a PHR are especially valuable to patients managing chronic conditions (President's Information

Technology Advisory Committee, 2004). Whilst a PHR may not be a major role player in improving informational continuity of care, its role in increasing health awareness could prove invaluable in promoting health and supporting healthcare providers in offering more effective preventative care as opposed to the South African healthcare system that is currently highly hospital-centric with a strong curative focus (Department of Health, 2011; Lehmann et al., 2006; Markle Foundation, 2004). PHRs, by allowing patients to take responsibility for their own health by managing their PHRs, could provide healthcare providers with an additional source of patient information and could aid in improving communication between the patient and his healthcare provider (Australian Medical Association, 2010).

4.4.4 The Proposed Technological Model

Figure 4.3 illustrates the technological model that implements PHRs, EMRs, and a multilateral public-utility standards-based HIE to promote informational continuity of care in the South African healthcare landscape.

The technological model thus proposes a decentralized scalable solution that allows patients improved health self-management through the use of their PHRs and improved informational continuity of care through a multilateral public utility standards-based HIE. This will allow data to be exchanged between various standards-based EMR systems, with standards-based PHRs providing an additional source of information to healthcare providers. This technological model does not exclusively benefit healthcare providers that adopt EMRs. For example, if a healthcare provider who uses an EMR refers a patient to a healthcare provider that has not adopted an EMR yet, or prescribe medication that must be collected from a pharmacy that does not support the e-prescribing features of an EMR system, there are still benefits that can be derived from the use of the EMR. The healthcare provider using the EMR can generate a more detailed referral letter from the EMR that will contain more relevant information than would normally be included in a short hand-written referral letter. The EMR system could be used to generate a prescription and print it out for the patient to take to the pharmacy, whilst still benefitting from
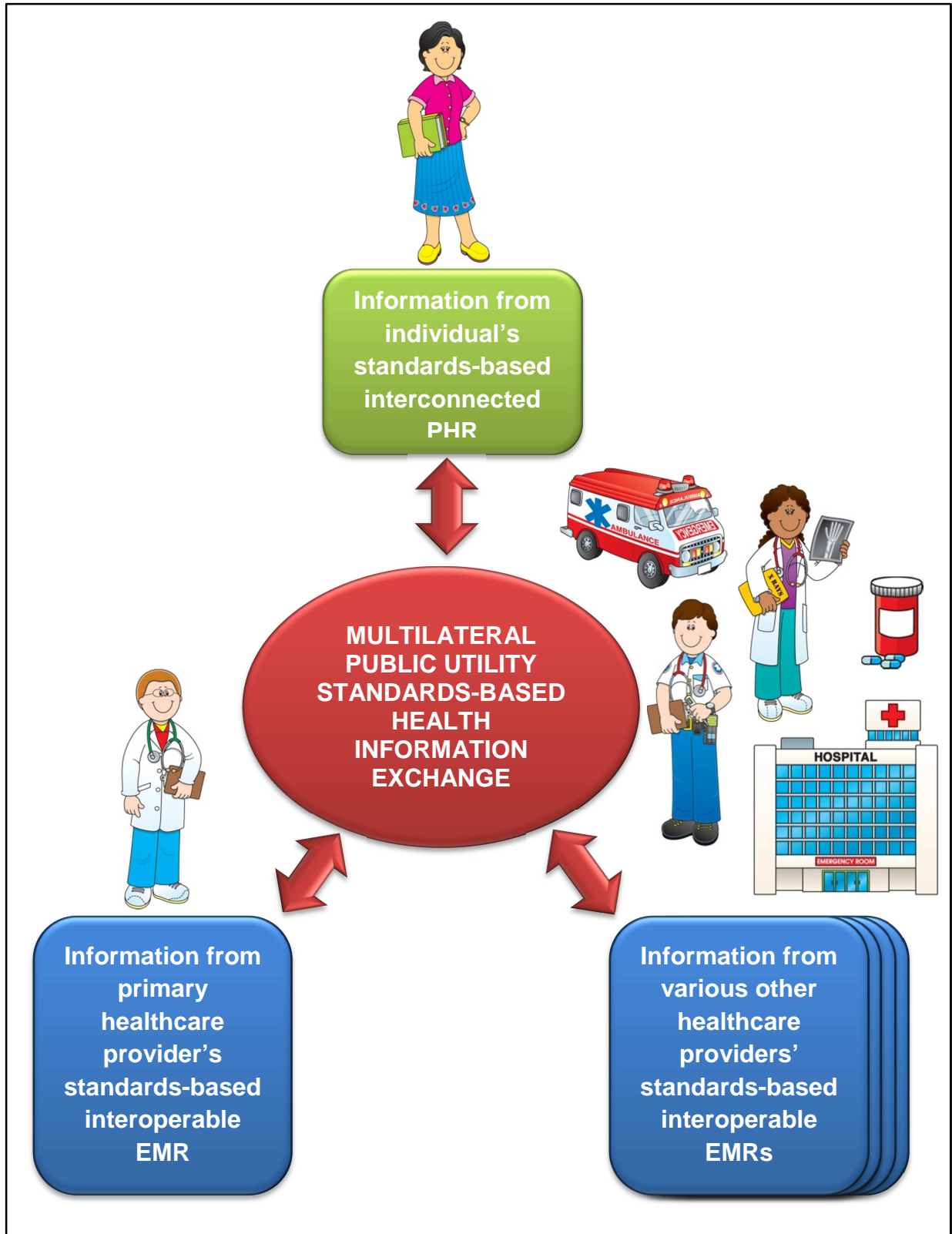
Figure 4.3: Proposed technological model to improve informational continuity of care in the South African healthcare landscape.

features such as checking for drug interactions, allergies, and so forth, and eliminate possible errors that could occur due to illegible handwriting on a handwritten prescription.

An example of a country that adopted an approach similar to the decentralized scalable approach to electronic record adoption proposed is Singapore. The approach adopted by Singapore is discussed to highlight the success of the decentralized scalable nature of such an approach and does not take the differences in size, population, per capita income, and so forth between South Africa and Singapore into account. Singapore adopted a phased approach as part of their Intelligent Nation 2015 (iN2015) program to realize their vision of "one Singaporean, one health record" (Health IT News, 2010). In 2004, their approach started with the roll-out of an EMR exchange to allow public hospitals to exchange in-patient data electronically. This was followed by a program initiated in 2006 to allow the seamless flow of information between GPs backed up by the establishment of a program in 2009 to promote EMR adoption by GPs. By 2009 the first phase of their PHR program was completed. Singapore is now in the process of implementing the first phase of a national EHR to enhance the quality of care offered to patients and to reduce health care costs. Phase 2 of the PHR program will involve the expansion of the functionalities offered, including integration with the national EHR.

The top-down, government-led centralized approach to information sharing that was initially adopted through the United Kingdom's (UK) National Programme for IT (NPfIT) has proved to be less successful than the scalable decentralized approach adopted by Singapore. The approach adopted by the UK imposed centrally chosen systems on healthcare providers and due to various failures are now being dismantled in favor of a decentralized approach (Currie, Finnegan, Gozman, & Koshy, 2011; DH Media Centre, 2011; Hitchcock, 2011) .

4.5 Conclusion

This chapter described the purpose of medical records and the problems associated with paper-based medical records. Electronic methods of record keeping can eliminate several of these problems and contribute to improved informational continuity of care. Several electronic record systems were discussed, including PHRs, EMRs, EHRs, and HIEs that allows these different types of electronic record systems to exchange data. The chapter concluded by presenting a technological model that employs PHRs, EMRs, and an HIE that has the potential to improve informational continuity of care in the South African healthcare landscape. To ensure the success of such a technological model, it is necessary to understand the factors that need to be addressed to encourage the adoption and meaningful use of HITs such as electronic records. In the next chapter, the results of a Delphi study conducted to determine these factors is discussed.

CHAPTER 5

A SOUTH AFRICAN PERSPECTIVE ON FACTORS THAT IMPACT THE ADOPTION AND MEANINGFUL USE OF HEALTH INFORMATION TECHNOLOGIES

In the previous chapter problems associated with traditional paper-based medical records were highlighted and various HITs that can address these problems were described. The chapter concluded by presenting a model that employs appropriate HITs to address the problem of informational continuity of care in the South African healthcare landscape.

In this chapter factors that need to be addressed to encourage the adoption and meaningful use of such HITs in the South African healthcare landscape are explored. This chapter reports on the results of a Delphi study conducted to identify such factors.

In the next chapter the main objective of this research project will be addressed through the formulation of guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape in order to improve continuity of care.

5.1 Introduction

A three-round Delphi study was employed to identify factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare sector. This chapter reports on the results of this Delphi study, focusing on the design of the questionnaire for each round, and the analysis of the contributions after each round. Finally, a list of factors that require urgent attention to encourage the adoption and meaningful use of HITs is presented.

It is important to explore the heterogeneity of the Delphi panel prior to reporting on the results of each round. As described in Chapter 2, diversity in the panel leads to better performance since it allows for a wider range of perspectives. While there is no specific tool that can be used to measure the heterogeneity of the group, the description of the Delphi panel in the next section indicates that there was enough diversity in the panel to allow for different perspectives to emerge.

5.2 The Delphi Panel

A database containing the names and e-mail addresses of current and former members of the South African Health Informatics Association (SAHIA), and individuals who have attended health informatics related events in South Africa was obtained from SAHIA to identify participants who would be suitably knowledgeable regarding the adoption and meaningful use of HITs in the context of the South African healthcare landscape. SAHIA is an independent organization registered as a Section 21 company formed to promote the professional application of health informatics in South Africa. It aims to represent South African health informatics nationally and internationally, most notably through its membership of the International Medical Informatics Association (IMIA) (SAHIA, 2011). From this database, 196 individuals were e-mailed in April 2011 to invite them to take part in the Delphi study. A further 25 individuals were invited to participate in the Delphi study based on

recommendations from other researchers active in health informatics, and recommendations from individuals who responded to the first round of invitations. Although Delphi studies are usually conducted by mail, the use of e-mail can speed up the communication process and was used as the mode of communication for this Delphi study (Loo, 2002). Delivery receipts were activated and out of the total of 221 e-mails that were sent 37 could not be delivered, assumedly due to invalid e-mail addresses.

The first round questionnaire was sent out with the initial invitation and 21 individuals returned their completed questionnaires, and became the members of the Delphi panel for this study. This falls well within the range of recommendations for the size of a Delphi panel, as discussed in Chapter 2.

This Delphi study was completed in three rounds and all 21 participants that returned their questionnaires during the first round took part in all three rounds of the Delphi study. Such a high retention rate indicates a high level of interest in the problem being addressed (O'Loughlin & Kelly, 2004).

Participants were asked to provide the following background details:
- Their current job title, department, and organization.
- Whether their experience was mostly in the private or the public sector.
- Whether their experience was mostly in the health or ICT sector.
- A description summarizing their experience in the South African healthcare/health informatics/ICT sector.

Job titles of the participants who agreed to take part in this study included managers (including clinical-, clinical risk-, contracts-, division-, project-, senior account-, and senior operations managers), heads of departments, chief executive officers, directors, and presidents. Other job titles included specialists (including an EMR- and a healthcare informatics sales specialist), consultants, researchers, and senior facilitators.

The organizations in which these participants work, ranged from public and private healthcare providers, medical aids, ICT companies, research institutions, departments of health, agencies providing ICT services to the government, and not-for-profit organizations.

Figure 5.1 indicates experience per sector and per industry of the participants. The number of participants (out of 21) per sector and industry respectively, is indicated.
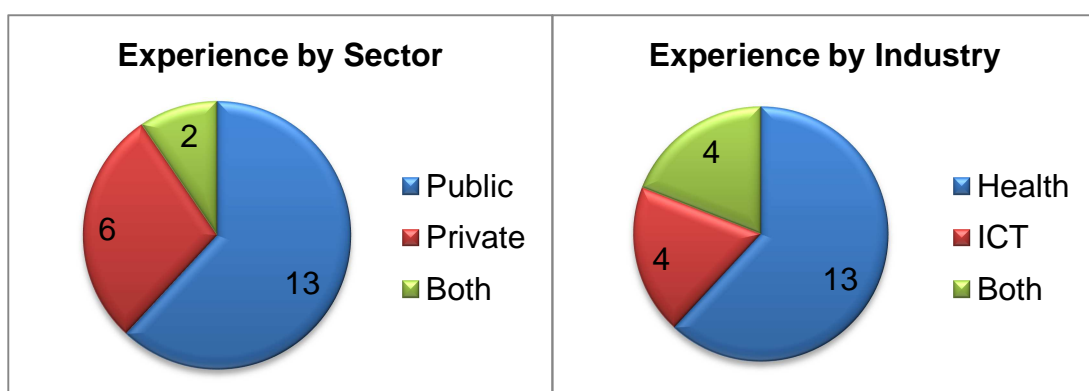
Figure 5.1: Participant experience per sector and industry.

Any descriptions relating to the experience of participants are not included in this thesis to protect their anonymity.

In the following sections the design of the questionnaire used for each round of the study, and the analysis and results of each round are described.

5.3 Round 1

5.3.1 The Round 1 Questionnaire

The questionnaire developed for Round 1 (see Appendix A) was unstructured and presented participants with a single open-ended question, namely:

"Based on your experience and knowledge of the South African healthcare landscape, describe as many aspects/barriers that should be addressed to encourage the adoption and meaningful use of HITs."

The unstructured, open-ended nature of the question allowed participants to state their own ideas, views, and opinions without any restrictions.

In the next section the analysis of the ideas, views, and opinions expressed by the participants who returned the Round 1 questionnaire is described.

5.3.2 Round 1 Analysis

Participants were labelled alphabetically, starting with *Participant* A, as the completed questionnaires were received. A total of 21 completed questionnaires were received during Round 1 of the Delphi study (see Appendix B). The responses received from participants ranged from short bullet point lists to multiple pages of detailed discussions. The responses received were analysed qualitatively, incorporating two phases. The purpose of these two phases was to collate the responses from the participants into a master list of aspects to incorporate into the Round 2 questionnaire.

5.3.2.1 Phase 1

The first phase of analysis involved analysing the ideas, views, and opinions expressed by participants and grouping similar aspects together by coding these aspects using broad key phrases (see Appendix C). Where several different responses appeared to relate to the same issue, the researcher grouped them together under a broad key phrase in an attempt to provide one universal description. It has been suggested that infrequent occurring aspects may be omitted to keep the resulting master list manageable, but this goes against the basic principles of the Delphi technique (Hasson et al., 2000). The researcher thus included key phrases for all unique aspects identified. An inductive approach to the analysis of the data was followed (Oates, 2006).

The first phase of analysis identified 33 unique aspects, as presented in Table 5.1. Table 5.1 indicates the following:

- The key phrases representing the 33 aspects identified during the first phase of analysis.
- The number of aspects identified by each participant.
- The number of times each aspect was identified.

The promoter of this research, to ensure that the list of 33 phrases fairly represented the ideas, views, and opinions expressed by participants, worked through a sample of the Round 1 questionnaires to confirm that researcher bias did not influence the key phrases identified, and the grouping of aspects under these phrases. The promoter found that researcher bias did not influence the key phrases identified and after discussion with the researcher the only change made was to the grouping of aspects, which was to group all aspects related to education, training, and awareness under one key phrase where the researcher previously had these aspects grouped under three separate key phrases. Once this process was completed, the researcher commenced the second phase of analysis.

5.3.2.2 Phase 2

Phase 2 of the analysis involves grouping all of the aspects relating to a key phrase together (see Appendix D). Each grouping was analysed individually to derive factors that could influence the adoption and meaningful use of HITs. Table 5.2 represents the list of 58 factors that were constructed from the initial groupings. This list represents a summary of 58 unique aspects that were addressed by the participants. Note, that for some key phrases there were more than one factor derived. This occurred in situations where the individual aspects grouped together under the broad key phrase addressed varying aspects related to the key phrase.

KEY PHRASE REPRESENTING CONCEPT IDENTIFIED	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	NUMBER OF TIMES IDENTIFIED
1. Guidelines, policies, and procedures	X		X		X		X	X	X		X				X	X	X	X	X			12
2. User Support	X			X		X		X			X		X			X	X				X	9
3. Management and/or decision maker support	X	X		X		X	X	X			X		X	X	X	X	X				X	13
4. Quality control and accountability	X					X			X				X	X							X	6
5. Data capturing	X			X									X			X					X	5
6. Staff capacity	X	X	X	X	X		X		X		X		X	X	X	X	X					13
7. Education, training, and awareness	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X				X	16
8. Infrastructure	X	X	X	X	X			X			X	X		X	X	X	X		X		X	14
9. Unrealistic expectations		X														X						2
10. Meaningful use		X					X	X												X	X	5
11. Standardization		X		X			X	X	X	X	X	X	X	X	X	X		X	X		X	15
12. Open source		X																				1
13. Cost			X			X		X	X	X	X		X	X	X	X						10
14. Return on investment			X					X													X	3
15. Resistance			X	X		X		X	X		X				X	X		X			X	10
16. Security and privacy			X	X				X			X	X		X							X	7
17. Theft			X																			1
18. Change management			X	X					X				X			X		X			X	7
19. Business processes and workflow			X			X			X	X	X	X	X			X	X					9
20. After-sales and technical support			X	X			X				X	X				X					X	7
21. System availability and reliability			X																		X	2
22. Doctor-patient relationship				X																		1
23. Incentives and motivation				X				X					X			X						4
24. Government				X	X			X	X	X	X		X	X		X	X					10
25. Patient identifier				X				X	X													3
26. Clinical and administrative needs					X	X		X		X	X		X	X		X					X	9
27. Mobile health and wireless technologies											X	X										2
28. Citizen focused											X			X		X				X		4
29. Career path														X	X							2
30. Priority															X							1
31. Implementation															X	X	X		X			4
32. Stakeholders involved																X						1
33. Accessibility																X						1
NUMBER OF ASPECTS IDENTIFIED BY PARTICIPANT	8	8	13	12	9	7	5	10	12	9	13	9	14	11	11	19	14	2	5	3	15	

Table 5.1: Detailed overview of key aspects identified during the phase 1 analysis of Delphi Round 1 questionnaires.

The researcher promoter again checked this master list of factors to ensure that there was no researcher bias before the researcher developed the Round 2 questionnaire.

KEY PHRASE	FACTORS THAT COULD INFLUENCE THE ADOPTION AND MEANINGFUL USE OF HITs
1. Guidelines, policies, and procedures	Organizations that are interested in implementing technology often end up not doing so because there are no clear guidelines on what to consider when implementing technology and how to prepare the environment for the implementation.
	Guidelines, policies, and procedures to guide sustainable implementation of ever-changing technological solutions in the healthcare environment are not available.
	There is a lack of capacity and absence of necessary structures to implement, execute, support, and monitor existing policies and regulations in terms of technology implementations.
2. User Support	High staff turnover results in lack of capacity and consistency in efforts to implement technology.
	Users are not properly trained and motivated to ensure buy-in. This results in resistance and lack of commitment.
	Lack of user involvement at all stages also results in lack of buy-in.
3. Management and/or decision maker support	Decision makers and management do not provide adequate direction, leadership, and support in terms of technology adoption.
	Lack of ownership and accountability makes it difficult to sustain technology implementations.
4. Quality control and accountability	Health information captured using technology solutions are considered to be unreliable because there is a lack of quality control mechanisms.
	There is a lack of accountability mediated through audit trails.
5. Data capturing	The user interface of data capturing forms offered by technology solutions are not conducive to ease of use and accurate data capturing.
6. Staff capacity	Staff is overburdened due to staff shortages and heavy patient loads which results in a lack of capacity to support technology implementation and use.

(Table 5.2 continued)

KEY PHRASE	FACTORS THAT COULD INFLUENCE THE ADOPTION AND MEANINGFUL USE OF HITs
7. Education, training, and awareness	Lack of computer literacy skills amongst healthcare staff.
	Poor insight and lack of understanding into the role that technology solutions could play in improving healthcare delivery.
	There is a lack of appropriate training to ensure meaningful use of the system once it is implemented.
	Decision makers are not trained to understand the technology solutions offered and how it will meet requirements for future expansion.
	There is a lack of awareness and a deeper understanding of the value that technology could have in supporting the organization and healthcare delivery.
8. Infrastructure	Lack of adequate connectivity and communication infrastructure in South Africa.
	Lack of reliable electricity supply.
	Insufficient ICT resources on site.
	Lack of space for ICT resources on site.
	Physical layout on site restricts easy interaction between technological system and workflow.
9. Unrealistic expectations	Users have unrealistic expectations and expect sophisticated technological solutions to immediately solve all problems. These expectations are often not met at the onset of the implementation of the technology solution which creates resistance to future implementations.
10. Meaningful use	Users do not make meaningful use of the system once it is implemented because they often do not have confidence in the information provided by the system and are thus not willing to make decisions based on this information.
11. Standardization	Lack of standardization of technological solutions hampers integration and interoperability between systems.
	Lack if implementation, enforcement, and monitoring of compliance to relevant healthcare technology standards.
12. Open source	Lack of open source solutions.
13. Cost	Cost of hardware, software, maintenance, and support is prohibitive.
	Lack of funding to spend on technology solutions.
	Poor planning in terms of budgeting for technology implementations.
14. Return on investment	There is not sufficient evidence on meaningful return on investment for technology implementations.
15. Resistance	There is resistance to change from current paper-based systems and way of doing things.
	Fear and a lack of computer literacy skills results in resistance to the adoption of technology.
16. Security and privacy	Concerns relating to the confidentiality, security, and privacy of patient data are not adequately addressed.
17. Theft	There are concerns relating to the theft of hardware.

(Table 5.2 continued)

KEY PHRASE	FACTORS THAT COULD INFLUENCE THE ADOPTION AND MEANINGFUL USE OF HITs
18. Change management	Implementing technology solutions requires significant change in an organization. There is often a lack of a comprehensive change management strategy which results in the organization not being properly prepared for the level of change required.
19. Business processes and workflow	Poor mapping of system capabilities to business processes and workflow in the complex healthcare environment.
20. After-sales and technical support	Lack of on-site technical support results in unacceptable response times when support is needed.
	Lack of adequate Service Level Agreements (SLAs) results in unacceptable response times to queries and requests for support
	Poor after-sales support results in inadequate maintenance, customization, and enhancement of systems once implemented.
21. System availability and reliability	Slow, unreliable, unavailable systems results in users losing confidence in the technology solution and thus not using it.
22. Doctor-patient relationship	There is a perception that the use of technology will have a negative impact on the doctor-patient relationship.
23. Incentives and motivation	It is necessary to introduce incentives to using technology to motivate staff and increase staff retention.
24. Government	There is a lack of a Government backed drive to implement technology solutions.
	Lack of a national framework and guidelines for the implementation of technological systems to address problems with current systems.
25. Patient identifier	Lack of common unique identifier to track patients.
26. Clinical and administrative needs	Available technological solutions do not meet the clinical needs of the healthcare sector.
	Available technological solutions do not meet the administrative needs of the healthcare sector.
27. Mobile health and wireless technologies	Potential benefits offered by wireless technologies and mobile devices are not exploited to its fullest potential.
28. Citizen focused	Citizens are not engaged and aware of the benefits that technology could offer in terms of healthcare delivery.
29. Career path	A lack of an adequate career path in health informatics results in disinterest and little incentive to make the effort to learn about available technology.
30. Priority	The provision of basic health care is top priority which leaves little capacity to spend time, effort, and funds on implementing and using new technologies instead of current systems.

(Table 5.2 continued)

KEY PHRASE	FACTORS THAT COULD INFLUENCE THE ADOPTION AND MEANINGFUL USE OF HITs
31. Implementation	Cost-cutting mechanisms such as aggressive time scales for implementation are detrimental to the long term success of technology implementations.
	Project implementations take too long to complete or are not completed at all.
	To ensure the desired effect on quality of care it is necessary to assess the proposed implementation properly and consider cost-effectiveness.
	Potential advantages offered by cloud computing are not exploited to its fullest potential.
32. Stakeholders involved	Conflicting expectations and dependence on various stakeholders hampers implementation.
33. Accessibility	Some organizations in rural areas are inaccessible in terms of service delivery (especially IT).

Table 5.2: Key phrases and unique factors identified during Delphi Round 1.

5.4 Round 2

5.4.1 The Round 2 Questionnaire

The 58 factors derived from the analysis of the Round 1 responses formed the basis for the Round 2 questionnaire. The Round 2 questionnaire was structured and participants were invited to rate the importance of each factor to identify the factors that require the most urgent attention to encourage the adoption and meaningful use of HITs in South Africa (see Appendix E).

Participants were asked to rate a factor as:

- Very important.
- Important.
- Slightly important.
- Unimportant.

Participants were provided with a detailed rating scale, as presented in Table 5.3.

VERY IMPORTANT (A most relevant factor)	• First-order priority. • Has direct bearing on the adoption and meaningful use of HITs. • Must be resolved or dealt with.
IMPORTANT (Is relevant to the issue)	• Second-order priority. • Significant impact on the adoption and meaningful use of HITs but not until other factors are addressed. • Does not have to be fully resolved or dealt with.
SLIGHTLY IMPORTANT (Insignificantly relevant)	• Third-order priority. • Has little importance on the adoption and meaningful use of HITs. • Not a determining factor or major issue.
UNIMPORTANT (No priority)	• No relevance. • No measureable effect on the adoption and meaningful use of HITs. • Should be dropped as an aspect/barrier to consider.

Table 5.3: Rating scale provided to participants in the Delphi Round 2 questionnaire.

5.4.2 Round 2 Analysis

All 21 participants who partook in Round 1 returned their Round 2 questionnaires (see Appendix F). The Round 2 questionnaires that were returned were analysed in terms of the importance rating of the factors (see Appendix G).

The responses from participants to the Round 2 questionnaire was analysed according to the system proposed by De Loe (1995), as described in Chapter 2. This approach allows for the level of importance for each factor to be identified, and the degree to which the participants agreed on the level of importance. The polarity of responses is calculated to determine whether responses were polarized, for example, half of the participants rating a factor as *very important* and half rating it as *unimportant*.

All responses were captured in an Excel document to enable the researcher to calculate the number of responses (expressed as a percentage) related to the level of importance for each factor, and the polarity of these responses. All calculations were checked by a statistician from the Statistics Department at the Nelson Mandela Metropolitan University (NMMU) and are confirmed as correct.

Table 5.4 summarizes the results of Round 2 and indicates the following:

- Responses from participants (expressed as a percentage).
- The polarity.
- The level of importance on which consensus was reached (where consensus was reached).
- The degree of consensus.

The polarity, level of importance on which consensus was reached, and the degree of consensus were determined according to the system proposed by De Loe (1995), as described in Chapter 2.

The polarity indicates whether the responses of the participants were polarized and is expressed as being either strong if the polarity is greater than or equal to 1.5; weak if it is greater than or equal to 1.2 but less than 1.5; or none if it is less than 1.2. In Table 5.4 the polarity is indicated as follows:

- S: Strong.
- W: Weak.
- N: None.

Consensus is expressed as the degree to which participants agree on the rating of an item. For the degree of consensus to be high, medium, low, or none, the following requirements had to be met:

- High: 70% of ratings in one rating category or 80% in two contiguous rating categories.
- Medium: 60% of ratings in one rating category or 70% in two contiguous rating categories.
- Low: 50% of ratings in one rating category or 60% in two contiguous rating categories.
- None: Less than 60% of ratings in two contiguous rating categories.

The level of support for a specific rating can be indicated as the individual rating category, or as two contiguous rating categories. In Table 5.4 the level of importance is indicated as:

- VI: Very important.
- VI-I: Very important to important.
- I: Important.
- I-SI: Important to slightly important.
- SI: Slightly important.
- SI-U: Slightly important to unimportant.
- U: Unimportant.
- A: Ambiguous.

The level of support for a specific rating can be ambiguous in the following situations (De Loe, 1995):

- If the degree of consensus is *low* and the ratings are divided equally between two categories, for example, rating distributions of: 50% *very important*, 0% *important*, 0% *slightly important*, and 50% *unimportant*.
- If the ratings are distributed in a pattern such as the following example: 25% *very important*, 45% *important*, 25% *slightly important*, and 5% *unimportant*. In such a case the degree of consensus would be *medium*, but the level of importance could be either *very important to important* or *important to slightly important*.

Clear consensus ranging from high to low was reached on the level of importance for 52 of the factors, while for 3 of the factors consensus was determined to be ambiguous, and for 3 factors consensus could not be reached.

The factors in Table 5.4 were sorted according to the level of importance and degree of consensus. The first 40 factors were rated as being *very important to important*, the next 11 were *important to slightly important* and one factor was rated as *slightly important to unimportant*. Six factors where the level of

consensus was ambiguous or consensus could not be reached appear last in the table.

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
1	There is a lack of awareness and a deeper understanding of the value that technology could have in supporting the organization and healthcare delivery.	57	43	0	0	N 0.24	VI-I 100%	High
2	Lack of ownership and accountability makes it difficult to sustain technology implementations.	43	57	0	0	N 0.24	VI-I 100%	High
3	Decision makers and management do not provide adequate direction, leadership, and support in terms of technology adoption.	71	24	5	0	N 0.32	VI-I 95%	High
4	Implementing technology solutions requires significant change in an organization. There is often a lack of a comprehensive change management strategy which results in the organization not being properly prepared for the level of change required.	67	29	5	0	N 0.33	VI-I 95%	High
5	Staff is overburdened due to staff shortages and heavy patient loads which results in a lack of capacity to support technology implementation and use.	57	38	5	0	N 0.34	VI-I 95%	High
6	There is a lack of appropriate training to ensure meaningful use of the system once it is implemented.	38	57	5	0	N 0.32	VI-I 95%	High
7	Decision makers are not trained to understand the technology solutions offered and how it will meet requirements for future expansion.	76	14	10	0	N 0.41	VI-I 90%	High
8	Users are not properly trained and motivated to ensure buy-in. This results in resistance and lack of commitment.	52	38	10	0	N 0.44	VI-I 90%	High
9	Lack of standardization of technological solutions hampers integration and interoperability between systems.	52	38	10	0	N 0.44	VI-I 90%	High
10	Poor mapping of system capabilities to business processes and workflow in the complex healthcare environment.	43	48	10	0	N 0.41	VI-I 90%	High
11	Lack of user involvement at all stages also results in lack of buy-in.	38	52	10	0	N 0.39	VI-I 90%	High

(Table 5.4 continued)

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
12	Lack of implementation, enforcement, and monitoring of compliance to relevant healthcare technology standards.	33	57	5	5	N 0.54	VI-I 90%	High
13	Lack of adequate Service Level Agreements (SLAs) results in unacceptable response times to queries and requests for support	33	57	5	5	N 0.54	VI-I 90%	High
14	There is a lack of capacity and absence of necessary structures to implement, execute, support, and monitor existing policies and regulations in terms of technology implementations.	71	14	14	0	N 0.53	VI-I 86%	High
15	Guidelines, policies, and procedures to guide sustainable implementation of ever-changing technological solutions in the healthcare environment are not available.	57	29	14	0	N 0.53	VI-I 86%	High
16	Poor insight and lack of understanding into the role that technology solutions could play in improving healthcare delivery.	48	38	14	0	N 0.51	VI-I 86%	High
17	A lack of an adequate career path in health informatics results in disinterest and little incentive to make the effort to learn about available technology.	43	43	10	5	N 0.66	VI-I 86%	High
18	Users have unrealistic expectations and expect sophisticated technological solutions to immediately solve all problems. These expectations are often not met at the onset of the implementation of the technology solution which creates resistance to future implementations.	19	67	10	5	N 0.48	VI-I 86%	High
19	Lack of common unique identifier to track patients.	48	33	14	5	N 0.75	VI-I 81%	High
20	Lack of computer literacy skills amongst healthcare staff.	43	38	19	0	N 0.56	VI-I 81%	High
21	Slow, unreliable, unavailable systems results in users losing confidence in the technology solution and thus not using it.	33	48	14	5	N 0.66	VI-I 81%	High
22	High staff turnover results in lack of capacity and consistency in efforts to implement technology.	29	52	19	0	N 0.47	VI-I 81%	High
23	The provision of basic health care is top priority which leaves little capacity to spend time, effort, and funds on implementing and using new technologies instead of current systems.	29	52	10	10	N 0.76	VI-I 81%	High

(Table 5.4 continued)

	FACTOR	Very Important	Important	Slightly Important	Unimportant	POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		RESPONSES (% Rounded)						
24	Lack of a national framework and guidelines for the implementation of technological systems to address problems with current systems.	62	14	24	0	N 0.71	VI-I 76%	Medium
25	Insufficient ICT resources on site.	57	19	24	0	N 0.70	VI-I 76%	Medium
26	Poor planning in terms of budgeting for technology implementations.	52	24	19	5	N 0.85	VI-I 76%	Medium
27	Organizations that are interested in implementing technology often end up not doing so because there are no clear guidelines on what to consider when implementing technology and how to prepare the environment for the implementation.	38	38	24	0	N 0.60	VI-I 76%	Medium
28	Health information captured using technology solutions are considered to be unreliable because there is a lack of quality control mechanisms.	33	43	19	5	N 0.71	VI-I 76%	Medium
29	The user interface of data capturing forms offered by technology solutions are not conducive to ease of use and accurate data capturing.	33	43	24	0	N 0.56	VI-I 76%	Medium
30	Available technological solutions do not meet the clinical needs of the healthcare sector.	33	43	14	10	N 0.86	VI-I 76%	Medium
31	Lack of on-site technical support results in unacceptable response times when support is needed.	29	48	19	5	N 0.67	VI-I 76%	Medium
32	Citizens are not engaged and aware of the benefits that technology could offer in terms of healthcare delivery.	29	48	14	10	N 0.81	VI-I 76%	Medium
33	Lack of adequate connectivity and communication infrastructure in South Africa.	57	14	29	0	N 0.78	VI-I 71%	Medium
34	Some organizations in rural areas are inaccessible in terms of service delivery (especially IT).	43	29	14	14	N 1.14	VI-I 71%	Medium
35	There is a lack of accountability mediated through audit trails.	38	33	19	10	N 0.95	VI-I 71%	Medium
36	Lack of funding to spend on technology solutions.	24	48	19	10	N 0.79	VI-I 71%	Medium
37	There is a lack of a Government backed drive to implement technology solutions.	38	29	24	10	N 1.00	VI-I 67%	Low
38	Users do not make meaningful use of the system once it is implemented because they often do not have confidence in the information provided by the system and are thus not willing to make decisions based on this information.	33	33	29	5	N 0.81	VI-I 67%	Low

(Table 5.4 continued)

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
39	Conflicting expectations and dependence on various stakeholders hampers implementation.	33	33	24	10	N 0.94	VI-I 67%	Low
40	Potential benefits offered by wireless technologies and mobile devices are not exploited to its fullest potential.	38	24	33	5	N 0.90	VI-I 62%	Low
41	There are concerns relating to the theft of hardware.	10	43	38	10	N 0.63	I-SI 81%	High
42	There is resistance to change from current paper-based systems and way of doing things.	24	48	29	0	N 0.52	I-SI 76%	Medium
43	Cost-cutting mechanisms such as aggressive time scales for implementation are detrimental to the long term success of technology implementations.	24	48	29	0	N 0.52	I-SI 76%	Medium
44	Physical layout on site restricts easy interaction between technological system and workflow.	19	48	29	5	N 0.63	I-SI 76%	Medium
45	Concerns relating to the confidentiality, security, and privacy of patient data are not adequately addressed.	24	43	33	0	N 0.56	I-SI 76%	Medium
46	Lack of space for ICT resources on site.	19	38	38	5	N 0.68	I-SI 76%	Medium
47	Cost of hardware, software, maintenance, and support is prohibitive.	14	33	43	10	N 0.73	I-SI 76%	Medium
48	There is a perception that the use of technology will have a negative impact on the doctor-patient relationship.	14	29	48	10	N 0.73	I-SI 76%	Medium
49	To ensure the desired effect on quality of care it is necessary to assess the proposed implementation properly and consider cost-effectiveness.	29	38	33	0	N 0.62	I-SI 71%	Medium
50	Lack of reliable electricity supply.	24	38	33	5	N 0.73	I-SI 71%	Medium
51	Poor after-sales support results in inadequate maintenance, customization, and enhancement of systems once implemented.	24	29	43	5	N 0.78	I-SI 71%	Medium
52	Lack of open source solutions.	5	10	57	29	N 0.56	SI-U 86%	High
53	Fear and a lack of computer literacy skills results in resistance to the adoption of technology.	24	52	24	0	N 0.48	A VI-I or I-SI 76%	Medium
54	Project implementations take too long to complete or are not completed at all.	24	48	24	5	N 0.66	A VI-I or I-SI 71%	Medium

(Table 5.4 continued)

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
55	There is not sufficient evidence on meaningful return on investment for technology implementations.	24	38	24	14	N 0.97	A VI-I or I-SI 62%	Low
56	Available technological solutions do not meet the administrative needs of the healthcare sector.	29	29	24	19	N 1.17	-	None
57	It is necessary to introduce incentives to using technology to motivate staff and increase staff retention.	24	29	19	29	W 1.30	-	None
58	Potential advantages offered by cloud computing are not exploited to its fullest potential.	29	14	33	24	W 1.30	-	None

Table 5.4: Summarized results of Delphi Round 2.

The results of Round 2 were used to design the Round 3 questionnaire, as described in the following section.

5.5 Round 3

5.5.1 The Round 3 Questionnaire

The results from Round 2 were used to compile the Round 3 questionnaire (see Appendix H). This questionnaire was split into two sections, Section A and Section B. Section A contained the 52 factors on which consensus was reached during Round 2, whilst Section B contained the 6 factors on which consensus could not be reached, or where consensus was determined to be ambiguous. An Information Sheet explaining how to complete the questionnaire was sent to the participants. Each participant received a personalized questionnaire indicating their response to the level of importance for each factor during the previous round, and a summary of the response of the panel. This allowed the individual to see where their response lay in relation to that of the total panel. After comparing and reflecting on their

personal and the ratings of the panel, participants were allowed to change their rating of the level of importance, if so desired.

The purpose of Section A was to validate the responses to the factors on which consensus was reached, and to determine whether it was possible to improve the degree of consensus where the degree was only medium or low. The following were indicated to participants in Section A:

- The original factor.
- The level of importance as determined during Round 2.
- The degree of consensus as determined during Round 2.
- The level of importance as rated by the individual participant during Round 2.
- The number of responses for each level of importance (expressed as a percentage).

Colour coding was used to indicate whether the response of the participant was in line with the level of importance at which consensus was reached. If a response was highlighted in green, it meant that the response of the participant was in line with the level of importance at which consensus was reached. If his response was highlighted in red, it meant that his response was not in line with the level of importance at which consensus was reached. The percentages indicating the level at which consensus was reached were highlighted in blue.

The purpose of Section B was to determine whether it was possible to reach consensus on factors where consensus was not reached or where the level of importance was determined to be ambiguous. The following were indicated to participants in Section B:

- The original factor.
- The level of importance as rated by the individual participant during Round 2.
- The number of responses for each level of importance (expressed as a percentage).

Colour coding was again used to indicate whether a response was in line with the majority response from other participants. If a response was highlighted in green, it meant that the response of the participant was in line with the response from the majority of participants, and if his response was not in line with the majority, his response was highlighted in red. The percentage(s) indicating the majority of responses were highlighted in blue.

For both Sections A and B participants were invited to consider the panel response for each factor and to rate the level of importance of each factor again. They were allowed to revise their original rating if so desired. If their Round 3 rating was not in line with the level at which consensus was reached, or the majority of responses, they were asked to provide a short motivation for their deviation from the majority.

5.5.2 Round 3 Analysis

All of the 21 participants returned their questionnaires (see Appendix I). The responses were analysed by employing the same analysis approach as used to analyse the Round 2 results, as described in Section 5.4.2 (see Appendix J). The focus was again on determining the level of importance, and the degree of consensus. The motivations provided by the participants for their variation from the judgement of the majority provided valuable qualitative data that draws attention to the heterogeneous ideas, views, and opinions of the panel.

The analysis of the Round 3 questionnaires indicated that 42 of the original 58 factors were rated as being *very important to important* with the degree of consensus ranging from high to low. Since these factors were derived from the contributions made by participants themselves during Round 1, it is not surprising that the majority of the factors were rated as being *very important to important*. Eleven factors were rated as being *important to slightly important* with the degree of consensus ranging from high to medium. Only two factors were rated as being *slightly important to unimportant* and here the degree of consensus is high and low respectively.

There were two factors where the level of importance was ambiguous, and one factor where the degree of consensus was none. For both of the factors where the level of importance was ambiguous the degree of consensus was medium, but the level of importance could be either *very important to important*, or *important to slightly important*.

Table 5.5 summarizes the results of the third round and indicates the results of the previous round for comparison. The factors are sorted according to level of importance and degree of consensus. Round 2 results are highlighted in yellow and Round 3 results in blue. Appendix K contains the detailed Round 3 results and indicates the motivations provided by participants for not agreeing with the majority. Two participants did not include individual motivations for each factor where they differed from the majority. When the researcher e-mailed them to request individual motivations they simply forwarded a single motivation for their overall disagreement with the majority. These generic motivations were included in Appendix K but were not considered in the interpretation of results because they were deemed too generic to apply to each specific factor.

This Delphi study was completed within three rounds and the decision to end the study after three rounds was made based on recommendations to not have more than three rounds to reduce participant fatigue (De Meyrick, 2003; Hasson et al., 2000; Keeney et al., 2001; Linstone & Turoff, 1975; Loo, 2002; Mullen, 2003; Powell, 2003). Since there is not such a strong emphasis on reaching consensus in a Policy Delphi the researcher considered three rounds to be sufficient to satisfy the original purpose of the Delphi study, which was to identify factors that need to be considered to encourage the adoption and meaningful use of HITs in the South African healthcare landscape.

After the results of the Delphi study was finalized, a report containing these results was e-mailed to all participants (see Appendix L).

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
1	Staff is overburdened due to staff shortages and heavy patient loads which results in a lack of capacity to support technology implementation and use.	57	38	5	0	N 0.34	VI-I 95%	High
		57	**43**	**0**	**0**	**N 0.24**	**VI-I 100%**	**High**
2	Lack of ownership and accountability makes it difficult to sustain technology implementations.	43	57	0	0	N 0.24	VI-I 100%	High
		38	**62**	**0**	**0**	**N 0.32**	**VI-I 100%**	**High**
3	Decision makers and management do not provide adequate direction, leadership, and support in terms of technology adoption.	71	24	5	0	N 0.32	VI-I 95%	High
		71	**24**	**5**	**0**	**N 0.32**	**VI-I 95%**	**High**
4	Implementing technology solutions requires significant change in an organization. There is often a lack of a comprehensive change management strategy which results in the organization not being properly prepared for the level of change required.	67	29	5	0	N 0.33	VI-I 95%	High
		67	**29**	**5**	**0**	**N 0.33**	**VI-I 95%**	**High**
5	There is a lack of awareness and a deeper understanding of the value that technology could have in supporting the organization and healthcare delivery.	57	43	0	0	N 0.24	VI-I 100%	High
		62	**33**	**5**	**0**	**N 0.34**	**VI-I 95%**	**High**
6	Users are not properly trained and motivated to ensure buy-in. This results in resistance and lack of commitment.	52	38	10	0	N 0.44	VI-I 90%	High
		52	**43**	**5**	**0**	**N 0.34**	**VI-I 95%**	**High**
7	Poor mapping of system capabilities to business processes and workflow in the complex healthcare environment.	43	48	10	0	N 0.41	VI-I 90%	High
		43	**52**	**5**	**0**	**N 0.33**	**VI-I 95%**	**High**
8	There is a lack of appropriate training to ensure meaningful use of the system once it is implemented.	38	57	5	0	N 0.32	VI-I 95%	High
		33	**62**	**5**	**0**	**N 0.30**	**VI-I 95%**	**High**
9	Users have unrealistic expectations and expect sophisticated technological solutions to immediately solve all problems. These expectations are often not met at the onset of the implementation of the technology solution which creates resistance to future implementations.	19	67	10	5	N 0.48	VI-I 86%	High
		19	**76**	**5**	**0**	**N 0.22**	**VI-I 95%**	**High**
10	Guidelines, policies, and procedures to guide sustainable implementation of ever-changing technological solutions in the healthcare environment are not available.	57	29	14	0	N 0.53	VI-I 86%	High
		62	**29**	**10**	**0**	**N 0.44**	**VI-I 90%**	**High**
11	Slow, unreliable, unavailable systems results in users losing confidence in the technology solution and thus not using it.	33	48	14	5	N 0.66	VI-I 81%	High
		33	**57**	**5**	**5**	**N 0.54**	**VI-I 90%**	**High**

(Table 5.5 continued)

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
12	Health information captured using technology solutions are considered to be unreliable because there is a lack of quality control mechanisms.	33	43	19	5	N 0.71	VI-I 76%	Medium
		29	**62**	**5**	**5**	**N 0.50**	**VI-I 90%**	**High**
13	Citizens are not engaged and aware of the benefits that technology could offer in terms of healthcare delivery.	29	48	14	10	N 0.81	VI-I 76%	Medium
		29	**62**	**5**	**5**	**N 0.50**	**VI-I 90%**	**High**
14	High staff turnover results in lack of capacity and consistency in efforts to implement technology.	29	52	19	0	N 0.47	VI-I 81%	High
		29	**62**	**10**	**0**	**N 0.34**	**VI-I 90%**	**High**
15	Lack of user involvement at all stages also results in lack of buy-in.	38	52	10	0	N 0.39	VI-I 90%	High
		29	**62**	**10**	**0**	**N 0.34**	**VI-I 90%**	**High**
16	Decision makers are not trained to understand the technology solutions offered and how it will meet requirements for future expansion.	76	14	10	0	N 0.41	VI-I 90%	High
		76	**10**	**14**	**0**	**N 0.52**	**VI-I 86%**	**High**
17	There is a lack of capacity and absence of necessary structures to implement, execute, support, and monitor existing policies and regulations in terms of technology implementations.	71	14	14	0	N 0.53	VI-I 86%	High
		67	**19**	**14**	**0**	**N 0.54**	**VI-I 86%**	**High**
18	Poor insight and lack of understanding into the role that technology solutions could play in improving healthcare delivery.	48	38	14	0	N 0.51	VI-I 86%	High
		52	**33**	**14**	**0**	**N 0.52**	**VI-I 86%**	**High**
19	There is a lack of accountability mediated through audit trails.	38	33	19	10	N 0.95	VI-I 71%	Medium
		48	**38**	**10**	**5**	**N 0.68**	**VI-I 86%**	**High**
20	Poor planning in terms of budgeting for technology implementations.	52	24	19	5	N 0.85	VI-I 76%	Medium
		48	**38**	**10**	**5**	**N 0.68**	**VI-I 86%**	**High**
21	Lack of standardization of technological solutions hampers integration and interoperability between systems.	52	38	10	0	N 0.44	VI-I 90%	High
		48	**38**	**14**	**0**	**N 0.51**	**VI-I 86%**	**High**
22	Conflicting expectations and dependence on various stakeholders hampers implementation.	33	33	24	10	N 0.94	VI-I 67%	Low
		43	**43**	**5**	**10**	**N 0.82**	**VI-I 86%**	**High**
23	A lack of an adequate career path in health informatics results in disinterest and little incentive to make the effort to learn about available technology.	43	43	10	5	N 0.66	VI-I 86%	High
		43	**43**	**14**	**0**	**N 0.49**	**VI-I 86%**	**High**

(Table 5.5 continued)

	FACTOR	Very Important	Important	Slightly Important	Unimportant	POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
24	Organizations that are interested in implementing technology often end up not doing so because there are no clear guidelines on what to consider when implementing technology and how to prepare the environment for the implementation.	38	38	24	0	N 0.60	VI-I 76%	Medium
		38	**48**	**14**	**0**	**N 0.47**	**VI-I 86%**	**High**
25	The user interface of data capturing forms offered by technology solutions are not conducive to ease of use and accurate data capturing.	33	43	24	0	N 0.56	VI-I 76%	Medium
		33	**52**	**14**	**0**	**N 0.44**	**VI-I 86%**	**High**
26	Lack of implementation, enforcement, and monitoring of compliance to relevant healthcare technology standards.	33	57	5	5	N 0.54	VI-I 90%	High
		29	**57**	**14**	**0**	**N 0.41**	**VI-I 86%**	**High**
27	Lack of adequate Service Level Agreements (SLAs) results in unacceptable response times to queries and requests for support	33	57	5	5	N 0.54	VI-I 90%	High
		29	**57**	**14**	**0**	**N 0.41**	**VI-I 86%**	**High**
28	The provision of basic health care is top priority which leaves little capacity to spend time, effort, and funds on implementing and using new technologies instead of current systems.	29	52	10	10	N 0.76	VI-I 81%	High
		29	**57**	**5**	**10**	**N 0.71**	**VI-I 86%**	**High**
29	Lack of on-site technical support results in unacceptable response times when support is needed.	29	48	19	5	N 0.67	VI-I 76%	Medium
		24	**62**	**10**	**5**	**N 0.52**	**VI-I 86%**	**High**
30	Insufficient ICT resources on site.	57	19	24	0	N 0.70	VI-I 76%	Medium
		62	**19**	**19**	**0**	**N 0.63**	**VI-I 81%**	**High**
31	Lack of computer literacy skills amongst healthcare staff.	43	38	19	0	N 0.56	VI-I 81%	High
		43	**38**	**19**	**0**	**N 0.56**	**VI-I 81%**	**High**
32	Lack of adequate connectivity and communication infrastructure in South Africa.	57	14	29	0	N 0.78	VI-I 71%	Medium
		62	**14**	**24**	**0**	**N 0.71**	**VI-I 76%**	**Medium**
33	Lack of a national framework and guidelines for the implementation of technological systems to address problems with current systems.	62	14	24	0	N 0.71	VI-I 76%	Medium
		62	**14**	**24**	**0**	**N 0.71**	**VI-I 76%**	**Medium**
34	Some organizations in rural areas are inaccessible in terms of service delivery (especially IT).	43	29	14	14	N 1.14	VI-I 71%	Medium
		48	**29**	**10**	**14**	**N 1.13**	**VI-I 76%**	**Medium**

(Table 5.5 continued)

FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
	Very Important	Important	Slightly Important	Unimportant			
35 Lack of common unique identifier to track patients.	48	33	14	5	N 0.75	VI-I 81%	High
	48	**29**	**19**	**5**	**N 0.82**	**VI-I 76%**	**Medium**
36 Users do not make meaningful use of the system once it is implemented because they often do not have confidence in the information provided by the system and are thus not willing to make decisions based on this information.	33	33	29	5	N 0.81	VI-I 67%	Low
	38	**38**	**19**	**5**	**N 0.75**	**VI-I 76%**	**Medium**
37 Available technological solutions do not meet the clinical needs of the healthcare sector.	33	43	14	10	N 0.86	VI-I 76%	Medium
	29	**48**	**19**	**5**	**N 0.67**	**VI-I 76%**	**Medium**
38 There is a lack of a Government backed drive to implement technology solutions.	38	29	24	10	N 1.00	VI-I 67%	Low
	38	**33**	**24**	**5**	**N 0.81**	**VI-I 71%**	**Medium**
39 Lack of funding to spend on technology solutions.	24	48	19	10	N 0.79	VI-I 71%	Medium
	24	**48**	**19**	**10**	**N 0.79**	**VI-I 71%**	**Medium**
40 Potential benefits offered by wireless technologies and mobile devices are not exploited to its fullest potential.	38	24	33	5	N 0.90	VI-I 62%	Low
	38	**29**	**33**	**0**	**N 0.71**	**VI-I 67%**	**Low**
41 There is not sufficient evidence on meaningful return on investment for technology implementations.	24	38	24	14	N 0.97	A VI-I or I-SI 62%	Low
	24	**43**	**19**	**14**	**N 0.94**	**VI-I 67%**	**Low**
42 Available technological solutions do not meet the administrative needs of the healthcare sector.	29	29	24	19	N 1.17	-	None
	29	**33**	**24**	**14**	**N 1.04**	**VI-I 62%**	**Low**
43 There are concerns relating to the theft of hardware.	10	43	38	10	N 0.63	I-SI 81%	High
	5	**57**	**33**	**5**	**N 0.43**	**I-SI 90%**	**High**
44 There is a perception that the use of technology will have a negative impact on the doctor-patient relationship.	14	29	48	10	N 0.73	I-SI 76%	Medium
	0	**38**	**52**	**10**	**N 0.39**	**I-SI 90%**	**High**
45 Cost-cutting mechanisms such as aggressive time scales for implementation are detrimental to the long term success of technology implementations.	24	48	29	0	N 0.52	I-SI 76%	Medium
	14	**62**	**24**	**0**	**N 0.37**	**I-SI 86%**	**High**

(Table 5.5 continued)

	FACTOR	RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
46	Physical layout on site restricts easy interaction between technological system and workflow.	19	48	29	5	N 0.63	I-SI 76%	Medium
		10	52	33	5	N 0.51	I-SI 86%	High
47	Cost of hardware, software, maintenance, and support is prohibitive.	14	33	43	10	N 0.73	I-SI 76%	Medium
		5	38	48	10	N 0.52	I-SI 86%	High
48	There is resistance to change from current paper-based systems and way of doing things.	24	48	29	0	N 0.52	I-SI 76%	Medium
		19	52	29	0	N 0.47	I-SI 81%	High
49	Lack of reliable electricity supply.	24	38	33	5	N 0.73	I-SI 71%	Medium
		19	43	38	0	N 0.54	I-SI 81%	High
50	Concerns relating to the confidentiality, security, and privacy of patient data are not adequately addressed.	24	43	33	0	N 0.56	I-SI 76%	Medium
		19	43	38	0	N 0.54	I-SI 81%	High
51	Lack of space for ICT resources on site.	19	38	38	5	N 0.68	I-SI 76%	Medium
		14	38	43	5	N 0.62	I-SI 81%	High
52	Poor after-sales support results in inadequate maintenance, customization, and enhancement of systems once implemented.	24	29	43	5	N 0.78	I-SI 71%	Medium
		14	38	43	5	N 0.62	I-SI 81%	High
53	To ensure the desired effect on quality of care it is necessary to assess the proposed implementation properly and consider cost-effectiveness.	29	38	33	0	N 0.62	I-SI 71%	Medium
		24	43	33	0	N 0.56	I-SI 76%	Medium
54	Lack of open source solutions.	5	10	57	29	N 0.56	SI-U 86%	High
		0	10	57	33	N 0.37	SI-U 90%	High
55	Potential advantages offered by cloud computing are not exploited to its fullest potential.	29	14	33	24	W 1.30	-	None
		29	5	43	24	W 1.28	SI-U 67%	Low
56	Fear and a lack of computer literacy skills results in resistance to the adoption of technology.	24	52	24	0	N 0.48	A VI-I or I-SI 76%	Medium
		19	62	19	0	N 0.38	A VI-I or I-SI 81%	Medium

(Table 5.5 continued)

FACTOR		RESPONSES (% Rounded)				POLARITY	LEVEL OF IMPORTANCE	DEGREE OF CONSENSUS
		Very Important	Important	Slightly Important	Unimportant			
57	Project implementations take too long to complete or are not completed at all.	24	48	24	5	N 0.66	A VI-I or I-SI 71%	Medium
		19	62	19	0	N 0.38	A VI-I or I-SI 81%	Medium
58	It is necessary to introduce incentives to using technology to motivate staff and increase staff retention.	24	29	19	29	W 1.30	-	None
		14	43	14	29	N 1.10	-	None

Table 5.5: Summarized results of Delphi Rounds 2 and 3.

Factor 58 was the only factor where the degree of consensus was determined to be *none*. When considering the ratings by the participants for each of the levels of importance, there is no clear level that was rated significantly higher than the others, although 43% of the participants thought that it is necessary to introduce incentives to motivate staff to use technology. When looking at the motivations provided by participants that did not agree with this 43%, it is possible to spot interesting trends (see Appendix K). The participants that rated this factor as *very important* were of the opinion that incentives would be the only way to ensure the meaningful use of HITs while the participants that rated the factor as *slightly important* were of the opinion that a thorough change management process would ensure that incentives were not necessary. The 29% of the participants that rated this factor as *unimportant* were mostly of the opinion that in the current healthcare landscape HITs should be accepted as "tools of the trade" and that staff should not receive incentives for simply doing what is expected of them.

5.6 Factors that Impact the Adoption and Meaningful Use of HITs in the South African Healthcare Landscape

The purpose of the Delphi study was to identify factors that need to be considered to encourage the adoption and meaningful use of HITs in the South African healthcare landscape. As discussed in Section 5.2, the participants in the Delphi study were considered to be suitably knowledgeable about the South African context and the domain under investigation. According to the discussion of the results of the final round of the Delphi study, there were no factors on which consensus was reached that it is *very important* that these factors are addressed to encourage the adoption and meaningful use of HITs. Despite this, consensus was reached on 42 factors that were rated as being *very important to important* in encouraging the adoption and meaningful use of HITs. According to the rating scale that was used by participants, to rate each factor during Rounds 2 and 3 of the Delphi study, it implies that these factors have a direct or significant impact on the adoption and meaningful use of HITs in the South African healthcare landscape. These factors are summarized and discussed in the following sections.

The 33 broad key phrases used during the phase 1 analysis of the Delphi Round 1 results to group the ideas, views, and opinions expressed by participants were again used to group relevant factors together (see Section 5.3.2 and Tables 5.1 and 5.2) with a view to drafting the guidelines required to meet the main objective of this research project. The 42 individual factors on which consensus was reached that they are *very important to important* factors were grouped according to the broad key phrases that they were derived from during the first round of the Delphi study (see Table 5.2). This results in 26 broad categories being identified. Out of the 33 broad categories that were identified during the first round of the Delphi study, seven of these categories contained no factors that were rated as *very important to important*. In summarizing these results, the quantitative data resulting from the Round 3 analysis, and some of the motivations provided by participants for not agreeing with the majority of other participants were considered. Each

section contains a table that summarizes the final results of the Delphi study in terms of factors related to the broad key phrase. The factors in these tables are numbered according to the number assigned to the specific factor in Table 5.5.

The following discussion concludes the sequential exploratory mixed methods research process as discussed in Chapter 2. In Chapter 2, Figure 2.2 illustrates the process is followed to identify factors/barriers that need to be addressed to encourage the adoption and meaningful use of HITs. Figure 5.2 is an updated version of Figure 2.2 based on the discussion of the execution of the Delphi method in this chapter.
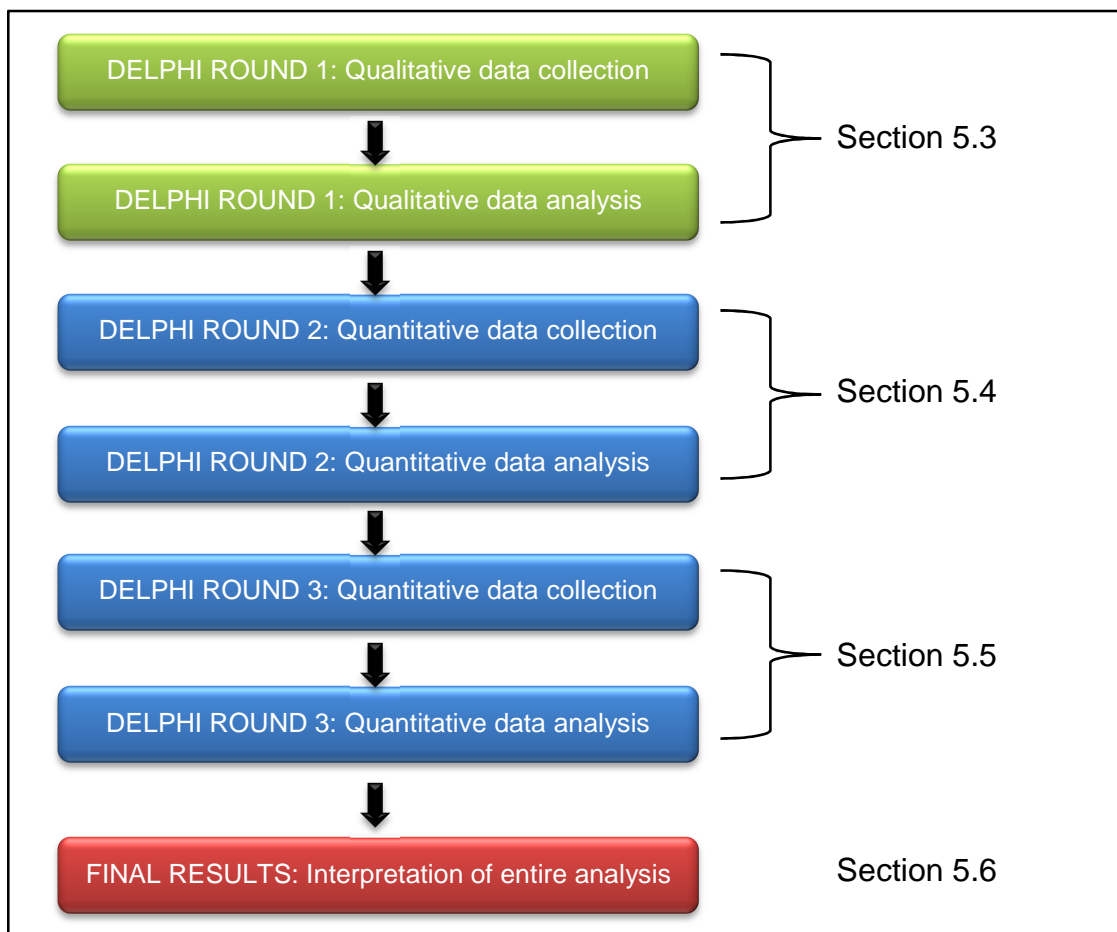
Figure 5.2: Research process followed to identify factors that need to be addressed to encourage the adoption of HITs.

5.6.1 Guidelines, Policies, and Procedures

10. Guidelines, policies, and procedures to guide sustainable implementation of ever-changing technological solutions in the healthcare environment are not available.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
62%	29%	10%	0%	90%	High	None (0.44)
17. There is a lack of capacity and absence of necessary structures to implement, execute, support, and monitor existing policies and regulations in terms of technology implementations.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
67%	19%	14%	0%	86%	High	None (0.54)
24. Organizations that are interested in implementing technology often end up not doing so because there are no clear guidelines on what to consider when implementing technology and how to prepare the environment for the implementation.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
38%	48%	14%	0%	86%	High	None (0.47)

Table 5.6: Factors related to guidelines, policies, and procedures.

Participants considered the lack of clear guidelines about what to consider when selecting a technological solution, especially considering the dynamic nature of HITs, and a lack of guidelines on how to prepare the environment for sustainable implementation as factors that should be addressed. A lack of capacity and the necessary structures to implement, execute, support, and monitor existing policies and regulations in terms of technology implementations also rated as a factor that hampers the adoption and meaningful use of HITs.

5.6.2 User Support

6. Users are not properly trained and motivated to ensure buy-in. This results in resistance and lack of commitment.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
52%	43%	5%	0%	95%	High	None (0.34)
14. High staff turnover results in lack of capacity and consistency in efforts to implement technology.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	62%	10%	0%	90%	High	None (0.34)
15. Lack of user involvement at all stages also results in lack of buy-in.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	62%	10%	0%	90%	High	None (0.34)

Table 5.7: Factors related to user support.

The lack of user involvement in all stages of adopting HITs results in a lack of buy-in. Other factors that result in a lack of buy-in and resultant resistance and lack of commitment include insufficient training on how to use the adopted HITs, and a lack of motivation to use the HITs. These factors may be contributed to high staff turnover which results in a lack of capacity and consistency in efforts to implement technology.

5.6.3 Management and/or Decision Maker Support

2. Lack of ownership and accountability makes it difficult to sustain technology implementations.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
38%	62%	0%	0%	100%	High	None (0.32)
3. Decision makers and management do not provide adequate direction, leadership, and support in terms of technology adoption.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
71%	24%	5%	0%	95%	High	None (0.32)

Table 5.8: Factors related to management and/or decision maker support.

All of the 21 participants indicated that a lack of ownership and accountability makes it difficult to sustain technology implementations with 100% of the participants rating Factor 2 as *very important to important*. This was supported by Factor 3 that indicates that decision makers and management do not provide adequate direction, leadership, and support in terms of technology adoption.

5.6.4 Quality Control and Accountability

12. Health information captured using technology solutions are considered to be unreliable because there is a lack of quality control mechanisms.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	62%	5%	5%	90%	High	None (0.50)
19. There is a lack of accountability mediated through audit trails.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
48%	38%	10%	5%	86%	High	None (0.68)

Table 5.9: Factors related to quality control and accountability.

Health data that are captured using HITs are considered to be unreliable because there is a lack of quality control mechanisms, and a lack of accountability for the data captured.

5.6.5 Data Capturing

25. The user interface of data capturing forms offered by technology solutions are not conducive to ease of use and accurate data capturing.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
33%	52%	14%	0%	86%	High	None (0.44)

Table 5.10: Factors related to data capturing.

Despite user involvement in the development of many software systems used in the healthcare environment and an improvement in user-interfaces, it seems that the user-interface of data capturing forms

is still not as conducive to ease of use and accurate data capturing as it should be.

5.6.6 Staff Capacity

1. Staff is overburdened due to staff shortages and heavy patient loads which results in a lack of capacity to support technology implementation and use.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
57%	43%	0%	0%	100%	High	None (0.24)

Table 5.11: Factors related to staff capacity.

Staff shortages which lead to overburdened staff and heavy patient loads emerged as a factor that has a direct impact on the adoption and meaningful use of HITs. All participants indicated that staff shortages results in a lack of capacity to support HIT implementation and meaningful use.

5.6.7 Education, Training and Awareness

5. There is a lack of awareness and a deeper understanding of the value that technology could have in supporting the organization and healthcare delivery.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
62%	33%	5%	0%	95%	High	None (0.34)
8. There is a lack of appropriate training to ensure meaningful use of the system once it is implemented.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
33%	62%	5%	0%	95%	High	None (0.30)
16. Decision makers are not trained to understand the technology solutions offered and how it will meet requirements for future expansion.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
76%	10%	14%	0%	86%	High	None (0.52)
18. Poor insight and lack of understanding into the role that technology solutions could play in improving healthcare delivery.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
52%	33%	14%	0%	86%	High	None (0.52)

(Table 5.12 continued)

31. Lack of computer literacy skills amongst healthcare staff.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
43%	38%	19%	0%	81%	High	None (0.56)

Table 5.12: Factors related to education, training, and awareness.

Participants rated a lack of computer literacy skills amongst healthcare staff, and decision makers that are not trained to understand the technology solutions offered and how it will meet requirements for future expansion as factors that should be addressed. This could be attributed to a lack of appropriate training once the system is implemented, which was also rated by participants as a factor that has a direct impact on the meaningful use of HITs. Three participants that rated a lack of computer literacy skills as only *slightly important* mentioned that a lack of computer literacy skills can be addressed fairly easily and quickly with appropriate training, and that healthcare staff are generally more computer literate than a few years ago, especially with the increased penetration of mobile technologies. Other factors that should be addressed relates to awareness, poor insight, and a lack of understanding of the value that HITs could have in supporting the organization and healthcare delivery.

5.6.8   Infrastructure

30. Insufficient ICT resources on site.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
62%	19%	19%	0%	81%	High	None (0.63)
32. Lack of adequate connectivity and communication infrastructure in South Africa.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
62%	14%	24%	0%	76%	Medium	None (0.71)

Table 5.13: Factors related to infrastructure.

Insufficient ICT resources on site were considered to be a factor that should be addressed. There was consensus amongst participants that a lack of adequate connectivity and communication infrastructure in South Africa hampers the adoption and meaningful use of HITs.

5.6.9 Unrealistic Expectations

9. Users have unrealistic expectations and expect sophisticated technological solutions to immediately solve all problems. These expectations are often not met at the onset of the implementation of the technology solution which creates resistance to future implementations.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
19%	76%	5%	0%	95%	High	None (0.22)

Table 5.14: Factors related to unrealistic expectations.

Participants considered users to have unrealistic expectations and were of the opinion that users expected sophisticated technological solutions to immediately solve all of the problems that they experience. When these expectations are not met at the onset of the implementation of the solution, it creates resistance to future implementations. This relates to poor insight and understanding of the value that HITs could have in supporting the organization and healthcare delivery, as discussed in Section 5.6.7. A better understanding of the value that HITs could offer, and the limitations of the solution, could aide in addressing unrealistic expectations.

5.6.10 Meaningful Use

36. Users do not make meaningful use of the system once it is implemented because they often do not have confidence in the information provided by the system and are thus not willing to make decisions based on this information.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
38%	38%	19%	5%	76%	Medium	None (0.75)

Table 5.15: Factors related to meaningful use.

Users often do not have confidence in the information provided by a HIT system due to a lack of quality control and accountability, as discussed in Section 5.6.4. They are unwilling to make decisions based on the information provided by the system, which results in an absence of meaningful use.

5.6.11   Standardization

21. Lack of standardization of technological solutions hampers integration and interoperability between systems.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
48%	38%	14%	0%	86%	High	None (0.51)
26. Lack of implementation, enforcement, and monitoring of compliance to relevant healthcare technology standards.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	57%	14%	0%	86%	High	None (0.41)

Table 5.16: Factors related to standardization.

There are two factors, in terms of standardization, that need to be addressed. First, there is a lack of implementation, enforcement, and monitoring of compliance to relevant healthcare technology standards. Second, this hampers integration and interoperability between systems. Both of these factors have a negative impact on the adoption and meaningful use of HITs.

5.6.12   Cost

20. Poor planning in terms of budgeting for technology implementations.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
48%	38%	10%	5%	86%	High	None (0.68)
39. Lack of funding to spend on technology solutions.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
24%	48%	19%	10%	71%	Medium	None (0.79)

Table 5.17: Factors related to cost.

A factor that was rated as *very important to important* in terms of cost related to a lack of funding to spend on technology solutions. Interestingly poor planning in terms of budgeting for technology implementations was rated significantly more important than the lack of funding. It seems that the lack of funding might be due to poor budgeting practices. Based on comments made by two participants it seems that this is less of a factor in the private healthcare sector and that HIT adoption is not a high priority in an overburdened public healthcare sector which results in less funds being allocated to HIT implementation.

It was interesting to note that another factor related to cost that was added to the questionnaire during Round 1, related to the cost of hardware, software, maintenance, and support. This factor was finally rated as *important to slightly important*, indicating that it is not the actual cost of HIT implementation that is prohibitive, but rather the lack of funding.

5.6.13   Return on Investment

41. There is not sufficient evidence on meaningful return on investment for technology implementations.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
24%	43%	19%	14%	67%	Low	None (0.94)

Table 5.18: Factors related to return on investment.

There was *low* consensus that there is not sufficient evidence on meaningful return on investment (ROI) for technology implementations. One participant that did not agree with this statement indicated that he considered HIT adoption to be so important for the future that there should not be such a strong focus on ROI and two other participants indicated that there are studies that show the value and ROI of HITs but that these are not made readily available to the decision makers.

5.6.14   Change Management

4. Implementing technology solutions requires significant change in an organization. There is often a lack of a comprehensive change management strategy which results in the organization not being properly prepared for the level of change required.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
67%	29%	5%	0%	95%	High	None (0.33)

Table 5.19: Factors related to change management.

The adoption of HIT into the healthcare environment requires significant change in the organization. A comprehensive change management strategy is often not in place which results in the organization being unprepared for the level of change required. There was high consensus that change management should be addressed, with 67% of the participants rating appropriate change management as having a direct impact on the adoption and meaningful use of HITs.

5.6.15   Business Processes and Workflow

7. Poor mapping of system capabilities to business processes and workflow in the complex healthcare environment.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
43%	52%	5%	0%	95%	High	None (0.33)

Table 5.20: Factors related to business processes and workflow.

The majority of participants believe that there is a poor mapping of system capabilities to business processes and workflow in the complex healthcare environment.

5.6.16 After Sales and Technical Support

27. Lack of adequate Service Level Agreements (SLAs) results in unacceptable response times to queries and requests for support.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	57%	14%	0%	86%	High	None (0.41)
29. Lack of on-site technical support results in unacceptable response times when support is needed.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
24%	62%	10%	5%	86%	High	None (0.52)

Table 5.21: Factors related to after sales and technical support.

A lack of on-site technical support results in unacceptable response times when support is needed, which hampers meaningful use of HIT implementations. This may be attributed to inadequate Service Level Agreements (SLAs).

5.6.17 System Availability and Reliability

11. Slow, unreliable, unavailable systems results in users losing confidence in the technology solution and thus not using it.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
33%	57%	5%	5%	90%	High	None (0.54)

Table 5.22: Factors related to system availability and reliability.

Systems that are slow and unreliable or unavailable results in users losing confidence in the HIT implementation and not using it. These factors may be attributed to inadequate after sales and technical support, as discussed in Section 5.6.16.

5.6.18 Government

33. Lack of a national framework and guidelines for the implementation of technological systems to address problems with current systems.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
62%	14%	24%	0%	76%	Medium	None (0.71)
38. There is a lack of a Government backed drive to implement technology solutions.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
38%	33%	24%	5%	71%	Medium	None (0.81)

Table 5.23: Factors related to the government.

A lack of a government backed drive to implement HIT and a national framework and guidelines to drive such implementations was indicated as factors that need to be addressed. Two participants who rated Factors 33 and 38 as only *slightly important,* commented that this does not relate to the private healthcare sector, but rather to the public healthcare sector where the implementation of HITs would have to be backed by government.

5.6.19 Patient Identifier

35. Lack of common unique identifier to track patients.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
48%	29%	19%	5%	76%	Medium	None (0.82)

Table 5.24: Factors related to a patient identifier.

There is a lack of a common unique identifier that can be used to track patients.

5.6.20   Clinical and Administrative Needs

37. Available technological solutions do not meet the clinical needs of the healthcare sector.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	48%	19%	5%	76%	Medium	None (0.67)
42. Available technological solutions do not meet the administrative needs of the healthcare sector.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
29%	33%	24%	14%	62%	Low	None (1.04)

Table 5.25: Factors related to clinical and administrative needs.

There was *medium* consensus that available technological solutions do not meet the clinical needs of the healthcare sector and *low* consensus that available solutions do not meet their administrative needs. Four participants who did not agree with Factor 37 and five participants who did not agree with Factor 42 commented that there are actually very good solutions available that meet the clinical and administrative needs of the healthcare sector but that these solutions come at a price.

5.6.21   Mobile Health and Wireless Technologies

40. Potential benefits offered by wireless technologies and mobile devices are not exploited to its fullest potential.						
VI	**I**	**SI**	**U**	**% RATING AS VI-I**	**DEGREE OF CONSENSUS**	**POLARITY**
38%	29%	33%	0%	67%	Low	None (0.71)

Table 5.26: Factors related to mobile health and wireless technologies.

There was only *low* consensus that the potential benefits offered by wireless technologies and mobile devices are not exploited to its fullest potential. The benefits of these technologies should be investigated to make HITs more accessible.

5.6.22 Citizen Focused

13. Citizens are not engaged and aware of the benefits that technology could offer in terms of healthcare delivery.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
29%	62%	5%	5%	90%	High	None (0.50)

Table 5.27: Factors related to citizen focus.

Citizens are not engaged and aware of the benefits that technology could offer in terms of healthcare delivery and as such there is not a demand from citizens to adopt HITs to lower costs and improve the quality of care that they receive.

5.6.23 Career Path

23. A lack of an adequate career path in health informatics results in disinterest and little incentive to make the effort to learn about available technology.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
43%	43%	14%	0%	86%	High	None (0.49)

Table 5.28: Factors related to career path.

There is little incentive for healthcare staff to make an effort to learn about HITs because there is currently no career path for health informaticians in South Africa.

5.6.24 Priority

28. The provision of basic health care is top priority which leaves little capacity to spend time, effort, and funds on implementing and using new technologies instead of current systems.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
29%	57%	5%	10%	86%	High	None (0.71)

Table 5.29: Factors related to priority.

A factor that has a direct impact on the adoption and meaningful use of HITs in the South African healthcare sector and that has been alluded to in several of the factors discussed in Section 5.6 thus far, relates to the priorities of the South African healthcare sector. In the overburdened public sector, the provision of basic health care is the top priority, which leaves little capacity to spend time, effort, human resources, and funds on implementing and using new technologies instead of the current systems.

5.6.25 Stakeholders Involved

22. Conflicting expectations and dependence on various stakeholders hampers implementation.						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
43%	43%	5%	10%	86%	High	None (0.82)

Table 5.30: Factors related to stakeholders involved.

There are many stakeholders that may be affected by the adoption and use of HITs and the conflicting expectations and dependence on the approval of these stakeholders often hampers implementation.

5.6.26 Accessibility

34. Some organizations in rural areas are inaccessible in terms of service delivery (especially IT).						
VI	I	SI	U	% RATING AS VI-I	DEGREE OF CONSENSUS	POLARITY
48%	29%	10%	14%	76%	Medium	None (1.13)

Table 5.31: Factors related to accessibility.

In the public sector many healthcare facilities are located in rural areas and it may be difficult to deliver ICT services to these inaccessible areas.

The previous sections summarized the factors that have a direct or significant impact on the adoption and meaningful use of HITs in the South African healthcare landscape. In Chapter 6, these factors are incorporated into the formulation of guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

In the next section the validity and reliability of the Delphi results is discussed before concluding this chapter.

5.7   Reliability and Validity of Delphi Results

In Chapter 2 it was established that the reliability of the results obtained through a qualitative method, such as the Delphi method, should be established based on the credibility (truthfulness), auditability (consistency), and confirmability of the results, and the fittingness (applicability) of the method to the problem under investigation (Hasson et al., 2000). The criteria of fittingness of the method is addressed in Section 2.3.3.6 of Chapter 2 and it was established that the Delphi method was an appropriate method to identify the factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape. The detailed discussions in this chapter based on the analysis of the responses received during the various rounds of this Delhi study revealed the following regarding the credibility and auditability of the results:

▪ After the researcher analysed the first round responses the research promoter worked through the analysis to ensure that the analysis fairly represented the ideas, views, and opinions expressed by participants and that there was no researcher bias.

▪ All calculations used to process the results of the second and third rounds were checked by a statistician from the Statistics Department at the Nelson Mandela Metropolitan University (NMMU) and were confirmed to be correct.

The detailed discussions of the design of the questionnaire used during each round of the study, and the analysis of the responses received after each round further strengthens the confirmability of the results. All of the original responses received from participants, and the detailed documents used during the analysis of the results are provided in the Appendices. This further serves to confirm the results of the Delphi study.

In terms of validity, the following criteria that should be applied to determine the validity of Delphi results were highlighted in Chapter 2:

- Researcher bias should not be imposed on participants.
- Participants should have appropriate knowledge of the area under investigation.
- Response rates.

The first round questionnaire was unstructured and open-ended, as recommended in Section 2.3.3.2 of Chapter 2, to ensure that no researcher bias was imposed on the participants. To further exclude researcher bias when the results were analysed the research promoter checked all the analysis of the results, as previously mentioned.

Section 5.2 discussed the knowledge of the participants that took part in this study which was deemed appropriate for the problem under investigation based on their job titles, the organizations that they work for, and their experience.

A total of 21 participants took part in this study which is well within the recommended range for a Delphi study. All 21 participants returned their questionnaires for all 3 rounds of the study, which further contributes to the validity of the Delphi results.

Based on this discussion the results of this Delphi study can be deemed to be both reliable and valid.

5.8 Conclusion

This chapter described the results of a three round Delphi study, concluding with the final results presented in Table 5.5. These results contribute to a clearer understanding of the factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare sector. Conducting this Delphi study was, thus, a significant step in identifying aspects that are relevant to the formulation of guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape in order to improve continuity of care. The next chapter will present these guidelines.

CHAPTER 6

GUIDELINES TO ENCOURAGE THE ADOPTION AND MEANINGFUL USE OF HEALTH INFORMATION TECHNOLOGIES IN THE SOUTH AFRICAN HEALTHCARE LANDSCAPE TO IMPROVE CONTINUITY OF CARE

Chapters 3 to 5 addressed the sub-objectives of this research project. Chapter 3 explored the nature of the South African healthcare landscape and its impact on continuity of care. Chapter 4 investigated HITs that could be employed to improve continuity of care. A technological model employing appropriate HITs which is sensitive to the South African healthcare landscape was presented to improve continuity of care in this country. Chapter 5 highlighted factors that need to be addressed to encourage the adoption and meaningful use of such HITs in the South African healthcare landscape.

In this chapter the main objective of this research project is addressed through the formulation of guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

The next chapter will conclude the research presented in this thesis.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

6.1 Introduction

The main objective of this research project is to formulate guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

In Chapter 3, it was established that the modern healthcare setting is typically highly fragmented and, therefore, it is appropriate to focus on the informational dimension of continuity of care to ensure that information is sharable between various healthcare providers in situations where interpersonal and longitudinal continuity is not easily achievable. This means there is a strong emphasis on the continuity of medical records.

In Chapter 4, it was established that there are various problems associated with paper-based methods of record keeping in the healthcare sector, especially with informational continuity of care. In Section 4.4 a technological model that employs electronic methods of record keeping was proposed to improve informational continuity of care in the South African healthcare landscape.

Chapter 5 reported on the results of a Delphi study that was executed to identify factors that need to be addressed to encourage the adoption and meaningful use of HITs, such as electronic records. The factors identified in this study are presented in Section 5.6.

This chapter presents the guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care. These address both the technological requirements on a high level, and the factors that need to be addressed to encourage the adoption and meaningful use of the suggested technological components.

The next section describes the process followed to formulate the guidelines.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

6.2 Formulating the Guidelines

The main objective of this research project is to formulate guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care. Firstly, it is necessary to explore the concept of continuity of care and the impact of the South African healthcare landscape on it, and modern healthcare provision as it relates to the concept of continuity of care to formulate such guidelines. It was established in Chapter 3 that the fragmented nature of modern healthcare provision makes it difficult in many situations to achieve interpersonal or longitudinal continuity of care. The focus has shifted to the informational dimension of continuity of care and, as a result, the continuity of medical records. In situations where interpersonal or longitudinal continuity is difficult to achieve, informational continuity can ensure that patients still receive appropriate care by ensuring that the treating healthcare professional has relevant health information about the patient available when needed. It was established that South Africa is no exception in terms of the fragmented nature of healthcare provision. In South Africa, healthcare services are provided by both the public and private healthcare sectors. The majority of patients receive care from the public sector, however, patients may receive care from healthcare providers in both sectors. Once the intended NHI is implemented in South Africa it is expected that many patients will increasingly receive care from both sectors. Within each sector there is fragmentation with patients receiving care from various healthcare providers at primary, secondary, tertiary and quaternary levels of care.

Secondly, it was established that it is necessary to investigate various HITs, especially electronic methods of record keeping in the healthcare sector, that could be employed to improve informational continuity of care, to formulate guidelines to address the improvement of continuity of care in South Africa. Chapter 4 explored such HITs and proposed a technological model that employs various HITs and is mindful of the South African healthcare landscape to improve continuity of care. It was necessary to investigate

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

factors that need to be addressed in South Africa to encourage the adoption and meaningful use of HITs to ensure the successful adoption of such a technological model and the meaningful use of its components. The final aspect that had to be addressed to formulate guidelines for the improvement of continuity of care was to identify these factors.

The Delphi method was employed to identify these factors and Chapter 5 reported on the results of the study. There were 21 participants who are suitably knowledgeable about health informatics and the South African healthcare landscape that took part. Forty-two factors were identified as factors that have a direct or significant impact on the adoption and meaningful use of HITs in South Africa. These 42 factors were summarized into 26 categories in Section 5.6.

It was established that it is necessary to focus on the informational continuity of medical records to achieve continuity of care in the modern South African healthcare landscape. A technological model that employs various HITs, most notably electronic record keeping systems, was developed that is applicable to the South African healthcare landscape. The factors that need to be addressed to ensure the successful adoption and meaningful use of the technological components of this model were identified and summarized into 26 broad categories. Finally, the researcher was ready to formulate guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

The guidelines were formulated though argumentation. As stated in Chapter 2, argumentation involves deducing a conclusion, also called a claim, through reasoning. The conclusion is based on a set of assumptions, also called the support, which is the information from which the conclusions can be drawn. The support of the argument therefore provides the justification for the claim of the argument.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

The support for the guidelines was described in Chapters 3, 4, and 5 and summarized above. The support for the guidelines was strengthened through the acceptance of a paper presenting the technological model for improved continuity of care by the South African Family Practice journal (see Appendix M), and the results of the Delphi study (see Section 5.7 in Chapter 5).

The researcher, in formulating the guidelines, considered the technological model, and the factors that need to be addressed to encourage the adoption and meaningful use of the technological components of the model. These factors are summarized in Section 5.6 and during their review it became clear that by addressing some factors, other factors may be addressed as a consequence. It can be stated that some factors are symptoms of other factors. This is reflected in the guidelines in the next section. The guidelines, thus, unify the technological model with the factors that need to be addressed to ensure the successful adoption and meaningful use of the components of the model. Additionally, the researcher reflected on the original contributions received from the Delphi participants during the first round of the study (see Appendix D) to gain a deeper understanding of the factors that have a direct to significant impact on the adoption and meaningful use of HITs in the South African healthcare landscape.

The researcher followed an approach similar to that followed in the analysis of the Round 1 results of the Delphi study to incorporate the factors that need to be addressed to ensure the successful adoption and meaningful use of the components of the technological model into the formulation of the guidelines. The researcher worked through the aspects identified in the categories presented in Sections 5.6.1 to 5.6.26 to group similar aspects together by coding these groupings using broad key phrases. The following broad groupings were identified:

- The South African government and various professional bodies.
- HIT vendors.
- Healthcare staff, management, and decision makers.
- Healthcare organizations.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

- Healthcare consumers.
- Infrastructure.

Next, the researcher analysed these groupings to formulate the guidelines that relate to the specific groupings that could play a role in creating an environment that is conducive to the adoption and meaningful use of HITs in the South African healthcare landscape.

In the following section these guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care are presented. They indicate the HITs required to improve continuity of care in the context of the South African healthcare landscape, and factors that need to be addressed to create an environment that is conducive to the adoption and meaningful use of such HITs. While there are unique factors that would have to be addressed to encourage the adoption and meaningful use of each technological component of the model, these guidelines provide an indication of the factors that needs to be addressed to create an environment that is generally conducive to the adoption and meaningful use of HITs in the South African healthcare landscape.

6.3 Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the South African Healthcare Landscape to Improve Continuity of Care

The guidelines depicted in Figure 6.1 illustrate the technological components that are necessary to improve continuity of care, and the factors that need to be addressed to encourage the adoption and meaningful use of such technological components in the South African healthcare landscape. In the following sections, the technological model that was presented in Chapter 4 is reiterated. Thereafter, the guidelines needed to encourage the adoption and

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

meaningful use of HITs in the context of the proposed model are discussed in the form of aspects relating to the following broad areas:

- The South African government and various professional bodies.
- HIT vendors.
- Healthcare staff, management, and decision makers.
- Healthcare organizations.
- Healthcare consumers.
- Infrastructure.

The factors addressed in each of these broad areas have been derived from the factors identified in Section 5.6. The arrows (⤳) used in Figure 6.1 indicate instances where addressing a specific factors may address other factors as a consequence.

6.3.1 Technological Components

The technological components that are necessary to improve informational continuity of care in the South African healthcare landscape, as described in Section 4.4, include a multilateral public-utility standards-based HIE with standards-based interoperable EMRs as the primary source of information and standards-based interconnected PHRs as a possible secondary source of information. The proposed solution is decentralized and scalable and could potentially enable patients to improve their health self-management through the use of PHRs. Informational continuity of care can be improved through a standards-based HIE that allows data to be exchanged between various standards-based EMR systems, with standards-based PHRs providing a potential additional source of information to the healthcare providers.

Once the NHI is implemented in South Africa, it is understood that primary healthcare providers will act as gatekeepers in terms of referrals to higher levels of care (McIntyre, 2010). Patients will be expected to follow the appropriate referral route and will only be able to access care at higher levels of the healthcare system based on a referral from their primary healthcare provider (McIntyre, 2010; Ramjee & McLeod, 2010; Van den Heever, 2010).

SOUTH AFRICAN GOVERNMENT AND VARIOUS PROFESSIONAL BODIES:

- Initiate a government-backed drive to implement relevant HITs.
- Develop a national framework and guidelines to drive implementation and meaningful use.
- Establish professional bodies to support and monitor technology implementation and adherence to relevant policies and regulations.
- Address staff shortages in public healthcare sector.
- Establish career path for health informaticians.
- Ensure appropriate budgeting for HIT adoption.
- Establish professional body to guide, enforce, and monitor compliance to relevant standards.

- Prioritize HIT adoption.
- Reduce conflicting stakeholder demands.

HEALTHCARE CONSUMERS:

- Identify unique patient identifier.
- Raise awareness regarding the benefits associated with HIT use.

- Demand from healthcare consumers to adopt HITs to lower costs and improve the quality of care that they receive.

- Improved mapping to business processes and workflow.
- Improved adherence to clinical and administrative needs.
- Improved user interfaces to assists in accurate data capturing.

HIT VENDORS:

- Involve users in all stages of development and implementation.
- Improve quality control mechanisms in software.
- Adopt relevant standards when developing HITs.
- Investigate potential of wireless and mobile technologies to make HITs more accessible.
- Improve SLAs to ensure appropriate after sales and technical support.

- Improved meaningful use of HITs.

- Improved system availability and reliability.

Information from individual's standards-based interconnected PHR

HEALTHCARE STAFF, MANAGEMENT, AND DECISION MAKERS:

- Improve direction, leadership, and support in terms of HIT adoption.
- Increase HIT awareness.
- Ensure appropriate training.

- Address unrealistic expectations.
- Improve insight into value of HITs.
- Motivate staff to make meaningful use of HITs.
- Increase sense of ownership and accountability
- Ease concerns related to ROI.

- Improved computer literacy skills.
- Improved meaningful use of HITs.

MULTILATERAL PUBLIC UTILITY STANDARDS-BASED HEALTH INFORMATION EXCHANGE

PRIMARY CARE:
Starting point for EMR implementation

Information from primary healthcare provider's standards-based interoperable EMR

Information from various other healthcare providers' standards-based interoperable EMRs

HEALTHCARE ORGANIZATIONS

- Improve ICT resources on site.
- Implement appropriate change management strategies to support adoption of HITs.

INFRASTRUCTURE:

- Improve connectivity and communication infrastructure.

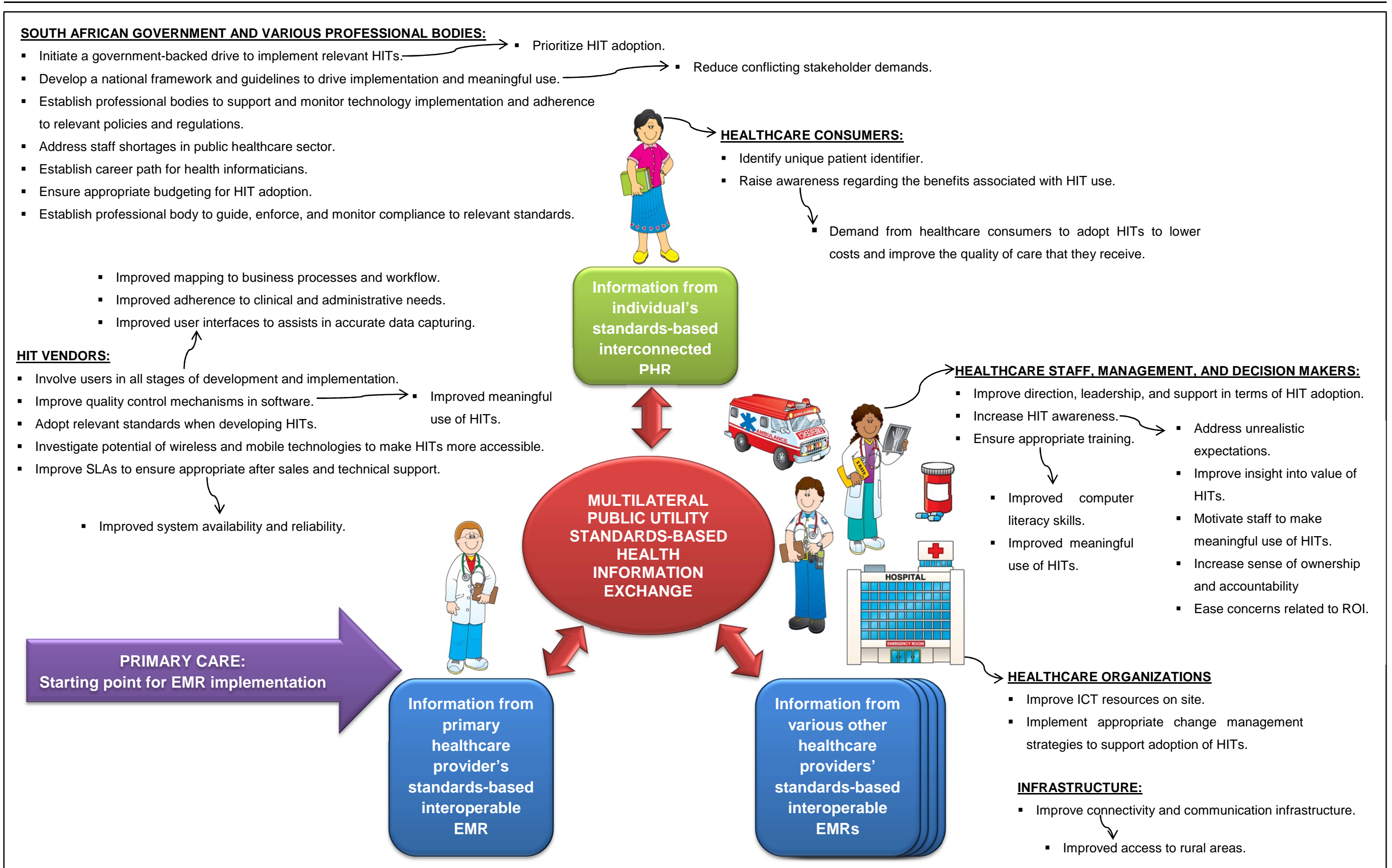- Improved access to rural areas.

Figure 6.1: Guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape in order to improve continuity of care.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

This makes the primary care level especially appropriate for the adoption of EMRs (as indicated in Figure 6.1) because it is at this level that the bulk of health data of the patient is generated. It is noted that primary care is information intensive and whilst the primary level of care is the level of care where interpersonal or longitudinal continuity is most likely to occur it is less likely to be perfectly realized in the modern healthcare landscape, however, informational continuity is crucial at this level of care (Donaldson, Yordy, Lohr, & Vanselow, 1996). It is logical to think that the entry point into the healthcare system is the obvious place where improved continuity should be promoted (Saltman et al., 2006).

The proposed technological solution requires the adoption of standards-based interoperable EMRs by primary healthcare providers to ensure that at least the bulk of health information of the patient is in a format that can be shared through the multilateral public-utility standards-based HIE. Once healthcare providers at higher levels of care adopt EMRs, it is then feasible to work towards the vision of an EHR to improve informational continuity further.

Chapter 4 notes that this technological solution does not exclusively benefit healthcare providers that adopt EMRs because other healthcare providers will benefit from more detailed referral letters and the other benefits associated with EMR functionality, such as the checking of allergies and drug interactions when the provider that uses an EMR prescribes medication, and so forth.

Sections 6.3.2 to 6.3.7 discuss the factors that need to be addressed to encourage the adoption and meaningful use of the technological components recommended by these guidelines.

6.3.2 South African Government and Various Professional Bodies

6.3.2.1 Initiate a Government-Backed Drive to Implement Relevant HITs

During the first round of the Delphi study, participants commented that there is a lack of support from government for the

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

implementation of HITs in the public sector and since there is no government mandate driving the adoption of HITs, the private sector is equally slow to adopt them due to the investment required. Several participants commented that instability in the South African government and the appointment of three different Ministers of Health in the past five years has led to continually changing levels of support for the adoption, or not, of HITs. Additionally, there are very diverse approaches to the adoption and use of HITs amongst the various provincial Departments of Health.

The final results of the Delphi study indicate that a national drive for the implementation of HITs backed by the government is necessary to make the adoption and meaningful use of HITs a priority in both the public and the private sectors of the healthcare system. This could encourage the private sector to focus less on ROI and more on the other benefits associated with HIT adoption, such as improved quality of care.

6.3.2.2 Develop a National Framework and Guidelines to Drive Implementation and Meaningful Use

In addition to the need for a government-backed drive for the implementation of HITs, Delphi participants commented that there is a lack of clear guidelines on what is expected in terms of the adoption and appropriate use of HITs in the healthcare sector. Participants commented both on the huge gap in terms of HIT adoption and use between the private and the public sector, and on the diverse nature of provincial HIT adoption and use in the public sector.

The results of the final round of the Delphi study indicate that appropriate guidelines, policies, and procedures that are backed by the government are necessary to drive the adoption and meaningful use of HITs. Several participants commented that this is highly

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

applicable to the public healthcare sector and that the private sector has successfully implemented certain HIT systems, for example, billing systems. This may be the case but it is necessary for the national Department of Health to enforce its role as steward of the healthcare system to ensure that appropriate EMR systems are adopted in all sectors of the South African healthcare landscape to ensure the sharing of information through an HIE. This can be achieved through the development of a government-backed national framework for the adoption and use of HITs such as EMRs, PHRs, and HIEs.

This type of framework would aid in addressing the factors related to the difficulty of satisfying the needs of multiple stakeholders affected by the implementation of HIT solutions. The framework should thus be comprehensive and address the needs of all the relevant stakeholders involved.

6.3.2.3 Establish Professional Bodies to Support and Monitor Technology Implementation and Adherence to Relevant Policies and Regulations

Delphi participants indicate that government departments do not always know which criteria should be considered in the selection of HIT systems. This has resulted in many inferior systems being adopted which has resulted in poor performance and frustration. The development of a national framework with the appropriate guidelines, policies, and procedures (as discussed) will aid in addressing these problems. To further address these problems it is necessary to ensure that there are appropriate professional bodies to support and monitor technology implementations and adherence to these policies and relevant regulations. Such professional bodies will play a role in ensuring that the HITs that are adopted comply with relevant regulations such as the National Health Act, Health Professions Act,

CHAPTER 6:

Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

Electronic Communications Act, Promotion of Access to Information
Act, and so forth.

6.3.2.4 Address Staff Shortages in Public Healthcare Sector

Heavy patient loads and staff shortages make it difficult to integrate
new HIT implementations with workflow within the healthcare setting.
In the final round of the Delphi study, 100% of the participants rated
the impact of staff shortages as a factor that has a direct and
significant impact on the adoption and meaningful use of HITs in the
South African context. These staff shortages would have to be
addressed to ensure the required capacity to sustain the
implementation and meaningful use of these systems to ensure the
sustainability of HIT implementations. This is especially true for the
public healthcare sector.

6.3.2.5 Establish Career Path for Health Informaticians

There is little incentive for healthcare staff to make an extra effort to
learn about HITs and implement it in their work environment in a
healthcare setting where they are already overburdened (as
discussed). Incentives for such efforts such as promotion
opportunities as a health informatician would motivate staff to make
the extra effort. It is necessary to identify areas in the healthcare
environment where opportunities for health informaticians could be
developed. This may be addressed by a national framework, as
discussed in Section 6.3.2.2.

6.3.2.6 Ensure Appropriate Budgeting for HIT Adoption

The provision of basic healthcare services is the main priority when it
comes to allocating funds in the South African overburdened public
healthcare sector. In areas where even basic healthcare is lacking
the allocation of funds to HIT implementations is not practical. This is
less of a problem in the private healthcare sector.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

It is envisioned that the implementation of the planned NHI will strengthen the delivery of healthcare services in South Africa and hopefully lead to more funds being allocated for HITs. A government backed drive towards the implementation and meaningful use of HITS, as discussed in Section 6.3.2.1, could lead to HITs receiving more priority in terms of budgeting.

6.3.2.7 Establish Professional Body to Guide, Enforce, and Monitor Compliance to Relevant Standards

Fifteen of the 21 Delphi participants mentioned the importance of standardization in terms of the successful implementation and meaningful use of HITs during the first round of the study. In the final round standardization was again rated as being a *very important to important* factor to address.

There are different standards that are being implemented in the private and the public sector, and within the sectors as well. For example, in the public sector there is no coordination on the adoption of standards between the provincial Departments of Health, which leads to the creation of silos of information which are very difficult to integrate on a national level.

Firstly, it is necessary to provide guidelines on standardization, typically in the context of a national framework for HIT implementation (see Section 6.3.2.2). Secondly, it is necessary to establish professional bodies to enforce and monitor compliance to these relevant healthcare technology standards to aid integration and interoperability between the different HIT systems.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

6.3.3 HIT Vendors

6.3.3.1 Involve Users in All Stages of Development and Implementation

Several Delphi participants mentioned during the first round of the study that users should be involved in all stages of the development and implementation of HIT solutions. Their involvement ensures buy-in, and can also ensure better mapping of system capabilities to business processes and workflow in the complex healthcare environment, systems that meet the clinical and administrative needs of the healthcare sector, and improved user-interfaces that are conducive to ease of use and accurate data capturing.

6.3.3.2 Improve Quality Control Mechanisms in Software

The errors of paper-based systems are often duplicated in the automation of these systems and there are not always appropriate quality control mechanisms in place to avoid this. Several participants mentioned an absence of a culture of data quality in the South African healthcare system, as was indicated in Section 4.2.1 in the discussion of the Chamisa and Zulu (2007) study. If appropriate quality control mechanisms are absent then the problems associated with the use of paper-based systems are duplicated in the technological solutions which results in a lack of trust in the data contained in these systems and a resultant lack of meaningful use. Appropriate quality control mechanisms should be built into technology solutions where possible to improve data quality and to ensure that individuals can be held accountable for the quality of the data they entered into the system. If users trust the data contained in these systems, it will lead to improved meaningful use of these systems.

6.3.3.3 Adopt Relevant Standards When Developing HITs

The lack of standardization hampers integration and interoperability between different HIT solutions. Especially in terms of improving

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

informational continuity of care, the adoption of relevant standards is crucial to ensure that different EMRs, PHRs, and ultimately EHRs, can exchange data through HIEs. HIT vendors should ensure that the solutions they develop adhere to relevant standards and as indicated in Section 6.3.2.7 there should be a professional body in South Africa that guides, enforces, and monitors compliance to relevant standards, as set out in a national framework (see Section 6.3.2.2).

6.3.3.4 Investigate Potential of Wireless and Mobile Technologies to Make HITs More Accessible

The potential of wireless technologies should be explored to support the deployment of HIT solutions in the rural areas of South Africa. Mobile devices can aid in making HITs more accessible. While many healthcare workers might not be computer literate, a growing number can be considered to be mobile literate (IHEED Institute, 2011).

6.3.3.5 Improve SLAs to Ensure Appropriate After Sales and Technical Support

Several Delphi participants commented during the first round of the study that slow and unreliable or unavailable systems results in users losing confidence in the HIT implementation and not using it. This can be attributed to a lack of on-site technical support in many instances. Vendors should work with customers to ensure that appropriate SLA's are agreed upon that will balance their needs with the funds available.

6.3.4 Healthcare Staff, Management, and Decision Makers

6.3.4.1 Improve Direction, Leadership, and Support in Terms of HIT Adoption

The Delphi participants had very strong opinions related to ownership and accountability. They were of the opinion that a lack of

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

ownership and accountability has a direct and significant impact on the adoption and meaningful use of HITs. All 21 participants rated the factor related to a lack of ownership and accountability as a *very important* or *important* factor that should be addressed. The final results of the Delphi study indicate that decision makers and management do not provide adequate direction, leadership, and support in terms of technology adoption. This has a negative impact on the adoption and meaningful use of HITs since it leads to a lack of acceptance and motivation to use the system, and ultimately creates resistance amongst staff.

6.3.4.2 Increase HIT Awareness

There were several factors exposed through the Delphi study that can be traced back to a lack of awareness and poor insight amongst healthcare staff of the functionality offered by HITs, and the value of HITs in the healthcare environment.

One of these factors relates to unrealistic expectations that are often not met when a HIT solution is implemented. Staff expect HIT solutions to immediately solve all of the problems they experience and when this does not happen, it creates resistance to future HIT implementations. Increased awareness and a better understanding about both the value and limitations of HITs will aide in addressing these unrealistic expectations.

Another factor, that relates both to the need for improved direction, leadership, and support, and to the need for increased awareness, is staff motivation. If staff has a better understanding of the value that HITs could have in their work environment it would lead to increased motivation to learn how to use the system to make meaningful use of it. This will increase the sense of ownership and accountability amongst staff which would lead to a further improvement in meaningful use.

CHAPTER 6:

Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the South African Healthcare Landscape to Improve Continuity of Care

Increased insight into the value of HITs in reducing costs and improving the quality of care would aid in shifting the strong focus on ROI and rather focus attention on the various other benefits associated with the adoption and meaningful use of HITs.

6.3.4.3   Ensure Appropriate Training

Sixteen of the 21 Delphi participants made contributions related to education, training, and awareness during the first round of the study. Unsurprisingly, all the factors related to this category were rated to have a direct to significant impact on the adoption, and especially the meaningful use of HITs, in the final round of the Delphi study. The general computer literacy levels of healthcare workers should be improved to ensure meaningful use. It is equally necessary to ensure that the users of the system receive appropriate training once the system is installed to ensure that they will be able to make meaningful use of it. Additionally, decision makers should receive appropriate training to raise their awareness and insight into the features and requirements of HIT solutions. This is necessary to ensure that they understand the solutions offered to them to be able to make informed decisions and select solutions that will meet their healthcare requirements, and their requirements for future expansion.

6.3.5 Healthcare Organizations

6.3.5.1   Improve ICT Resources on Site

Many healthcare facilities do not currently have sufficient ICT resources on site to support the meaningful use of HIT solutions once implemented. This factor needs to be addressed and taken into consideration in terms of budgeting for HIT adoption.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

6.3.5.2 Implement Appropriate Change Management Strategies to Support Adoption of HITs

Adopting HITs into the healthcare environment often involves changes to workflow and the current way of performing certain tasks. A cultural change is thus required in the organization which can only be facilitated through appropriate change management strategies. An appropriate change management process will prepare the organization for the level of change required and ensure meaningful use of the new system.

6.3.6 Healthcare Consumers

6.3.6.1 Identify Unique Patient Identifier

A lack of a common unique identifier that can be used to track patients hampers the adoption and meaningful use of HITs. Especially in the context of this study, it is very important to be able to uniquely identify patient records to ensure the appropriate exchange of data through the HIE. There are plans to introduce a National Health Insurance card as part of the NHI rollout (Department of Health, 2011). This card will be issued to the registered population of South Africa and will allow for ease of access to patient information, and the portability of health services. Such a card may offer a solution to the problem of uniquely identifying patients.

6.3.6.2 Raise Awareness Regarding the Benefits Associated with HIT Use

The results of the Delphi study reveal that the participants considered citizen engagement to be an important factor in encouraging the adoption and meaningful use of HITs. They commented that citizens should be empowered and become more involved in taking control of their health. The technological model proposed in this thesis promotes the use of PHRs to enable

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

individuals to become more involved in managing their health. It would be necessary to raise awareness around the usefulness of HITs such as PHRs and as previously mentioned the potential offered by mobile technologies should be explored to make these HITs more accessible to the general public.

Once citizens become more aware of the benefits associated with HITS such as EMRs, PHRs, and HIEs, such as the associated cost savings and improved quality of care, the demand from citizens could help to encourage HIT adoption in the South African healthcare sector.

6.3.7 Infrastructure

6.3.5.1 Improve Connectivity and Communication Infrastructure

It would be necessary to improve the accessibility of affordable connectivity and communication infrastructure available to healthcare facilities in South Africa to encourage the adoption of HITs to support the meaningful use of these HITs once implemented. Improved connectivity and communication infrastructure will make healthcare facilities in rural areas of South Africa more accessible in terms of ICT service delivery.

6.4 Conclusion

This chapter addressed the main objective of this research project, which is to formulate guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care. It was necessary to develop the support for the guidelines to formulate such guidelines through argumentation. The support for the guidelines is summarized in Section 6.2.

CHAPTER 6:
Guidelines to Encourage the Adoption and Meaningful use of Health Information Technologies in the
South African Healthcare Landscape to Improve Continuity of Care

The guidelines were subsequently developed by considering the technological model, as presented in Chapter 4, and the factors that need to be addressed to encourage the adoption and meaningful use of the technological components of the model. These factors are summarized in Section 5.6.

The guidelines are illustrated in Figure 6.1 and discussed in Section 6.3. The guidelines provide directives towards addressing the factors that would encourage the adoption and meaningful use of HITs in the context of the proposed technological model. The components of the technological model are based on a decentralized, scalable approach that will allow disparate standards-based EMR and PHR systems to exchange data through an HIE. The proposed model supports the future adoption of EHR technology through the standards-based nature of the solution. The guidelines indicate that the primary healthcare level would be the most appropriate level to focus initial EMR implementation efforts on. This is due to the information intensive nature of this level of the healthcare system, and the role that the primary healthcare providers play in terms of gatekeeping to the higher levels of care in the healthcare system.

The guidelines further direct attention to the factors that need to be addressed to encourage the adoption of HITs such as EMRS, PHRs, and HIEs, and their meaningful use once implemented. These factors were categorized as factors relating to the South African government and various professional bodies, HIT vendors, healthcare staff, management, and decision makers, healthcare organizations, healthcare consumers, and infrastructure related factors. Under each of these broad categories, the factors that need to be addressed were highlighted and in certain instances it was indicated how these factors could address other factors that were emphasized by the Delphi study.

The next chapter will conclude this research project.

CHAPTER 7

CONCLUSION

In the previous chapter the main objective of this research project was addressed. Guidelines for the improvement of continuity of care in the South African healthcare landscape through the adoption and meaningful use of appropriate HITs were presented.

This chapter concludes the research presented in this thesis and suggests some areas suitable for future research.

7.1 Introduction

This chapter concludes the research by providing a summary of the results and an overview of the research process followed to achieve these results. The contributions made through the work presented in this thesis towards the body of knowledge in the field of health informatics in the South African context are summarized. The researcher acknowledges any research limitations and suggests areas suitable for future research.

7.2 Summary of Results

The main objective of this research project was to formulate guidelines to encourage the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

The following sub-objectives were specified in Chapter 1 to reach the main objective:

1. Understand the nature of the South African healthcare landscape and its impact on continuity of care in this country.

2. Investigate HITs that would be appropriate to address the improvement of continuity of care in the context of the South African healthcare landscape.

3. Develop an appropriate technological model to address the improvement of continuity of care in South Africa through the adoption of HITs.

4. Identify factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape.

5. Formulate guidelines to create an environment that is generally conducive to the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

Sub-objective 1 was addressed in Chapter 3 and it was recognised that the fragmented nature of the South African healthcare sector makes it increasingly difficult to achieve interpersonal and longitudinal continuity and that a focus on informational continuity and the continuity of medical records is increasingly important.

Chapter 4 addressed sub-objectives 2 and 3. Problems associated with traditional paper-based medical records were initially discussed, followed by a description of various HITs that could be employed to address these problems. The chapter concluded by presenting a technological model that implements standards-based PHRs and EMRs, and a multilateral public-utility standards-based HIE to promote informational continuity of care in the South African healthcare landscape.

Sub-objective 4 was addressed in Chapter 5. This chapter reported on the results of a Delphi study that was employed to identify the factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape.

Once the first four sub-objectives were addressed, the researcher was ready to address sub-objective 5: Formulate guidelines to create an environment that is generally conducive to the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care.

These guidelines were formulated though argumentation. The technological model, and the factors that need to be addressed to encourage the adoption and meaningful use of the technological components of the model was considered in the formulation of the guidelines. The guidelines thus unify the technological model with the factors that need to be addressed to ensure the successful adoption and meaningful use of the components of the model. These guidelines were presented and discussed in Chapter 6.

The following section provides an overview of the research process that was followed to reach these results.

7.3 Overview of Research Process

In Chapter 2, Figure 2.1 summarizes the research process followed to complete this research study. Figure 7.1 is an adaptation of Figure 2.1 and serves as an overview of the research process followed in the completion of

this research study, highlighting the appropriateness of the various research methods employed in the completion of this study.

The researcher defined the reseach questions and objectives.	Chapter 1
The researcher described the reseach design and reseach methods. Research methods include a literature review, argumentation, and the Delphi method.	Chapter 2
A literature review enabled the researcher to determine the impact of the South African healthcare landcape on continuity of care. It was established that the highly fragmented nature of healthcare provision in South Africa has a negative effect on continuity of care.	Chapter 3
Through a literature review the researcher identified HITs that could be employed to improve continuity of care in the South African healthcare landscape. PHRs, EMRs, EHRs, and HIEs were identified as HITs that could play a role in improving continuity of care.	Chapter 4
The researcher used argumentation to develop a technological model that employs standards-based PHRs, EMRs, and HIEs in order to improve continuity of care in the South African healthcare landscape.	Chapter 4
The Delphi method was employed to identify factors that should be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare landscape. This method allowed the researcher to identify these factors through the contributions of a panel of suitably knowledgeable participants.	Chapter 5
The researcher used argumentation to formulate guidelines that provide directives towards addressing factors that would encourage the adoption and meaningful use of HITs in the context of the proposed technological model in order to improve continuity of care in the South African healthcare landscape.	Chapter 6
The reseach study is concluded by summarizing the results and contributions. The researcher acknowledges research limitations and provides directives for future research.	Chapter 7

Figure 7.1: Overview of research process.

7.4 Summary of Contributions

The work presented in this thesis makes four main contributions towards the body of knowledge in the field of health informatics in the South African context:

1. The first contribution relates to a better understanding of the impact of the South African healthcare landscape on continuity of care, as described in Chapter 3. The implementation of the proposed NHI will have an impact on this healthcare landscape and possible consequences of its implementation on continuity of care were explored in Chapter 3.

2. A technological model that employs HITs that were considered to be appropriate in the context of the South African healthcare landscape was presented in Chapter 4. The aim of this technological model is to improve informational continuity of care through the adoption and meaningful use of the suggested HITs. A paper that presents this technological model was accepted for publication in the South African Family Practice journal. The publication of this paper will play a significant role in raising awareness amongst the readership of the journal about the role that HITs could play in improving continuity and quality of care and how this could be achieved through a technological model that is suitable for the South African healthcare context.

3. The results of the Delphi study that was conducted as part of this research project highlighted factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African healthcare sector. These results were presented in Chapter 5 and have been written up as a paper and submitted to the International Journal of Medical Informatics for publication. The adoption of HITs into the complex healthcare environment is a challenging task involving various stakeholders. The results of this study raise awareness with regards to factors that need to be taken into consideration when planning to implement HITs. This Delphi study is the first study of its kind, that the researcher is aware of, that identified factors that need to be addressed to encourage the adoption and meaningful use of HITs in the South African context. These factors were identified through the participation of 21

participants who are considered to be suitably knowledgeable regarding the status quo of HIT adoption and its meaningful use in the context of the South African healthcare landscape, and as such the results of this study make a significant contribution to research in the South African health informatics milieu.

4. The final contribution made by this research project is the formulation of guidelines to create an environment that is generally conducive to the adoption and meaningful use of HITs in the South African healthcare landscape to improve continuity of care. These guidelines indicate the appropriate HITs that should be employed to improve continuity of care in the South African healthcare landscape and indicate an appropriate starting point for the implementation of such HITs. As motivated in Section 6.3.1, it is suggested that the primary healthcare level is viewed as the most appropriate level of the healthcare system to focus initial EMR adoption efforts on. EMR adoption at this level of the healthcare system will be the primary focus area of future research efforts by the researcher, as described later in this chapter. In addition, the guidelines indicated various factors that need to be addressed to encourage both the adoption, and meaningful use, of the proposed HITs. These factors highlight areas that should be addressed by various stakeholders to create an environment that is conducive to the adoption and meaningful use of HITs.

These guidelines will be written up as a journal paper and submitted to an appropriate journal for publication.

7.5 Research Limitations

The research is limited due to the complex nature of the problem that was addressed in this research project. It would be necessary to test the technological model that was presented in Chapter 4 to test the guidelines. There are several factors that makes the implementation of the technological model infeasible as part of this research project. It would involve a multitude of stakeholders, extensive budget requirements, and a considerable time-

frame. As indicated in the guidelines, there are several factors that need to be addressed to encourage the adoption of the HITs proposed in the technological model. Addressing these factors would involve various stakeholders and other resources which are beyond the scope of this research project. Despite these limitations this research project has made unique contributions, as highlighted in Section 7.4, that will play a significant role towards creating an environment that is conducive to the adoption and meaningful use of appropriate HITs to improve continuity of care in the South African healthcare landscape.

Through the completion of this research project the researcher has identified specific research areas that require further investigation. These are described in the following section.

7.6 Future Research

Through the completion of this research project, the researcher identified the following areas that require further investigation:

- In the guidelines presented in Chapter 6 the primary level of care has been indicated as the most appropriate level of care to focus initial EMR implementation efforts on. The implementation of an EMR in a primary care practice will introduce significant changes in the work environment and require work redesign. It has been suggested that a socio-technical systems (STS) approach should be followed to ensure successful adoption when significant changes and work redesign are introduced in an organization (Appelbaum, 1997; Liu & Errey, 2006). STS theory is based on the argument that an organization is open to influences from its environment, and that the organization is a combination of both social and technical components that must work together to accomplish tasks (Appelbaum, 1997; Cherns, 1987; Liu & Errey, 2006; Scacchi, 2004). Due to the complex nature of the healthcare landscape and the various stakeholders involved the researcher intends to employ STS theory as a theoretical lens through which the adoption of EMRs into a primary care environment will be explored. By focusing on the technology and

considering social and environmental factors the researcher expects to be able to better identify specific factors influencing the successful adoption and meaningful use of EMRs at the primary level of care.

▪ It is necessary to explore the appropriateness of the proposed guidelines in terms of rural under-privileged areas. The relevance of the factors identified in the guidelines to healthcare settings in rural under-privileged areas will be corroborated and the guidelines revised accordingly.

▪ The proposed technological model is based on standards-based HITs. A detailed discussion and breakdown of all the relevant standards were beyond the scope of this thesis. Future research efforts will address investigating relevant standards, and the standards currently adopted by both the private and the public sector of the South African healthcare system. There is currently little integration between the systems used in these two sectors (Harrison et al., 2007[a]). It is thus necessary to investigate measures to ensure the integration of systems between these two sectors.

7.7 Conclusion

This chapter concludes this thesis and illustrates that all of the objectives established at the beginning of this research project have been accomplished. An overview of the information covered in the various chapters of this thesis was provided as it relates to the objectives of the research project. The contributions of this research project were summarized and limitations highlighted. Finally, specific research areas that require further investigation were described to establish future research directions for the researcher.

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